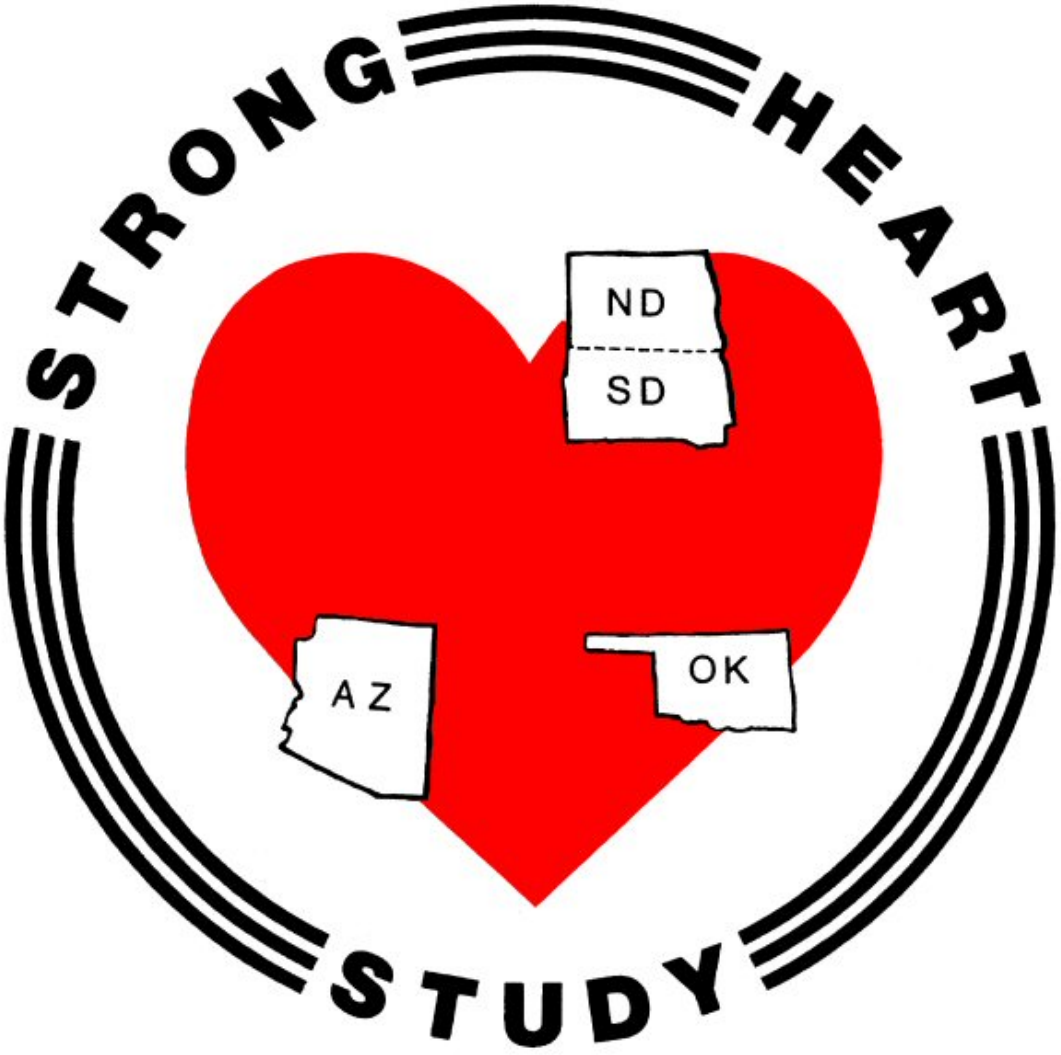


FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume One

GENERAL DESCRIPTION AND SURVEILLANCE PROCEDURES

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume One

GENERAL DESCRIPTION

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

ACKNOWLEDGEMENTS

The members of the Steering Committee of the Strong Heart Study would like to acknowledge that this manual and the extension of this study would not have been possible without the contributions and support of a large number of individuals and organizations. First, the Steering Committee wishes to express its appreciation to the thirteen Tribal Communities, whose approval and support have been so willingly offered and whose members are participants in the Strong Heart Study. For the preparation of the manual, we would like to acknowledge contributions and in some cases interview forms or instruction sheets from the following studies: Framingham, CARDIA, ARIC (Atherosclerosis Risk in Communities), CHS (Cardiovascular Health Study), The Longitudinal Diabetes Study of the Phoenix Epidemiology and Clinical Research Branch, National Institute of Diabetes, Digestive and Kidney Diseases, National Institutes of Health and the Diabetic Renal Disease Study. We wish to thank the Indian Health Service for providing us with access to medical records and reports, which have facilitated the planning and execution of the study. This SHS Phase V manual was compiled through the tireless efforts of Ms. JoAnne Whalen, Dr. Carl Schaefer, Ms. Lee Keesee, Dr. Jeunliang Yeh, Dr. Fawn Yeh, Ms. Karen Kimbley, Ms. Martha Stoddart, Ms. Debra Gates, Mr. Yiming Wang, and other staff at the Coordinating Center, and received careful oversight and many revisions from the SHS Steering Committee (especially Drs. Elisa Lee, Barbara Howard, Lyle Best, Richard Devereux, Jean MacCluer, Richard Fabsitz, Thomas Welty, Linda Cowan, and Jason Umans and the Study Coordinators (Dr. Tauqeer Ali, Ms. Marcia O'Leary, and Dr. Marie Russell). Special thanks are owed to Dr. Jan Beals, Dr. Thomas Welty and the Psychosocial Committee for developing a set of psychosocial instruments for use in Phase V and for developing the related Psychosocial Volume of the Manual (Volume 8). Additionally, we thank Lifescan, Inc. for supplying the glucose meters and supplies for the 3 Field Canters in Phase V. Finally, we wish to thank the staff of the Genetic Epidemiology Scientific Research Group, Epidemiology and Biometry Program, Division of Epidemiology and Clinical Applications Branch of the National Heart, Lung, and Blood Institute for making this study possible.

VOLUME I

GENERAL DESCRIPTION

Table of Contents

CHAPTER ONE

GENERAL DESCRIPTION AND STUDY MANAGEMENT

1.1 BACKGROUND

1.1.1 General

A review of existing data by the Subcommittee on Cardiovascular and Cerebrovascular Disease of the Secretary of Health and Human Service's Task Force on Black and Minority Health concluded that information on cardiovascular disease (CVD) in American Indians (AI) is inadequate and strongly recommended epidemiologic studies of this problem. The Strong Heart Study (SHS) was designed to respond to this recommendation.

1.1.2 Scientific Background

A. Rationale for studying heart disease in American Indians

CVD is the leading cause of death of American Indians. Approximately 30% of Indian deaths for all ages are associated with diseases of the heart. The number of deaths associated with heart disease and stroke among Indians aged 45 years and older exceeds the next three leading causes of death (cancer, diabetes and unintentional injuries) combined. The decline in age-adjusted CVD death rates experienced by the general population in recent decades is not being observed in the Indian population. Among most Indian groups, CVD morbidity and mortality are increasing. SHS offers by far the best, and perhaps the only, prospect of understanding why this increase in CVD is occurring and, more importantly, what can be done to reverse the trend.

An extremely practical reason exists for continued study of CVD among American Indians: - little systematic information about management of heart disease, stroke and hypertension among Indians is available to guide health care workers in identifying effective treatment and intervention programs. The SHS provides by far the greatest body of information to help guide therapeutic and preventive measures for those providing CVD care to AI. As management and prevention of CVD become more complex, the need for epidemiologic, pathophysiologic and genetic information becomes greater. Without information that can only be obtained from the SHS, the extension of such advances to AI will be problematic, subject to potential error, and require years of study. It also must be emphasized that the SHS population serves as the model for examining diabetes-related CVD; our results have been applied to other populations in the US and throughout the world.

B. Description of Strong Heart Study, Phases I - IV

The SHS includes cohort and family/genetic studies of CVD among AI men and women. SHS has been supported by the National Heart, Lung, and Blood Institute (NHLBI) from October 1, 1988 (Phases I-IV), and funding has now been continued for Phase V of SHS, which is a 2nd exam of all of the family members enrolled in the family pilot study of Phase III and/or the full-blown family study in Phase IV. SHS is the largest longitudinal study and the largest study of extended families ever undertaken among American Indians. The study population includes members of 13 communities in three geographical areas.

The SHS has two major components. The cohort study is a comprehensive investigation of CVD morbidity and mortality and associated risk factors. It employs standardized methodology for CVD epidemiology, and is designed to estimate CVD mortality and morbidity and prevalence of known and suspected CVD risk factors and target organ damage among American Indians and to assess the significance of these risk factors in a longitudinal analysis. It contains the largest cohort of individuals with diabetes under continuous CVD surveillance in the U.S.

During the Phase I baseline examination, conducted between 1989 and 1991, 4,549 tribal members (62% of the total population aged 45-74 years) were examined. A second examination (Phase II), involving 89% of surviving original cohort members, was conducted between 1993 and 1995. A third and final exam in 1998-1999 (Phase III) involved 88% of the surviving cohort (3,197 participants).

Continuous surveillance of the cohort has been in effect since the conclusion of the first examination. Information on each member is obtained yearly, and all deaths and all nonfatal CVD events are classified by standardized criteria.

The second major component is a genetic study (the Strong Heart Family Study, SHFS) using linkage analyses to localize genes influencing CVD and its risk factors. This study is noted for the large size of its families and extensive evaluation of cardiovascular risk factors and cardiovascular phenotypes by carotid and cardiac ultrasound measurements. The SHFS was initiated in Phase III as a (feasibility study), expanded to a fully-powered genetic study in Phase IV, and continues as a second exam of all of the surviving family members in Phase V. In Phase III, between 9 and 12 extended families (more than 300 members at least 18 years of age) were recruited and examined in each of the three field centers beginning in 1997. The exam included all elements of the Phases I – III exams except the echocardiogram, gall bladder sonogram, and pulmonary function tests. A 10-centimorgan (cM) map has been constructed and linkage analysis is being performed to assess inheritance of CVD risk factors. In Phase IV, an additional 18 to 25 extended families (a total of about 900 members at least 15 years of age) were recruited from each of the field centers from 2001 – 2003. This effort provided a total of 3,797 individuals from 94 families, of whom 825 are Phase III participants re-examined in Phase IV. In Phase IV, both cardiac and carotid ultrasound exams were done. Major goals for Phase IV were to estimate heritabilities, covariate and household effects, and genetic and environmental correlations for a large set of CVD risk factors and measures of preclinical disease; to generate a 10 cM map of nearly 400 short tandem repeats (STRs) for the 2,700+ Phase IV participants; to screen the phenotypes for linkage; and to begin finer scale mapping to localize quantitative trait loci (QTLs). In Phase V promising signals will be pursued.

High-throughput microsatellite genotyping for a genome scan has been completed in 3,797 SHFS participants (1,240 or more family members from each of the three centers). Work continues to screen the phenotypes for linkage using a variance component approach in full pedigrees; and to begin finer scale mapping with additional STRs to more precisely localize QTLs within targeted chromosomal regions, using SNPs in positional candidate genes for linkage/ association analysis to identify genes that are responsible for linkages detected by the initial genome scan.

C. Rationale for Phase V of the Strong Heart Study

One of the most promising routes for expanding knowledge of CVD is exploration of genetic linkage of CVD phenotypes. It is particularly important among Indian populations, because public health policies designed for majority populations are not likely to be not applicable or possibly even to be risk enhancing when applied to AI.

The high prevalence of diabetes in most Indian communities suggests that investigation of diabetes and CVD genetics in SHS may be particularly fruitful. There are several reasons why this might be true. First, possibly unique genetic etiologies may be operative. Second, the more homogeneous genetic background of SHS communities tends to reduce the variation seen in more heterogeneous populations, increasing power to detect genetic influences. Third, the high prevalence and incidence of these conditions enhance the statistical power. Lastly, SHS communities contain large extended families with limited migration.

The goal of the SHFS is detection and mapping of genes influencing variation in risk factors for CVD and related disorders. We successfully recruited and examined more than 1,200 family members in each of the three centers. A 10-centimorgan map is now complete for all of the family members, and we have localized several regions of interest. Our heritability assessments indicate that several CVD risk factors and measures of atherosclerosis and cardiac function have a strong genetic basis, and we have obtained promising preliminary indications of chromosomal regions that may contain genes for CVD risk factors and cardiac function. The sources of genetic variation responsible for these preliminary linkage results require further study, and additional disease-predisposing genes remain to be discovered and mapped. We have power to detect a range of previously unidentified risk factor genes that may be important determinants of cardiovascular health and disease among AI, and the availability of echocardiographic and carotid ultrasound measures provides an innovative approach to understanding genetic mechanisms involved in CVD. While our communities will not allow the transformation and establishment of permanent cell lines from the WBC samples, we have collected adequate amounts of DNA from the cohort at all 3 exams, and from family members at their baseline and repeat exams. Availability of DNA for SHS participants (including both cohort and family study participants) will enable us to analyze positional candidate genes identified by linkage analysis, as well as other candidate genes that may influence CVD risk factors (see below).

We will also examine selected candidate genes using a conservative approach due to the large number of conflicting results from association studies, particularly where non-functional

polymorphisms are investigated. Our highly selective candidate approach is complementary to the linkage strategy. Our analyses will examine relationships with major vascular end points particularly where intermediate phenotypes for pathways affected are less well represented in SHS (e.g., the innate immune system). Decreases in cost of genotyping mean that this can be achieved relatively inexpensively.

We will assess a limited number of compelling candidate genes and their relationship to major vascular endpoints without guidance from the linkage study.

1) Mannose binding lectin (MBL). This serum protein opsonizes pathogenic microorganisms by binding mannose moieties on their surface and activating complement via the lectin pathway prior to antibody formation. Decreases in opsonization detected in 5-7% of Caucasians and commonly among other populations result from markedly decreased levels of MBL related to variations of both structural and promoter portions of this gene. Previous reports suggest an association between MBL genotypes and CVD, and our preliminary data showed a high prevalence of variant MBL alleles and their relation to coronary artery disease (CAD) with potentially important public health implications.

2) Interleukin 6 (IL6) -174 C to G. Interleukin 6 stimulates release of acute phase proteins, including fibrinogen and C-reactive protein. A -174 polymorphism in the IL-6 promoter has been described, and in vitro expression supports a functional role. In non-disease states, the C allele is associated with lower concentrations of IL6 relative insulin sensitivity and higher endothelium dependent vasodilatation. The C allele has been associated with reduced carotid intimal medial thickness and coronary heart disease in some but not all studies.

3) Thrombospondin 4 (A387P variant). Thrombospondins are a family of extracellular matrix glycoproteins involved in cell adhesion. A large-scale screen of functional polymorphisms in the GeneQuest study highlighted the A387P variant as having the strongest association with vascular disease (Odds Ratio of myocardial infarction for P allele of 1.89).

4) Lymphotoxin-α (G252A, A804C variants). Variants in the lymphotoxin-α gene were significantly associated with myocardial infarction (OR 1.78) in a large Japanese case control study using genome wide SNP analysis screening.

5) Toll-like receptor-4 (TLR-4). Toll-like receptors, such as TLR-4, respond to microbial lipopolysaccharide (LPS) by activating the NK-kB signaling pathway and induce a wide variety of cytokines and other inflammatory mediators. Many in vitro investigations provide evidence of the influence of TLR-4 receptors on processes related to atherosclerosis. Genotypic variants of TLR-4 are associated with CRP and WBC responses to pulmonary LPS challenge in humans. Various lines of clinical evidence suggest a role for TLR-4 in the pathogenesis of CVD.

6) Peroxisome Proliferator-Activated Receptorγ (PPARγ) Pro12Ala. PPARγ is an important candidate gene for insulin sensitivity and has been related to vascular disease. In addition to very rare loss of function mutations (PPARγ mutations, digenic mutations of PPARγ and PPP1R3), it is now clear that a common mutation (Pro12Ala) of PPARγ has functional consequences *in vitro* and relates reliably to development of type 2 diabetes in large populations. Recently the Alanine 12 allele has been associated with protection against incident myocardial

infarction (OR 0.71). As the costs of SNP analyses continue to fall, other promising candidate genes may also be analyzed.

Rationales for Major Components of Phase V of the Strong Heart Study

1. Rationale for Mortality and Morbidity Surveillance of the Original Cohort plus the SHFS Members

Cohort surveillance is necessary to identify fatal and non-fatal CVD outcomes. Because we will not examine the original SHS cohort as part of Phase V, surveillance is the only tool for identification of incident CVD events. In 2006, the SHS cohort will range in age from about 62 to 91 years with a mean of 75. These participants constitute a cohort of elders who will have been under repeated observation for about 20 years.

An advantage of continued follow-up is the ability to study the development and progression of heart disease over time in a population with especially high prevalence rates of diabetes. Results will be applicable to diabetic populations throughout the world. Inclusion of the over 3000 Phase IV SHFS non-cohort participants will provide information on mortality within families at younger ages. This information can be analyzed to study clustering of risk factors and preclinical disease.

Continued surveillance will provide: (1) a sufficient period of observation following collection of risk factor data to ensure biologically plausible latent periods for vascular disease, (2) improved accuracy in estimating age-specific CVD mortality and morbidity rates and age-specific all-cause mortality rates and increased power to identify risk factors for development of CVD, (3) the opportunity to examine factors related to CVD incidence and mortality in mid-life (early or premature events) vs. those occurring among the elderly (late or non-premature events), and to explore factors associated with survival, (4) a dataset permitting study of the relationship between diabetes and CVD, and (5) information on family mortality patterns including younger individuals.

2. Rationale for Re-exam of Family Members

The re-exam will be conducted approximately 5 to 6 years after the original exam and will permit evaluation of genetic factors that contribute to changes in CVD risk factors. This re-exam will include both carotid and cardiac ultrasound measures, so that the preliminary data on progression can be examined in more detail with a larger number of participants, and among participants as young 15 yrs. Because of the high rates of insulin resistance, obesity, and diabetes among the young people in this population, the re-examination will permit detailed examination of the effects of these disorders on progression of preclinical CVD. Popliteal artery (artery in the leg) ultrasound has been added to provide better measures of peripheral arterial disease (PAD) because of the high rates of PAD observed using other indicators during our cohort exams. Thus, we will be able to compare popliteal and carotid atherosclerosis and their risk factors with emphasis on smoking- and diabetes-related phenotypes. Blood measures will include measures of risk factors that could be expected to change in this period of time – i.e.,

lipoprotein, hemostatic and inflammatory factors plus indices of glycemia – but not ones that would not be expected to change in this timeframe (e.g., Lp(a), apo E genotype).

The exam will include additional biomarkers. We will measure C-Reactive Protein (CRP), which has been shown to predict both CVD and type 2 diabetes mellitus in many populations, and genetic factors are known to strongly influence CRP expression. We will measure leptin because of its role in obesity and because numerous studies, including ours, have implicated a locus on chromosome 2p in determination of leptin levels and/or other obesity-related phenotypes. Leptin represents one of the first adipocyte-derived proteins that has offered clues into the potential endocrinological role of adipose tissue. We will also measure free fatty acids (FFA) because elevated FFAs decrease cellular glucose metabolism and impede insulin-mediated glucose disposal. Fatty acids suppress insulin secretion and are postulated to be mediators of beta cell failure in type 2 diabetes. Elevations of FFAs influence vascular function by causing endothelial damage leading to vasoconstriction, release of inflammatory cytokines and enhanced thrombosis.

In addition to the value for our genetic analyses, the re-exam will allow us to ask a number of questions about changes in risk factors and preclinical disease. Although the family cohort is not a population-based sample, families were recruited from all areas of our communities; and a comparison of the original cohort data with the family study data indicate that the cohort and family data do not differ in any meaningful way. Our preliminary analyses of risk factors for younger family members show alarming rates of obesity and diabetes and high prevalences of key risk factors. At the end of the Phase IV exam (2003), pilot family members were reexamined. Among those family members, 479 cohort members had echocardiograms in SHS Phases II and IV, and 825 cohort members and pilot family study participants had carotid ultrasound studies in Phases III and IV. These data provided repeat cardiac and arterial assessments in these individuals. Preliminary results revealed interesting and disturbing changes in carotid measures of atherosclerosis and in echocardiographic measures of left ventricular hypertrophy (LVH) and valvular disease over an average of only 4 to 8 yrs of follow-up.

Thus, despite the limitations of the relatedness of the sample and its non-random selection, we believe the data obtained in the re-exam will be both informative and trail breaking, pointing the direction for investigators wanting to plan further studies in younger individuals.

3. Rationale for New Biomarkers to be Measured in Stored Specimens

As an established study, SHS maintains a unique reservoir of stored biological samples. During the 15 years the cohort has been followed, we have obtained reliable information about participants who developed or who were free from atherosclerosis. Samples from these individuals can be used to assay new risk factors in relation to clinical or subclinical CVD. In Phase V, we will measure apo CIII, a small protein on the surface of apo-B containing lipoproteins and HDL that plays a major role in metabolism of VLDL via inhibition of lipoprotein lipase. Apo CIII also retards the clearance of VLDL and influences HDL metabolism. Concentrations of apo CIII are associated with CVD independent of triglyceride (TG) concentrations. Apo CIII is elevated in individuals with diabetes, and it potentiates

atherosclerosis. We will perform this test on a subset of the entire cohort using a case-cohort design.

4. Rationale for Benefits to Indian Communities and Clinical/Public Health Practice

Four prime considerations make imperative study of disease processes among American Indians and Alaska Natives (AI/AN): First, support for research is part of the federal government's obligation to raise the health status of American Indians to the highest possible level. Second, the SHS is essential for estimating as accurately as possible Indian morbidity and mortality, since the IHS mortality surveillance system depends upon state death certificates, which have been shown to be unreliable as an accurate index of Indian death rates. Third, Congress has directed the National Institutes of Health (NIH) and other federal agencies to address health disparities that exist among certain minority populations, including American Indians. Fourth, continuing (and in the case of CVD, growing) disparities in health status of Indians compared to the general population require investigation because information gained from studies among Indian populations will increase understanding of disease mechanisms important to all populations.

The SHS has demonstrated that a multi-center, longitudinal, epidemiologic and pathophysiologic study, including extended family studies, can be carried out in Indian communities and be of high quality, with high participation rates. Numerous logistical problems have been successfully overcome with the cooperation and support of the Indian communities. Cultural differences, which often lead to reluctance to attend exams have been successfully dealt with, and concerns about genetic analyses have been answered. Thus, the SHS serves as a model for epidemiologic studies in minority communities. Perhaps most significantly, the participating communities are eager to continue the study, and both the communities and staff are committed to continued success.

The SHS findings will continue being disseminated at local, regional, state, and national scientific meetings. The SHS has provided many vital services to AI communities by disseminating findings on the major known CVD risk factors and their contributions to CVD. Tangible improvements in community educational and medical infrastructure have also accrued. SHS places considerable emphasis on soliciting input and sharing results with participating Indian communities. Community representatives and physicians are members of the Steering Committee, and the advice of many community members has been implemented throughout all phases of the study.

Participants have received a thorough medical examination emphasizing the cardiovascular system, and extensive laboratory testing. Examinations have included an echocardiogram, carotid artery studies, measurements of ventilatory function, and testing for sensitivity to a variety of skin allergens. These evaluations would be prohibitively costly in the private sector, even if they were readily available to this population. Clinically useful information is regularly shared with participants and their health care providers (with the consent of the participants). Participants receive educational materials and advice on how to reduce their own cardiovascular risk factors. SHS newsletters are distributed twice per year to participants.

When significant medical conditions are detected, participants are referred for medical care according to established SHS referral criteria. Important, unrecognized conditions detected during theses exams have included many cases of incident diabetes, hypertension, and occasional cases of congenital heart disease. Such measures are especially important in a rural epidemiologic study whose participants have limited access to health care.

SHS investigators, staff, and coordinating center worked with the NHLBI to compile and publish a data book summarizing SHS findings that are useful to health care providers and community health officials. These have been widely distributed to other Indian communities and programs, and have even been utilized in one rural community of Native Hawaiians. Clearly, SHS data have had a major public health impact. These data serve as the reference for the IHS and other public health agencies in planning programs for health care delivery, education and prevention strategies; SHS data are presented and discussed at all major meetings involving health care providers to AI. Our data have been used for several national reports from the Surgeon General's office, the American Heart Association and the American Diabetes Association. They formed the basis for the current IHS recommendations on management of dyslipidemias and the ongoing IHS strategic plan for CVD prevention and therapy. SHS data have been used by the Native Elder Research Center at the University of Colorado for the training of AI researchers, and they formed the basis for the PATHWAYS and SANDS Trials now funded by NHLBI. SHS methodology was used as the basis for a new NIH-funded study of CVD in rural Native Hawaiians. The knowledge gained through SHS has allowed tribal leaders to promote healthier lifestyles, especially for the younger generations. The value of utilizing locally derived, community-specific data, rather than regionally derived data for health planning, is readily apparent. SHS has also motivated investigators to design and implement studies to promote healthy dietary and exercise habits among AI children and adults in the SHS communities, for example, the Oklahoma Native American EXPORT Center, funded by the National Center on Minority Health and Health Disparities (NCMHD) of NIH.

Whenever possible, community members have been hired to conduct the study. During the first four phases of SHS, more than 130 community members were employed as part of the SHS clinic staffs. Particularly noteworthy is that more than 100 health profession students have worked in Phases I – IV and that more than half of these were Indian. In several instances, student participation stimulated pursuit of health careers, and some were motivated toward serving Indian communities upon completion of training. Some of these students were research assistants with support from the NIH Minority Supplement program. Others have been mentored by field personnel, who have served as role models for young community members.

The continuation of the SHS in Phase V promises to produce additional benefits in all of these areas. Ultimately, the data will enable the IHS and the Tribes to better allocate limited health care resources and to implement community-specific preventive interventions.

1.2 RESEARCH OBJECTIVES

Specific Aim #1: Conduct genetic studies emphasizing the genome scan approach but also including investigation of carefully selected candidate genes:

a. Linkage analysis of genome scan data to localize genes that contribute to overt and preclinical CVD and CVD risk factors:

We have completed the genotyping of the 3,797 members of extended families in each of the three SHS field centers, of which 2,100 have been used in initial linkage analyses with the goal of localizing genes that influence risk factors for clinical and subclinical CVD, diabetes, and obesity, genes that influence measures of cardiac and vascular function, and genes that influence the progression of these traits over time. After identifying promising chromosomal regions that contain quantitative trait loci (QTLs) using data from a 10-centimorgan map, we will narrow regions of interest by fine mapping. This will involve prioritization of candidate genes within the region of each QTL for extensive resequencing to identify single nucleotide polymorphisms (SNPs), and then SNP typing of <u>all</u> SNPs that we identify in candidate genes. Our analyses will enable us to test whether specific SNPs account for our linkage signals. We also will test whether the SNPs account for population-level association in the SHS cohort.

In a screening analysis of more than 900 members of extended Phase III families and 1,140 of the members of Phase IV families using the 10 centimorgan map, we have identified numerous chromosomal regions containing promising linkage signals. More detailed analyses of some of these signals have shown*:*

1) Left ventricular mass normalized for height (LOD=5.3) on chromosome 12p.
2) Weight (LOD=5.17) and body mass index (BMI; LOD=5.08) on chromosome 4q.
3) Plasma insulin level (LOD=3.5) and lean body mass (LOD=2.6) on chromosome 2p.
4) Ejection fraction (LOD=3.5) on chromosome 1q.
5) Clusters of insulin resistance syndrome variables identified by factor analysis: a glucose/insulin/obesity factor on chromosome 4 (LOD = 2.3), a dyslipidemia factor on chromosome 12 (LOD = 2.7), and a blood pressure factor on chromosome 1 (LOD = 1.5).
6) LDL-C (LOD=3.7) on chromosome 10p.
7) PAI-1 (LOD = 3.03) on chromosome 11p.

As costs of genetic analyses fall, additional polymorphisms will be considered. Additional signals will be identified in ongoing screening analysis of nearly 3,800 family members. We have budgeted funds to localize and identify the QTLs responsible for three signals. If we are unable to identify the polymorphism responsible for a linkage signal, we will move on to another of the signals on our list. We also will examine whether the linkage signals increase with analysis of additional covariates or additional families or with bivariate analysis, and whether the signals are present primarily in specific subsets of the data (specific centers, specific families).

b. Examination of candidate genes not guided by linkage analysis

The main emphasis of genetic investigation in the SHFS is linkage analysis and subsequent identification of positional candidate genes. In addition, we plan to assess the relation of major

vascular endpoints to a limited number of compelling polymorphisms in candidate genes not guided by the linkage study. This will be designed to test hypotheses regarding intermediate phenotypes and pathways that are less well represented in the SHS (and therefore candidate genes that are difficult to exclude on the basis of the linkage studies), but are of potential importance to vascular disease. Most important in this respect are 'novel' vascular risk factors including the innate immune system, cell adhesion, endothelial dysfunction, inflammation, and insulin sensitivity. Investigation will be limited to polymorphisms showing some evidence of functionality. Given reductions in the cost in genotyping, where convincing functional variants exist, this approach allows testing of novel hypotheses and areas of biology more cheaply than additional phenotyping. It also allows examination of key polymorphisms (and contribution to meta-analysis) of data from American Indians - a group generally underrepresented in other large studies. Finally, it allows assessment of associations of these genes with markers of preclinical disease obtained from coronary and carotid ultrasound measurements.

As examples of this approach, we will investigate:

1) Mannose binding lectin (MBL) - We have already shown that functional variants are associated with incident CHD (adjusted OR 3.2) and will extend investigation to other variants in the gene.

2) Interleukin 6 (IL6) -174 C to G. IL6 is a key stimulator of release of acute phase proteins. The 174 C to G influences IL6 expression in vitro and has been associated with both metabolic and vascular phenotypes.

3) Thrombospondin 4 (A387P variant) - Influences cell adhesion and has previously been associated with vascular disease.

4) Lymphotoxin-α (G252A variant) - Influences transcription of a key cytokine and, in turn, expression of a range of adhesion molecules and cytokines and also shows significant association with vascular disease.

5) Toll-like receptor-4 (TLR-4) - TLR-4 variants influence innate immunity.

6) Peroxisome proliferator-activated receptorγ (PPARγ) Pro12Ala - PPARγ is an important candidate gene for insulin sensitivity and has previously been related to vascular disease.

Specific Aim #2: To continue mortality and morbidity surveillance:

Annual CVD mortality and morbidity surveillance of the original SHS cohort members (4,549 original, approximately 3,000 survivors, ages 60 to 89 years) will be continued, and annual mortality surveillance and limited morbidity follow-up of the over 3000 non-cohort SHFS participants will be initiated.

Questions to be addressed are:

a. What risk factors are related to the incidence of CVD across different age strata? What are the age- and gender-adjusted risk factor profiles for premature CVD deaths vs. non-premature CVD deaths?

b. How are incidence rates for various manifestations of CVD (e.g., coronary, cerebral, peripheral) influenced by age, gender, and diabetes status?

c. What are the relations between quantitative measures of systemic atherosclerosis, cardiac hypertrophy, and cardiovascular dysfunction (e.g., LV mass, carotid plaque, carotid wall

thickness) and CVD incidence and mortality? Are these potential predictors related to other established CVD risk factors, such as, diabetes?

d. What are the incidence rates and major risk factors for specific types of stroke (atherothrombotic, cardioembolic, hemorrhagic, etc) and do they differ by gender or diabetic status?

e. What factors are significantly related to long-term survival? Are there differences in the factors that predict longevity between individuals with and without diabetes at baseline?

f. What are the age-specific CVD incidence and mortality rates and all-cause mortality rates including rates of premature CVD death in American Indians in the three SHS geographic areas? Do these rates differ significantly among the three areas and if they do, what are the explanations for the differences?

g. Have age-specific mortality rates and proportional mortality ratios for CVD and other causes of mortality changed over the 20 years of the SHS follow-up (1989-2009)? Do changes differ between individuals with diabetes and without diabetes? If they do, what are the explanations for the differences?

h. What are the health-adjusted life expectancies (HALE) of American Indians in the three geographic areas? What is the impact of chronic health conditions such as CVD, diabetes, obesity, and renal disease on the HALE?

Specific Aim #3: To re-examine family members:

All SHFS participants will be re-examined so that changes in risk factors can be analyzed and genetic effects on changes can be estimated. The high prevalences of diabetes, obesity, and other risk factors in younger family members warrant follow-up. In addition, we have seen striking changes in cardiac and arterial findings in the relatively few cohort members who were examined in Phase IV, which merit repeat cardiovascular evaluation.

This aim offers several potential scientific opportunities:

a. to assess changes in key CVD risk factors that are the focus of the linkage analysis.

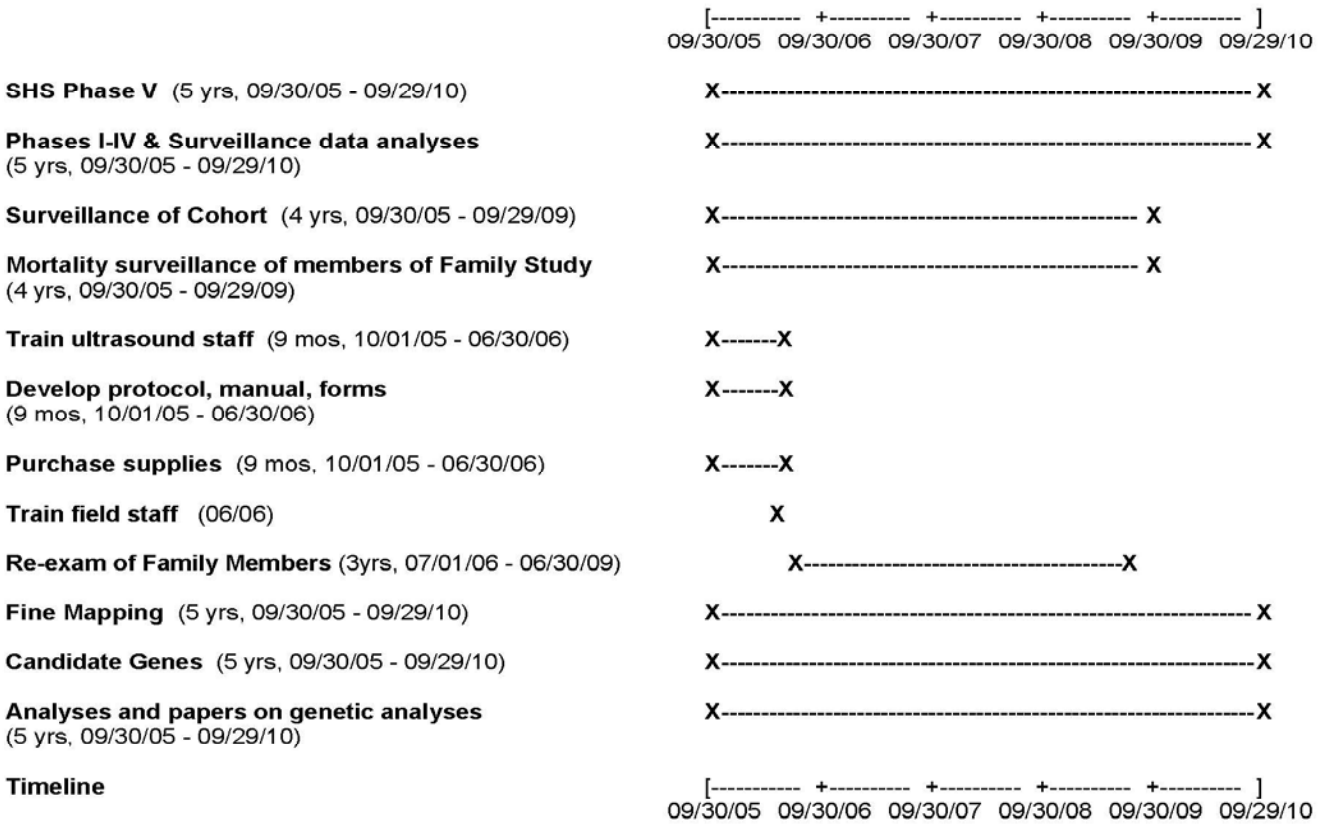
b. to examine changes in intermediate vascular phenotypes, to try to detect genes that are related to these changes, and to assess interactions of other risk factors (adiposity, insulin resistance, hyperglycemia) with these changes. In the first exam we found many young adults with diabetes or metabolic risk factors such as obesity and impaired fasting glucose. Identification of factors promoting atherosclerotic progression in this young at-risk age group is a high priority. Additionally, we will capitalize on members of the original cohort who also are in the Family Study (over 500) to examine long-term changes (for example, left ventricular hypertrophy and carotid intima medial thickness by standardized methods used since the 2nd SHS exam).

c. to examine subclinical atherosclerosis in peripheral arteries using popliteal ultrasound, assess its heritability and relations to risk factors (with focus on diabetes and smoking), and compare these to both carotid intima-media wall thickness (IMT) and ankle-brachial index (ABI).

d. to add measures of additional phenotypes – free fatty acids (FFA), C-reactive protein (CRP) and leptin. All three of these vasoactive substances are important indicators of inflammation and/or are related to obesity, insulin resistance and diabetes, and they will be valuable additions to the linkage analysis.

1.3 STUDY DESIGN

Timeline



1.3.1 Surveillance

Surveillance of the SHS cohort for CVD morbidity and mortality has been ongoing since 1989. Surveillance methods for Phase V of the SHS are the same as those used successfully in Phases II-IV. Mortality surveillance includes annual ascertainment of deaths in survivors of the original cohort and in participants in the SHFS of all ages (i.e., age 15 years and older at the Phase IV examination). Inclusion in the mortality surveillance of SHFS members will add over 3000 new individuals from the SHFS to the annual mortality surveillance cohort and permit continued examination of CVD risk factors in relation to "early" events and comparisons of these factors to those associated with CVD at older ages. Focusing on age-specific risks will allow us to indirectly take into account the "relatedness" of participants from the SHFS, who will have been added to the surveillance cohort. Very few members of our cohort have been lost to follow-up (N=11).

Morbidity surveillance will be done in the original SHS cohort using the same methodology as in Phase IV. For participants in the SHFS, non-fatal CVD events that have occurred since their Phase IV examination will be identified at the time of the Phase V re-examination by means of a physical examination, ECG, and history and through review of the participants' medical records covering the time period between the Phase IV and Phase V examinations.

Individuals are designated at each center, who are specifically responsible for mortality and morbidity surveillance activities. Surveillance contacts are accomplished using a variety of approaches specific to the SHS populations. These approaches include home visits, monitoring of IHS facility records, telephone calls and mail contacts. All reports of primary endpoints and selected secondary events of interest obtained through surveillance procedures will be validated from medical records. (See Volume Two – Morbidity and Mortality Surveillance)

1.3.2 Clinical Examination

Components of the Clinical Examination. The clinical examination includes a personal interview and a physical examination. Most of the procedures will be the same as those applied to the Phase IV family exam. Procedures are described in brief below, with details presented in Volume III of the manual.

1. Personal Interview

The following questionnaires will be administered:

i. Demographic information: income, residence, marital status, number of household members, and education will be determined.

ii. Health habits: Smoking, alcohol intake.

iii. Medical and reproductive history, including the Rose questionnaire for angina pectoris and intermittent claudication, medication history.

iv. Dietary survey: The Block 98 FFQ was used in Phase IV, modified slightly to add certain foods commonly eaten in our communities. In Phase V, the Block 2005 Food Frequency Questionnaire (FFQ) is being used (again modified slightly to include the additional foods commonly eaten in the communities). Block Dietary Data Systems (BDDS) will enter and analyze the data. Participants will receive individualized nutrient estimates and associated Recommended Dietary Intakes (RDI), providing additional health benefits.

2. Physical Examination

The physical examination includes the following procedures that were used previously. (Anthropometric measurements will be made with participants in loose clothing with shoes off and heavy objects removed from pockets.)

i. Weight: The scale will be balanced on a level and firm surface prior to weighing a participant.

ii. Height: The participant will be measured with special attention to posture, using a standard stadiometer.

iii. Waist circumference: Anthropometric tape will be applied at the level of the navel in the supine position as in previous phases.

iv. Body fat measurement: Resistance and reactances are recorded using an RJL bioelectric impedance meter. Percent body fat will be estimated by the RJL formula based on total body water.

v. Arm circumference: After proper positioning, this will be measured at the midpoint between the acromion and olecranon. The measure will be used to select the proper size blood pressure cuff.

vi. Amputated extremities will be recorded.

vii. Pedal pulses: The presence of posterior tibial and dorsal pedal pulses will be determined in both legs. The sensitivity and specificity of these evaluations will be compared to "gold standards" such as the ABI and ultrasound examination of the popliteal artery.

viii. Ankle edema: Pitting edema will be evaluated anteriorly from the mid-tibia to the ankle. The degree of edema (absent, mild, marked) will be recorded.

ix. Blood pressure measurements: Using the measured arm circumference to select the proper cuff size, the sitting arm blood pressure will be measured three times using a mercury sphygmomanometer. Three blood pressure measurements will be obtained with a 1-minute waiting period between successive measurements. The average of the last two measurements will be used for analysis.

x. Ankle/Brachial Index (ABI): Using a Doppler detector, brachial and ankle systolic pressures will be measured twice.

xi. Resting ECG: A Marquette MAC 1200 will obtain a standard 12 lead ECG. ECGs will be electronically transmitted to Cornell University. Tracings will be Minnesota-coded by computer.

xii. Fasting blood samples will be obtained for measurements of total triglyceride (TG) and cholesterol, LDL and HDL cholesterol, fibrinogen, and glucose, creatinine, insulin, HbA1c, CBC, chemistry profile, FFA, CRP, and leptin.

xiii. Urine will be collected at the beginning of the physical examination for measurement of albumin and creatinine.

xiv. Peripheral sensation will be measured in one foot by 5.07 monofilament, allowing estimation of peripheral sensory neuropathy prevalence and its relationship to diabetes and CVD.

xv. Echocardiography and ultrasound exams of the carotid artery and popliteal arteries.

xvi. Medical records from the Indian Health Service and/or other medical providers will be abstracted to ascertain hospitalizations, outpatient evaluations, or other manifestations of CVD that are SHS endpoints. For family participants, information since the first SHFS examination will be reviewed.

xvii. Physical activity: The Accusplit pedometer will be used to record the number of walking steps. Information will be recorded in the participant's activity record twice daily. The pedometers were used successfully in Phase IV, and the participants will again be allowed to keep them as a gift.

xviii. Psychosocial measures: The following questionnaires are administered to all Phase V SHS participants: Quality of Life – SF-12; CES-D depression scale; Social Support, Posttraumatic Stress Screening Scale, Generalized Anxiety Screening Scale, Spirituality, and Fatalism. All of these factors have been associated with CVD in other studies.

The clinical examination will last approximately three hours. If possible, all components will be completed in one visit. If for some reason the examination is not completed, every effort will be made to complete the remaining components of the examination within 1 month. The personal interview, consent, and FFQ may be completed up to two weeks prior to the physical examination. For pregnant women, the examination will be conducted no earlier than six weeks after delivery. Lactating women will be included in the study when six weeks or more postpartum.

The participant will arrive at the clinic fasting in the morning. After registration, a study staff member will explain the study and procedures to the participant, answer questions, if any, and administer the consent form. The participant will then be instructed to go to the laboratory for blood drawing and to obtain the urine specimen. The participant is then offered a light snack. The nurse clinician and other staff will then conduct the personal interview, obtain anthropometric measurements, blood pressure, impedance measurement for body fat composition, and ECG measurements. Project staff who have been trained and certified will perform echocardiography and ultrasound exams of the carotid and popliteal arteries. After all the procedures are completed, the participant will receive payment or sign a payment form, will be provided appropriate health educational material to reduce his/her cardiovascular risk, and will be thanked for his/her participation.

1.4 STUDY QUESTIONS

1. What risk factors are related to the incidence of CVD across different age strata? What are the age- and gender-adjusted risk factor profiles for premature CVD deaths vs. non-premature CVD deaths?
2. How are incidence rates for various manifestations of CVD (e.g., coronary, cerebral, peripheral) influenced by age, gender, and diabetes status?
3. What are the relations between quantitative measures of systemic atherosclerosis, cardiac hypertrophy and cardiovascular dysfunction (e.g., LV mass, carotid plaque, carotid wall thickness) and CVD incidence and mortality? Are these potential predictors related to other established risk factors such as diabetes?
4. What are the incidence rates and major risk factors for specific types of stroke (atherothrombotic, cardioembolic, hemorrhagic, etc) and do they differ by gender or diabetes status?
5. What factors are significantly related to long-term survival? Are there differences in the factors that predict longevity between individuals with and without diabetes at baseline?
6. What are the age-specific CVD incidence and mortality rates and all-cause mortality rates including rates of premature CVD death in American Indians in the three SHS geographic areas? Do these rates differ significantly among the three areas and if they do, what are the explanations for the differences?
7. Have age-specific mortality rates and proportional mortality ratios for CVD and other causes of mortality changed over the 20 years of the SHS follow-up (1989-2009)? Do changes differ between individuals with diabetes and without diabetes? If they do, what are the explanations for the differences?
8. What are the health-adjusted life expectancies (HALE) of the American Indians in the three geographic areas? What is the impact of chronic health conditions such as CVD, diabetes, obesity, and renal disease on the HALE?

1.5 STUDY MANAGEMENT

1.5.1 Introduction

The Strong Heart Study Phase V is funded by the National Heart, Lung, and Blood Institute and directed by the Genetic Epidemiology Scientific Research Group, Epidemiology and Biometry Program, Division of Epidemiology and Clinical Applications Branch. The SHS Observational Study Monitoring Board (OSMB) was established for SHS by NHLBI in 1997 and has provided extremely valuable oversight of the project since that time. The Principal and Co-investigators are listed in Appendix 1 below. An organizational chart of the Strong Heart Study Phase V is given in Appendix 2. The operations of the study are directed by the SHS Steering Committee (SC), which includes members from each center and the NHLBI Project Manager (see Appendix 3 for the members of Steering Committee). The SHS OSMB provides guidance and ideas during the annual OSMB meetings when SHS progress and plans are presented; they also review ancillary studies as they are considered by the SC, and make suggestions on potential collaborators. The Oklahoma Center, in addition to being a field center, assumes the responsibility of the Coordinating Center, and the Arizona Center acts as the Core Laboratory. The Cornell University Reading Center under the direction of Dr. Richard Devereux serves as both the ECG Reading Center and the Ultrasound Reading Center. Analysis of the Family Study genetic component is directed by Dr. Jean MacCluer at the Southwest Foundation for Biomedical Research. SHSV Sub-Committee members are listed in Appendix 4. Other key personnel at each center and consultants of the Study are listed in Appendix 5 and Appendix 6, respectively.

1.5.2 Confidentiality of Data

All personnel with access to data collected for the study at each center are required to sign a confidentiality pledge, which states that they understand the sensitive and confidential nature of the data and that divulgence of any information will result in disciplinary action. The pledge will be co-signed by the principal investigator. A sample of the confidentiality pledge is given in Appendix 7.

Completed data forms will be placed in locked file cabinets in offices assigned to the study at each study center. Only authorized staff members have the key to the office and access to the data forms.

Data on computers at the Coordinating Center will be safeguarded by a password, which is known only to authorized personnel.

1.5.3 Communications

1. Newsletter:

The Coordinating Center periodically prepares and distributes a newsletter to facilitate communication among Study staff and with the SHS participants. In general, each edition

includes: (1) reports from the Program Office, the Steering Committee, the Coordinating Center, the Core Laboratory, the Cornell Reading Center (ECG, Carotid Artery and Popliteal Artery Ultrasound, and Echocardiogram), and the Southwest Foundation for Biomedical Research (Genetic Study Center), (2) a description of the facilities and staff of a field center or central agency, (3) general information on data management, (4) information about new ancillary studies, and (5) upcoming events. The newsletter also provides reports on issues such as recruitment and participant follow-up rates, the development and use of new equipment, and preliminary study results and abstracts.

2. Electronic Mail:

E-mail through Internet and FAX continue to be the major electronic mail facilities used by all field centers, the Coordinating Center, Core Laboratory, Cornell Reading Center, Genetic Study Center, and the Program Office. This electronic mail network allows rapid and efficient communication among centers for messages such as announcements, meeting agendas, abstracts for clearance, and acknowledgments of receipt of data.

3. Web Site http://strongheart.ouhsc.edu/ :

The list of SHS scientific papers, both published and in press, is available and linked to abstracts posted on the National Library of Medicine PubMed website. The Manual of Operations for each of the five phases of SHS is also available, along with a wealth of other information including annotated data collection forms, virtually all of the SHS newsletters in Adobe Acrobat format, and downloadable slide presentations on various aspects of SHS.

4. Field Center Visits:

The Program Office and staff from the Coordinating Center, Cornell Reading Center, Core Laboratory, and Genetic Study Center conduct periodic monitoring visits to field centers as needed to: (1) maintain channels of communication with field center investigators and staff, (2) monitor participant recruitment and surveillance procedures, (3) monitor adherence to the protocol, and (4) provide technical support for activities such as data management and quality control.

1.6 DATA MANAGEMENT AND STATISTICAL ANALYSIS

1.6.1 Development and Production of Study Manual and Data Collection Forms

The Coordinating Center worked closely with the Steering Committee in the development and production of the study manual and data collection forms. A Forms Committee reviewed all forms and made recommendations for revisions, deletions, and additions of forms. The Psychosocial Committee held frequent conference calls and devised a set of psychosocial forms comprised of forms used previously in SHS and elsewhere. The Manual was revised by Steering Committee members, Field Coordinators and CC personnel. Revisions were circulated by email attachments, and further input and improvements were provided during the training sessions held in Oklahoma City (March 14 – 16, 2006). After initiation of the Phase V exams in May 2006, the entire manual was reviewed page by page and modifications were incorporated.

a. Sources of data

Data forms for the SHS are generated from a variety of sources.

i. From the three field centers: Clinical examination forms (personal interview, medical history, physical examination, quality of life and other psychosocial forms, machine reading of ECG, and CBC by local clinic labs), Death Certificate Form, and Morbidity Survey Medical Chart Review Form.
ii. From the Penn Medical Lab (Core Lab) at Medstar Research Institute: total triglyceride and cholesterol, LDL and HDL cholesterol, fibrinogen, and glucose, creatinine, insulin, HbA1c, CBC, chemistry profile, FFA, CRP, leptin, and urinary albumin and creatinine.
iii. From the Cornell University Reading Center, cardiologist's ECG reports, computerized Minnesota ECG codes, echocardiography, carotid artery and popliteal artery ultrasound data.
iv. From Mr. Karl Wise (study nosologist): ICD-9 coded cause of death.
v. From Dr. Maurice Sievers: Mortality study final decision package (Mortality Study Chart Review Form, Final Decision Form, and Informant Interview Form).
vi. From Mortality and Morbidity Review Committees (Mortality or Morbidity Study Chart Review Form, Mortality or Morbidity Final Decision Form, and Mortality Informant Interview Form).
vii. From Dr. Jean MacCluer: genotyping data on all family study members.
viii. From Block Dietary Data Systems: Analyses of the Food Frequency Questionnaire.

b. Database development

In SHSV, the Coordinating Center continues to use a distributed data entry system. In Phase V the Coordinating Center used Microsoft (MS) ACCESS 2003 to develop the data entry programs (similar to previous phases) and MS Windows Terminal Services to support real-time data entry (as opposed to batch transmission as used in Phase III) via high-speed Internet connections with state of the art field center computers. Separate files have been created for

each data form; these files and the data files are stored solely on the server(s) at the Coordinating Center. Maintenance of the data programs and files occurs on the server(s) at the Coordinating Center; the field centers transmit the exam data to the Coordinating Center for data cleanup and permanent storage.

The laboratory data and data from special studies are transmitted to the Coordinating Center electronically over the Internet or by sending data-containing media such as diskettes, CDs, and DVDs. The Coordinating Center stores the raw data sent from the specific study centers and converts them into SAS data files for analysis.

c. Procedures for data entry and verification of completeness

Each field center reviews every data form for completeness and accuracy before entering it into the field computer. Details of the data entry process and data management can be found in Volume 7 of this SHS V Operations Manual. The completeness of data entry for each form is checked again by the Coordinating Center. Any incomplete items (missing, questionable, unclear) are recorded, and the corresponding field center is contacted to find out the reason. When these items are completed by the individual center and received by the Coordinating Center, the information is updated in the Coordinating Center's database. To ensure the data quality, the field centers are required to double-enter 10% of the forms each month (or at least one double entry per transmission). The Coordinating Center checks the disagreement rate for double entry on a monthly basis. If the disagreement is greater than 0.5% in any transmission, that center is asked to re-enter (as second entry) the data of all the forms in that transmission.

The data received from the Core Laboratory via the Internet as ASCII files are directly converted into SAS datasets. Before these data are merged into the permanent data files, various quality and consistency checks are performed.

Uniform data entry forms for all information to be collected have been designed by the Coordinating Center for use by each Study Center. Each study subject has a unique identification number (ID number). Please see the Strong Heart Study Phase I Manual page 12a for the detailed procedure to assign the study ID number. For those original cohort members who participate in Phase V, the original ID number assigned in the Strong Heart Study Phase I will still be used. The ID number will be stamped on every page of all forms at each center. For laboratory specimens, printed labels supplied by the Core Lab are used. For each of the family members enrolled in the family study, Family IDs were assigned during the Phase III Pilot Family Study or during the Phase IV Family Study as follows:

Center	Family ID	SHS ID
Arizona	AZxxyyy	360001 - 36zzzz
Oklahoma	Okxxyyy	260001 - 26zzzz
South and North Dakota	Dkxxyyy	160001 - 16zzzz

Where xx : family number.

yyy : 001 - 999 for each family member.
zzzz : a unique number for each family member who participated in the examination and interview.

Standard IHS community codes are used to identify the community where the participant resides. A list of community codes for the three centers is given in Appendix A-1 of Volume 2. Hospitals where an SHS participant died or was treated for CVD are also coded. Standard IHS facility codes are used to identify IHS hospitals and clinics. Codes for other non-IHS hospitals are assigned by each center. The hospital/clinic codes are given in Appendix A-2 and A-3 of Volume 2, respectively. In addition, every member of the Study is assigned a Personnel Code, which will be used to identify the person who filled out a specific data form. The Personnel Codes for the three centers are listed in Appendix A-4 of Volume 2. Additional codes are added sequentially as new employees begin to work on the project.

All data forms must be filled out legibly and completely. Each and every form must be reviewed and checked for completeness and legibility before it is entered into the computer.

1. All forms should be filled out in black pen. Print all information in block capital letters, with one letter only in each box, so that data entry errors can be minimized. For example, one should differentiate: 7 from 1, U from V, 4 from 6, P from D, M from N, C from O, and T from J.

2. For names and addresses, start from the leftmost box and leave the unused boxes blank. Include periods for initials.

3. For numerical values, fill in the boxes in a right justified manner and leave the unused boxes blank.

4. For dates, two digits are allowed for the month and day, and four digits for the year. If the number has only one digit, use zero in front of the number.

5. When recording dates, use the following rule for missing dates:

If **date is unknown**/**missing**:	01/01/1001
If **only year** is known:	06/30/year (assign mid-year as the date)
If **only year and month** are known:	month/15/year (assign mid-month as the date)

6. To correct an error, draw a single line through the mistake and write the correct value above.

7. Fractions should be rounded up to the nearest whole number if the fraction is 0.5 or more, otherwise, drop the fraction, e.g. 2.25 = 2; 2.75 = 3; 3.5 = 4.

8. If an interval is given, record the midpoint of the interval if it is a whole number. If the midpoint includes the fraction 0.5, use the rounding rules previously given.

9. Unless otherwise instructed, no item on any of the forms should ever be left blank. Codes to be used in the event of missing or incomplete data are given under the heading of each specific item. If there is not a code for the "unknown" category, draw two parallel lines horizontally through the box or boxes to indicate that the interviewer or abstractor did not ignore the question. For example, if the time of death is unknown, draw two lines across the boxes.

1.6.2 Procedures for data entry and verification of completeness -- See *SHSV Operations Manual Volume VII - Data Entry*

1.6.3 Data Transmission

The lab data, ECG data, and ultrasound data will be transmitted to the Coordinating Center through a secure protocol. If the data transmission is via an email attachment, an encrypted, password-protected file will be required. The data will be converted to SAS datasets. However, before these data are merged into the permanent data files, they will undergo various error checking procedures to ensure the SAS conversion has been done accurately.

1.6.4 Data Backup

Several backup procedures are used to ensure the safety of the SHS data files in both field centers and the Coordinating Center.

a. Daily backup: Two sets of cartridges are rotated to backup the data every day from Monday through Thursday (one for Monday and Wednesday and the other for Tuesday and Thursday).

b. Weekly Backup: Similar to daily backup, two sets of cartridges are rotated, each for every other week. Backup of the week's data set is done every Friday.

c. Optical disk backup: Additional permanent files are stored on optical disks (CDs and DVDs) for long term storage.

d. Storage of backup data: Cartridges and optical disks are stored in locked file cabinets in different offices, and one set of them is stored in a different building.

1.6.5. Quality Assurance (QC) Program

The quality control (QC) program includes close monitoring of the quality of all measurements and interview data. A Quality Control Subcommittee oversees the QC program of

the Study. The members of this Subcommittee include the NHLBI Project Manager, a representative from the Coordinating Center, one principal investigator, and the three Field Center Coordinators. The Quality Control Committee meets periodically via conference calls during the examination period to assess the results of quality control activities. The QC Committee reviews the QC data and summary statistics provided by the Coordinating Center and reports to the Steering Committee with recommendations. Recommendations are made to the appropriate centers when problems are identified. Follow-up procedures are established and monitored for all the QC activities. After each site visit, reports are reviewed. If indicated, field staff are retrained, re-certified, and re-monitored by the QC personnel. For lab data, aberrant pairs are investigated and corrective actions are taken both in the core lab and in the field sites. The quality control program includes: a) data collection, b) site visits, c) routine maintenance and monitoring of instrument performance, d) duplicate measures for physical examinations, laboratory tests, observations of personal interviews, QC for cardiology tests, and QC for surveillance (each of these components is described below). Each clinical center has a quality control officer who is responsible for all aspects of quality control at that center. The Coordinating Center closely monitors the recruitment and progress of the Study. According to the target numbers to be recruited by each center during the whole study examination period, the CC develops a timetable to indicate the projected goal for each month. The field centers report the number of participants actually examined to the CC, and the CC then compiles these numbers on a monthly basis. Cumulative achievement for each field center is then calculated by comparing the actual number examined to the projected number for the corresponding month. In addition to recruitment, the CC also monitors whether the field centers have completed their quotas for double entry of data, QC physical examinations, and QC blinded blood samples. The CC submits progress reports to the SHS Steering Committee as a tool to monitor the progress of the study. If the percentage of projected recruitment in a certain field center falls below 80%, the PI and the field coordinator are informed, so that the efforts can be focused on recruitment in the following months. Field center coordinators are responsible for reviewing all QC data as they become available and following up on any problems that are detected. The QC committee monitors the efficacy of retraining and problem solving.

1. Data Collection

Every data form will be checked for completeness at the field center. Ambiguous or erroneous items will be clarified and corrected. The data entry programs generated by the Coordinating Center provide additional quality control checks by built-in range and logic checks. The program refuses to accept suspect data until the errors are corrected. Throughout the study, 10% of the examinations are selected for double entry. The Coordinating Center tracks the data entry error rates. If the data entry error rate of any field center is greater than 0.5% for any data transmission, that center has to double-enter all of the examination data for that transmission. Computer printouts of inconsistent data items are sent back to each field center for clarification or correction. Summary statistics such as mean, median, range, maximum and minimum for continuous variables and frequency distributions for categorical variables are calculated monthly for each center, and data not meeting consistency checks are flagged. Summary statistics will be

generated quarterly to identify any peculiar or unreasonable values. Further verifications will be made and errors corrected.

2. Quality Control Site Visits

Quality control site visits will be made periodically to each of the three centers during the examination period. The site visit teams will include representatives from the program office at NHLBI and investigators and staff members from each of the centers. Procedures used in the clinical examination will be carefully observed for adherence to protocol. Equipment will be inspected and problems noted. The site visitors then will meet with all of the clinic staff to inform them of any observed discrepancies. In addition, a written evaluation, including corrections or improvements needed, will be sent to each center.

3. Quality Control -- Equipment

Other quality control measures will include maintenance of the scale, measuring tapes, impedance, glucometer, sphygmomanometer, and ECG machine. The scale will be zeroed daily and calibrated with a known weight (50 lbs) every month or whenever the scale is moved. The standard sphygmomanometer will be inspected once a month. These inspections will include checking of the zero level, mercury or air leakage, manometer column for dirt or mercury oxide deposit, and the condition of all tubing and fittings. Other quality control measures for the blood pressure measurements will include simultaneous Y-tube observation of each technician and frequent staff meetings to provide feedback.

4. Quality Control -- Examination

1) Anthropometry and blood pressure

Duplicate measures of brachial artery blood pressure (systolic and diastolic) simultaneously using a double head stethoscope with two observers will be taken quarterly. Duplicate measures of anthropometry (height, weight, waist, hip, and electrical impedance measurements) will be performed with a second observer on a quarterly basis. These data will be sent to the Coordinating Center for analysis. In addition, distributions of measurements and digit preference for each staff member will be compiled and repeated quarterly. Results of the analyses will be provided to the field centers and the Steering Committee. Differences between duplicate measures exceeding the following values will be considered unacceptable:

i.) Systolic Blood Pressure: 4 mmHg, using Y-shaped stethoscope for two simultaneous observations.
ii.) Diastolic Blood Pressure: 4 mmHg, using Y-shaped stethoscope for two simultaneous observations.
iii.) Height: 1 cm
iv.) Weight: 1 Kg
v.) Resistance: 15 ohms

vi.) Waist circumference: 2 cm
vii.) Hip circumference: 2 cm
viii.) Arm circumference: 1 cm

2) Laboratory tests

Duplicate blood and urine specimens are collected on approximately 5% of the participants in Phase V. These duplicates are sent to the Core Laboratory in a blind fashion. Results obtained for each test will be analyzed quarterly by the Coordinating Center for accuracy and consistency. The percent of pairs with differences within 5% and 10% will be computed. Correlation coefficients and technical error rates will be calculated. Poor correlations or unreasonably high technical errors will be reported to the Laboratory and the Steering Committee.

3) Personal interview

Personal interviews by new staff will be observed monthly by the study coordinator until the staff member meets the standards of the study. Then new staff will be observed on a quarterly basis along with experienced interviewers. Problems and errors are identified using a checklist and corrected immediately.

4) Food Frequency Questionnaire (FFQ)

The Block FFQ is self-administered; participants receive guidance from SHS staff in how to fill out the questionnaire. The developer, Block Dietary Data Systems (BDDS), has provided documentation (see Volume 9 of this manual) that describes each question. During the March 2006 training sessions in OK, Jean Norris, MS, RD, DrPH (BDDS) provided training for the field staffs in how to instruct participants and how to check the FFQs for completeness, for proper pencil entries on the FFQ bubble forms, and for correction of the bubble forms if improperly filled in (e.g., pen instead of pencil). Trained staff members will assist any participants having difficulty with the FFQ.

5) Quality control for surveillance data

Surveillance activities at each center are monitored on a monthly basis by the Coordinating Center. Contact rates, numbers of potential events, rates of medical record abstraction and forwarding of packets for review are evaluated each month according to pre-set, expected completion rates. Final decisions on possible CVD deaths and morbid events are made by members of the Mortality Review and Morbidity Review Committees. These surveillance committees also evaluate the quality of chart reviews and advise clinic staff when changes are needed. The Mortality Review Committee is composed of a primary physician reviewer (Dr. Maurice Sievers) who reviews all deaths and a group of six physicians who serve as secondary reviewers for all potential CVD deaths. Each physician independently determines the classification of the cause of death, and the Coordinating Center then compares the results from

both physicians. All fatal events judged to be strokes by Dr. Sievers are directly forwarded to Dr. Jorge Kizer at Cornell Medical Center, Division of Cardiology, New York-Presbyterian Hospital but not to the next member of the Mortality Review Panel. The entire Mortality Committee adjudicates potential CVD cases when there is a disagreement between the primary and secondary reviewers. A detailed description of the steps in the process of identifying deaths and confirming the underlying cause is given in Volume 2. Monthly reports are reviewed by the Steering Committee in order to monitor the progress of surveillance and event reviews. An example of a monthly surveillance report is included in Volume 2.

6) Certification of technicians

Each center recruits the most qualified personnel. Clinical staff were centrally trained and certified before the examination began, and newly hired personnel will be trained at each clinic. The study coordinators will monitor the technicians quarterly to ensure accurate and consistent performance.

7) Confidentiality and security of data

All personnel with access to the collected data are required to sign a confidentiality pledge (see Appendix 7 below). Completed data forms are placed in locked file cabinets at every center and are accessible by authorized staff members only. At the Coordinating Center, the data are stored on computers that are used exclusively by the Strong Heart Study and are safeguarded by passwords that are known only to authorized personnel. The data are stored on hard disk and four copies of optical diskettes. Two of the Zip disks/optical diskettes are stored in two different locations other than the Coordinating Center office.

8) Monitoring of study progress

The Coordinating Center works closely with the field centers to monitor recruitment and progress of the examinations. At the beginning of the study, a projected monthly number of participants to be recruited was generated, and the Coordinating Center monitors the progress of each field center according to these projected numbers and provides quarterly progress reports to the Steering Committee. If the percentage of projected recruitment in a certain field center falls below 80%, the PI and the field coordinator will be informed, so that the efforts can be focused on recruitment. This program proved to be an efficient tool for monitoring the progress of SHS in previous phases and will be continued in Phase V of SHS. The Coordinating Center will also monitor the number of double entries, QC physical exams, and QC blinded blood samples and report to the Steering Committee quarterly.

1.6.6 Statistical Analysis and Power Estimates

There are two major types of statistical analyses for Phase V of SHS. The first type is characterized by genetic or linkage analyses (for Specific Aim #1 and part of Specific Aim #3).

The following presents detailed information regarding genetic analyses and their respective statistical power calculations.

Statistical Genetic Methods

Genotypic Data Cleaning

By the beginning of Phase V, all family members (more than 1,240 from each Field Center) will have been genotyped for approximately 400 markers spaced at intervals that average 10 cM. Before these data can be used in statistical genetic analyses, they must be "cleaned", i.e., any apparent pedigree discrepancies must be resolved and Mendelian and double recombinant errors must be eliminated. We also must estimate allele frequencies, construct genetic maps, and calculate multipoint identity-by-descent (IBD) matrices. The cleaning of all of the data in the 10 cM map will be finalized at the beginning of Phase V.

To verify the correctness of pedigrees we use PREST (McPeek and Sun, 2000; Sun et al., 2002) to sequentially answer the following two questions: 1) Which relationships are not consistent with the genotype data? 2) Among the rejected relationships, what is the most supported relationship for each one rejected? We focus on the full-sib and half-sib relationships rejected by the first stage tests. We combine a maximum likelihood approach at the relationship level with a maximum parsimony requirement at the level of pedigree configuration. The final pedigree structure is the one most consistent with the data and most parsimonious (i.e., requiring the fewest pedigree changes).

Clearly, we must resolve genotyping errors before linkage analyses are carried out. Genotyping errors influence our estimations of both map distance between markers and IBD sharing among relatives. We use SimWalk2 (Sobel et al., 2002) as the basis of our PEDSYS program PRESWALK to estimate error probabilities for each individual for each marker genotype. PRESWALK uses mistyping probabilities generated by SimWalk2 to blank genotypes using an iterative procedure. SimWalk2 can also detect genotyping errors due to spurious double-recombinants, which are difficult to detect because they may be consistent with Mendelian segregation.

Maximum likelihood techniques that account for pedigree structure, implemented in SOLAR, are used to estimate allelic frequencies. Since we type additional microsatellite markers in any (positional) candidate region, a population-specific genetic marker map of each region is constructed utilizing the known marker map positions and known sequence data. We use the marker orders specified in the Marshfield map, and the program CRI-MAP (Lander and Green, 1987) to estimate distances between markers. We use the program Loki (Heath, 1997; Heath et al., 1997) to compute multipoint IBD matrices. Loki employs MCMC methodology to compute the expectations of IBD sharing at points throughout the genome conditional on the information available at other neighboring points.

Cleaning of the SNP data and of the data for additional microsatellite markers in regions where we have linkage signals will be done in Phase V. The SNPs will be used only in measured genotype analysis and Bayesian QTN analysis, which do not rely on map information and do not require IBD computation. Given that these intra-genic SNPs are extremely close, we clearly couldn't hope to accurately estimate their genetic map distances.

A. Quantitative Genetic Analysis

Initial heritability estimates have been done for risk factors measured in Phase IV. Scripts enable us to automate the analyses rather than performing them separately for each phenotype. In all of these initial analyses, age, sex, and their higher order terms and interactions are included as covariates. More refined heritability estimates, including other covariates and allowing for center, household, and other effects, will be done in the remainder of Phase IV and in Phase V, as will bivariate analyses to estimate genetic correlations among risk factors. When phenotypic data generated in Phase V become available, these too will be subjected to quantitative genetic analysis.

Heritabilities and genetic correlations are estimated using maximum likelihood variance decomposition methods (Hopper and Mathews, 1982; Lange and Boehnke, 1983) that have been implemented in SOLAR (Almasy and Blangero, 1998). If the phenotype vector is assumed to be multivariate normal, the likelihood of the pedigree (i.e., the likelihood of the observed array of phenotypes in a family under a specific genetic model) is easily calculated. Optimization methods are used to estimate parameters, and subsequent hypothesis testing is performed using likelihood ratio tests. Multivariate normality does not always hold (in fact it is clearly violated when there are major gene effects). Theoretical and simulation studies indicate that variance decomposition methods are relatively robust to deviations from normality (Beaty et al., 1985; Amos, 1994; Allison et al., 1999), although they are sensitive to kurtosis. However, kurtosis is easily identified, and simulation studies show that use of the multivariate t distribution, implemented in SOLAR, recovers the correct test statistic distribution even in cases of strong kurtosis.

The variance terms that will be included in our analyses are the additive genetic variance, the variance due to shared household effects, and the random environmental variance. The simple model can be extended to include additional (or alternative) components such as shared spouse or sibling environments, dominance genetic effects, and mitochondrial effects. Our analyses will provide estimates of the relative importance of genetic, shared environmental, and random environmental effects on disease-related phenotypes. Phenotypes that are significantly positively skewed will be ln transformed prior to analysis. To reduce Type I error in screening for covariate effects (Blangero et al., 1992), the effects of potential covariates will be simultaneously estimated in all analyses using variance component methods, which directly account for the non-independence of relatives. Any covariates whose effects are significant at the $p \leq 0.10$ level will be retained in subsequent analyses.

Quantitative genetic analyses will be done separately by center. To test for heterogeneity among centers, analyses also will be done on the combined data set, with center as a covariate. A significant center effect for a disease-related trait will indicate that the centers differ in the relative contribution of genetic and/or shared environmental factors to variation in that trait. Whenever we find a center effect, we will do additional analyses using SOLAR to determine whether the differences between centers are due to differences in heritabilities between centers or to differential expression of genes in different environments.

Bivariate quantitative genetic analyses: The quantitative genetic methods described above are readily extended to multivariate traits (Lange and Boehnke, 1983). We will perform bivariate analyses to examine the genetic correlations between pairs of phenotypes. For example, we can test whether significant genetic correlations exist between left ventricular mass and blood pressure or between fibrinogen concentration and PAI-1. Large genetic correlations between traits imply that the same genes influence both traits.

We have previously used this approach in the San Antonio Family Heart Study (SAFHS) to reveal significant genetic correlations between hormone measures and measures of body fat (Comuzzie et al., 1996), indicating that these constellations of traits share underlying genetic determinants. We also have found that HDL and triglycerides are not significantly genetically correlated with measures of body fat distribution in the SAFHS (Mahaney et al., 1995). Similar analyses, using likelihood ratio tests, will enable us to estimate the magnitude of pleiotropic effects of underlying genes in American Indians.

Genotype x age interaction and longitudinal genetic models

G×E interaction is likely to be an important influence on continuous physiological variation. Our group has pursued a number of approaches for the examination of G×E interaction in quantitative genetic analysis (Blangero et al., 1990; Blangero, 1993; Jaquish et al., 1997a,b) and in variance component-based linkage analysis (Towne et al., 1997, 1999). Our earlier work concentrated largely on G×E interactions involving dichotomous environments, such as sex (Towne et al., 1997, 1999) or smoking (Martin et al., 2000). We have since expanded our work on G×E interaction methods for continuous environmental variables such as age (Almasy et al., 2001). A simple way to model G×age interaction in a quantitative genetic analysis is to use a matrix of differences in age between individuals (or between measures on the same individual) to structure the additive genetic component of variance. One approach we have used is a simple exponential decay model. Another approach is to make the additive genetic variance a function of age and test for changing genetic variance with age. We also include in the model a correlation in genetic effects at different ages. A correlation significantly different from 1 suggests that different genes influence the trait at different ages. Positive evidence for G×age interaction is interpreted as evidence for a heritable basis to phenotypic change with aging. The strategy of modeling variance as a function of age is easily extended to G×age interaction at a QTL by making the QTL variance a function of age.

Blangero (1993) has shown the conditions necessary for this approach to work when only cross-sectional data are available, so that each individual is measured in only one environment (e.g., one age) and data across the range of environments (ages) must be obtained from different individuals. Cross-sectional data are sufficient, although less powerful than longitudinal data, to provide valid inferences concerning G×E interaction. Fortunately, we will have longitudinal data for most of our phenotypes: measures at three points in time for each individual who participated in Phases III and IV and also in Phase V and at two time points for family members newly recruited in Phase IV and re-measured in Phase V. Our multivariate analysis routines incorporated in SOLAR allow for this type of unbalanced mixed longitudinal design and efficiently use all available data.

Longitudinal data will allow us to detect more precisely and powerfully the changing effects of genes with age. There are few QTL mapping methods suitable for the analysis of longitudinal data. Multiple measurements of the same trait over time can be viewed as measurements of a single multivariate trait. However this naïve perspective is dangerous unless we properly model the correlations between measurements on the same person. Similarly, we must allow the different variance components to change with age and allow the correlations between the expressions of the trait at different ages to be a function of the age difference. In this regard, members of our group are developing a model for longitudinal QTL analysis that is very similar to our G×E model. The central difference is that we allow multiple phenotypes per individual and employ parametric (co)variance functions that depend upon the ages of the individuals involved. Additionally, because we will have multiple measures on individuals, we also can estimate environmental correlations that may change with time in addition to QTL and residual additive genetic correlations (Towne et al., 2000).

Linkage Analysis

Genomic screening involves a complete search of all chromosomes for genes influencing quantitative or qualitative disease risk factors. Linkage analyses in a genome screen involve genotypic data for hundreds of anonymous markers that are distributed across all of the chromosomes.

Methods of linkage analysis that exploit identity by descent (IBD) allele sharing between pairs of relatives are widely used in the genetic analysis of complex traits as these methods generally require few assumptions about the genetic model underlying expression of the trait. Basically, these types of linkage analyses do not require that one previously specify or simultaneously estimate genetic model parameters such as allele frequencies, genotype mean effects, and dominance relationships among alleles for the putative disease locus. Instead, it is sufficient to estimate only chromosomal location and a summary measure of the relative importance of the disease locus such as the locus-specific heritability.

The best known of these methods is the sib-pair approach of Haseman and Elston (1972). Recently, variance component linkage analysis methods have been developed which are more powerful than relative-pair based approaches (Amos, 1994; Goldgar, 1990; Schork, 1993; Blangero and Almasy, 1997). These variance component methods have been extended to accommodate general pedigrees of arbitrary size and complexity and to allow analyses that include genotype by environment interaction, epistasis, threshold models for discrete traits, and pleiotropy, as well as multivariate and oligogenic analyses. The variance component approach fully exploits all of the genetic linkage information in extended pedigrees, considering all possible biological relationships simultaneously. Since the variance component method requires estimation of fewer parameters than in the fully parametric penetrance-based linkage methods, it is also more efficient. Formal mathematical development of variance component linkage analysis is given in Almasy and Blangero (1998).

In linkage analyses, we test the null hypothesis that σ_m^2, the additive genetic variance due to the trait locus, equals zero (i.e., no linkage) by comparing the likelihood of this restricted model with that of a model in which σ_m^2 is estimated. From these analyses, we identify

chromosomal regions that are most likely to contain a QTL for a CVD risk factor, focusing on those regions with the highest LOD scores. These analyses utilize SOLAR (Almasy and Blangero, 1998), developed at the Southwest Foundation for Biomedical Research.

Each marker is screened for linkage to each of the quantitative traits that show significant heritabilities, using data generated for the extended families recruited into the Family Study. For each phenotype, we will perform two-point and multipoint variance component linkage analyses using SOLAR. When necessary, the linkage analyses will incorporate the effects of shared household, spouse and sib environmental effects, or genotype by environment interaction. We will test the null hypothesis that the additive genetic variance due to the trait locus equals zero (i.e., no linkage) by comparing the likelihood of this restricted model with that of a model in which the additive genetic variance is estimated. All of our analyses will include the simultaneous estimation of covariate effects.

After we have identified chromosomal regions that are most likely to contain a QTL for a disease risk factor, we will focus on those regions with the highest LOD scores. We will do saturation mapping with additional STRs in each region and will repeat our linkage analyses with the goal of strengthening evidence for linkage and narrowing the region containing the QTL.

Initial linkage analyses for Phases III and IV already have been done using an automated procedure that we have developed. Output is entered into Excel spreadsheets that indicate LOD scores by chromosomal position (every 10 cM) for each phenotype. Also indicated in the spreadsheet for each phenotype are the number of individuals and number of pedigrees included in each analysis, heritability, proportion of variance attributable to covariates, covariate effects and their p values, the maximum LOD score, and its chromosomal location. This automated process allows us to concentrate our efforts on those chromosomal regions that appear most promising. More refined analyses have been done for a few of the linkage signals detected in the initial analyses, but analyses for additional signals remain to be done. These will be pursued in Phase V. As the phenotypic data generated in Phase V become available, we also will subject them to linkage analysis and will begin to examine longitudinal changes.

We will pursue selected linkage signals detected in the Phase III data as well as linkage signals revealed in our ongoing analyses. Further analyses will involve incorporation of additional covariates for some traits as well as bivariate analyses and analyses to assess shared household effects and genotype by environment interaction. Since we have found a significant linkage signal for insulin, we plan to analyze derived insulin sensitivity and secretion traits (e.g., Melchionda et al., 2002). Along these lines, we also plan to use recently developed data imputation methods (e.g., Soler and Blangero, 2003) in our analyses of the insulin phenotypes to account for the well-known effects of diabetes medication on insulin and glucose phenotypes.

After identifying promising chromosomal regions that contain QTLs using data from the 10 cM map, we will narrow the regions of interest by fine mapping and evaluate positional candidate genes. We will genotype SNPs in known genes in the region, and use measured genotype analysis along with information garnered from literature and genetic database searches to identify candidate genes in the region. We will sequence one or two of the most promising candidate genes within the region of each QTL to identify single nucleotide polymorphisms

(SNPs), and then genotype all SNPs that we identify in candidate genes. We will use our new statistical functional genomic approach. This includes a method for quantitative trait nucleotide analysis that will allow us to quantify the posterior probability that a given genetic variant is functional. Thus, our analyses will enable us to test whether specific SNP polymorphism(s) account for our linkage signals. If we find evidence of functional SNPs, we can then test whether the SNPs account for population-level association in the SHS cohort.

Heterogeneity among centers: The three Strong Heart Study centers differ in many aspects of their history, culture, and environment and may differ in their genetic risk for CVD as well. We hope to be able to map risk factor genes that are common across centers as well as those that are unique to one center. As discussed below, the families recruited in Phases III and IV provide excellent power to map genes that contribute to risk of CVD in separate analyses of each of the three centers. To detect heterogeneity among centers, we will evaluate models in which linkage parameters are separately estimated for each of the three centers, comparing them with models in which they are constrained to be the same across centers. (Analyses that combine the data across centers will include a covariate for the center effect.) If a gene in a specific chromosomal region influences a disease risk factor in only one of the three centers, then we would expect little evidence of linkage in the other two centers. The mapping of genes that influence disease risk factors in just one center will allow us to focus on specific families and perhaps to identify individuals who are at increased genetic risk of disease. If there is evidence of linkage in all three centers, then the relevant genes are more likely to be important in the general population.

Measured Genotype Analysis

As described below, in regions where strong linkage signals have been found, measured genotype analysis (Boerwinkle et al., 1986) will be used to examine the extent of association between phenotypes and SNPs. Using the likelihood ratio test, we will compare the likelihood of a model in which variation in the phenotype is influenced by polygenic factors, covariates, and random environmental effects (reduced model) with a model in which the effects of the SNP also are included (saturated model), using SOLAR. If a significant effect is found, we will estimate the proportion of the variation that is attributable to the SNP. The measured genotype models assume that the distribution of the phenotype is normal given the candidate locus (SNP). If necessary, we will perform measured genotype analyses that incorporate a simultaneous transformation of the data. The goodness of fit statistics suggested by Hopper and Mathews (1982) will be used to evaluate the validity of the fitted models. In these analyses, measured genotypes are assumed to have the same (fixed) effects on means in all pedigrees. Alternatively, we may perform association analyses using the Bayesian QTN approach. The benefit of this approach is that it automatically handles the multiple testing issue and can be used with either SNP genotypes or haplotypes.

Statistical Functional Genomics

After positional candidate loci are revealed by linkage analysis, we must attempt to determine the actual functional variants that are responsible for the observed linkage signal. This final activity takes us from the QTL to the responsible nucleotide differences (the QTNs [Long et

al., 1998; Phillips, 1999]) influencing the phenotype. Molecular sequencing and functional genetic analyses are traditionally relied upon to pinpoint the actual genetic variants involved. We propose to utilize a novel statistical functional genomic analysis that will bring rigorous statistical procedures to the final stage of identifying the specific variants involved in determining variation in disease risk.

We will apply a multi-step strategy to prioritize our analyses to identify potentially functional polymorphisms in three or more chromosomal regions where we have the strongest evidence for linkage to quantitative traits. This strategy is described in detail below. Briefly, we will:

1) Refine our linkage signals by genotyping additional microsatellites in the region of linkage.
2) Use genome databases to identify all known expressed genes in each region of linkage.
3) Genotype several previously-identified SNPs in each of the known genes in the region of linkage in those individuals contributing alleles to our study population ("founders").
4) Use measured genotype and/or QTN analyses to determine the extent of association of any of these SNPs with our linked traits.
5) Use information on function and expression obtained from the literature and from genetic databases, along with the results of the measured genotype analyses, to select the most promising candidate gene or genes from the linkage region.
6) Re-sequence the candidate gene(s) for SNP discovery in the set of individuals contributing alleles to our study population (i.e., founders).
7) Genotype the SNPs identified in step 6 in the portion of the data set in which the signal was initially detected.
8) Perform QTN analysis to identify the potentially functional polymorphisms.
9) Perform linkage analysis conditional on the potentially functional SNPs, to determine whether or not they are responsible for our linkage signal.
10) For those SNPs that explain the initial linkage result based on analysis of our partial data set, genotype them in all SHFS participants if linkage is confirmed in the entire dataset, and repeat the linkage analysis conditional on the SNPs.
11) Genotype the polymorphisms that are responsible for our linkage signals in the original SHS cohort and use measured genotype and/or QTN analysis to determine whether they are associated with quantitative traits.

This tiered approach will allow us to explore our linkage regions using multiple sources of information to prioritize positional candidate genes, and then focus our re-sequencing and QTN analyses on the most promising gene or genes. This general approach may be modified for a specific gene region. For instance, if there is a very strong positional candidate gene in the region, we might proceed directly to re-sequencing of that gene for SNP discovery. Throughout our study, at every step, we will, if necessary, modify our strategy based on the results of our molecular and quantitative analyses to give us the best chance of identifying functional polymorphisms responsible for our QTL.

Our tiered strategy for choosing multiple QTLs to follow up for prioritizing candidate genes to pursue for each QTL and for choosing the appropriate analysis based on the results from a previous step gives us flexibility to investigate and focus resources on the most encouraging

results. As we continue our phase III/IV linkage analyses, if our analysis involving one linkage region gives no direction, we will refocus our efforts and resources and move on to another QTL from our linkage results. We wish to emphasize that we will not abandon our proposed linkages without strong justification. We anticipate that our strategy will optimize our chances of finding functional polymorphisms that represent genetic risk factors for CVD-related phenotypes.

Refining the linkage region: In chromosomal regions where we have identified QTLs using variance component analyses with our 10-cM map, we will increase the density of markers to refine our linkage signal and reduce the genomic region containing candidate genes. We will identify additional microsatellite (STR) markers from the Applied Biosystems Linkage Mapping sets HD5, as well as several human genome databases. We will purchase primer pairs, with a fluorescently labeled reverse primer, and amplify these STRs using standard conditions (Cole and Hixson, 1998). Reaction products for each family member will be pooled according to size and fluorescent dye and analyzed by capillary electrophoresis on an ABI 3100 Automated DNA Analyzer (Applied Biosystems, Foster City, CA) using Genescan and Genotyper software. These additional microsatellites will be subjected to data cleaning, and linkage analysis will be repeated, as described above.

Prioritization of candidate genes in regions of linkage: To reduce the amount of resources devoted to re-sequencing in the SHFS participants, we will use a combination of in silico genetic database searches, literature searches, and measured genotype analyses to prioritize candidate genes for re-sequencing based on several factors including genetic location, function, expression, and potential association with the linked phenotype. This is the overall general strategy of prioritization, but it will be tailored to address the specific circumstances and state of knowledge regarding each QTL.

We will use results from genetic database (in silico) searches to identify known and expressed genes in our regions of linkage. We will genotype known SNPs in these genes, available as validated SNP genotyping assays from Applied Biosystems (Foster City, CA). We will genotype all individuals contributing alleles that are segregating in families responsible for our initial linkage findings. For instance, in our pilot (Phase III) families, approximately 400 individuals out of 900 meet the criteria of 1) having been genotyped, 2) having been phenotyped, 3) having offspring in the study, and 4) not having parents who were genotyped. Thus they contribute the alleles segregating in the study population and are defined as founders. We estimate that we will genotype approximately 250 SNPs per gene region in 400 SHFS participants. For details of the molecular genetic techniques, see below.

DNA sequencing to identify polymorphisms in candidate genes: We will use the results from our measured genotype analyses, combined with information obtained from our in silico genetic database searches and literature searches, to prioritize candidate genes for high-throughput re-sequence analysis for SNP discovery in our SHFS subjects. Our approach, based on our experience with the chromosome 2 QTL in the San Antonio Family Heart Study, is to thoroughly examine these positional candidate genes and identify, genotype and analyze all polymorphisms in these genes.

We will obtain our gene sequence information through several sources, including published articles as well as human genome databases. For our sequencing strategy, we will first re-sequence the coding regions and 1 kb of the proximal promoter, and then continue with the noncoding regions by extending through the 5' flanking region with potential regulatory sequences, and then introns. We estimate we will sequence approximately 10 kb of each candidate gene, and will sequence at least two promising candidate genes in each of three QTLs. For large genes, our efforts on noncoding regions will focus on those that show evolutionary conservation revealed by inter-species genomic sequence comparisons (reviewed in Pennacchio and Rubin, 2001) using global sequence alignment software tools such as VISTA (Mayor et al., 2000), Exonerate Mouse (Ensembl), and Exofish (Genoscope). These conserved regions have a reasonable likelihood of having gene regulatory properties. This strategy will become more important if we are unable to identify functional polymorphisms in the coding regions, and we must move away from the structural gene to find more distant regulatory regions, or on to other candidates in the linkage region. For details on the molecular genetic techniques, see below.

Genotyping of novel SNPs in candidate genes: We will genotype all the new SNPs that we identify from our re-sequencing efforts in the SHFS families that are responsible for the initial linkage. We estimate we will identify approximately 25 SNPs per candidate, and type them in at least 900 additional SHFS participants (400 will already have been genotyped during SNP discovery, above). We assume that the majority of the polymorphisms we detect will be single nucleotide polymorphisms (SNPs). Our method of choice for genotyping SNPs will be the allelic discrimination assay (Holland et al., 1991) on an ABI Prism 7900HT Sequence Detector (Applied Biosystems, Foster City, CA) (see Molecular Genetic Techniques, below). Primers and probes for each SNP specific assay will be developed using the Primer Express (Applied Biosystems) software, or purchased from Applied Biosystems using their custom design service, and PCR reactions will use TaqMan Universal PCR Master Mix PCR reagents. For those few polymorphisms that we may detect that are not SNPs, we will use more appropriate methods for detection. For instance, if they are STRs, we will use the methods described above for microsatellite markers. In some instances, we might genotype individuals using direct sequencing.

Estimation of linkage disequilibrium among SNPs: For our examination of intragenic positional candidate gene SNPs, we will estimate all of the pairwise linkage disequilibria parameters between all pairs of intragenic SNPs using a standard pedigree-based maximum likelihood method that can handle any pattern of missing data using the program MENDEL (Lange et al., 1988).

Quantitative Trait Nucleotide Analysis

Given complete sequence data for a gene harboring a functional site, we can identify statistically which polymorphism(s) is/are most likely to be affecting our phenotype. Although determination of the mechanism by which a genetic variant leads to phenotypic variation will still require molecular investigation, it is possible to formulate a first-line statistical genetic approach to limit the number of genetic variants to be examined in the molecular laboratory and to prioritize them in terms of their likely importance in the population. This approach requires enumeration of all polymorphisms within the positional candidate loci and will thus require re-

sequencing of a substantial number of individuals to establish the polymorphic sites in the population. Once the polymorphisms are found, they must be typed in a large number of individuals for whom phenotypic information is available (e.g., the extended pedigree sample in which we conducted our linkage analyses). Although large volumes of re-sequencing and SNP typing are labor intensive, recent advances in technology have rendered them practical, and new technologies may make this step even more efficient in the near future.

The QTN model: The QTN model that we have employed represents a simple extension of the classical variance component model. If a candidate locus has numerous polymorphic nucleotide sites, one of which is functional, then the variance associated with a marker in disequilibrium with the functional site will generally be less than that due to the functional polymorphism unless the genotypes at the two loci are completely correlated. We model the phenotype as a linear combination of fixed effects and random variables. Estimation of the various fixed effects and variance components associated with the random effects can be performed using standard maximum likelihood methods.

Model selection using the Bayesian Information Criterion: Once the extensive polymorphism within a positional candidate gene is assayed, Bayesian model averaging/model selection will be employed to determine the functional polymorphisms. We first applied this powerful methodological framework to the study of multiple QTLs in linkage analyses (Blangero et al., 1999; Martin et al., 2001). Because there may be a large number of SNPs to evaluate in a candidate gene, there can be many possible models of QTN action. If we consider only additive QTN effects, there are 2^m possible models, where m is the number of QTNs considered. Our approach is to evaluate all such models and utilize Bayesian methods to estimate the probability that each SNP is functional. The Bayesian QTN (BQTN) method is designed to separate potentially functional variants from neutral polymorphisms in linkage disequilibrium (LD) with them. In this framework, functional variants are those that are responsible for a displacement in the observed phenotype values. This method is predicated on the assumption that we have the complete collection of variants in the positional candidate gene. Hence the extensive re-sequencing of the candidate gene and surrounding conserved and known regulatory regions described above. The BQTN model incorporates each variant one by one, evaluating the likelihood of a model in which the trait mean varies by genotype at that variant. Then it evaluates models with all possible combinations of two variants, all possible combinations of three variants, and so on.

The phenotypic variation explained by a marker in linkage disequilibrium with a functional site is a function of the variation due to the actual functional site and the strength of LD between the marker and the functional site. Thus, the explanatory power, or effect size, of a genuine functional polymorphism is always greater than or equal to that of variants that are merely in LD with it. The effect sizes of the genuine functional variant and the neutral marker are equal only if they are in complete LD, which also requires that they have identical allele frequencies. Thus, barring complete LD, functional polymorphisms can be distinguished from markers in LD with them by their greater explanatory power in the multivariant BQTN models. In the rare case of complete LD, a SNP set can be treated as a single unit in the analyses. This will allow us to test whether one or more of the variants in complete LD is functional, but the

identification of which one will require either laboratory testing or replication in another population with different LD structures between the markers. The Bayesian Information Criterion (BIC) will be used to assess whether the QTN model explains sufficient variation in the phenotype to justify the number of parameters used. BIC differences greater than 2 are indicative of positive evidence of support for one model over another with posterior probabilities of greater than 75% (Raftery, 1995; Blangero et al., 1999). Similarly, BIC differences of 6 units represent strong support favoring a model with 95% posterior probabilities, and BIC differences greater than 10 units indicate posterior probabilities of greater than 99% and thus represent very strong support.

Bayesian model averaging in QTN analysis: The BIC also can be used to formulate a simple model averaging approach to estimation that explicitly allows for model uncertainty (Raftery, 1995). The main utility of this approach is that it provides an estimate of our faith that a given SNP is itself functional. We have incorporated the Bayesian model averaging/model selection procedures for QTN analysis into our program SOLAR.

Linkage analysis conditional upon marker polymorphisms: We will combine the QTN analysis with our IBD-based variance component linkage analysis. This will allow us to assess whether the putative functional polymorphisms found by the QTN method can account for a given linkage signal. We employ marker polymorphisms as fixed (for markers with 3 or fewer alleles) or random (for markers with 4 or more alleles) effects and then calculate the conditional LOD score after removing the effects of the marker. We have employed this method to test whether a putative functional polymorphism can adequately account for a prior linkage signal (Soria et al., 2000). If the conditional LOD score is zero, then there is no residual linkage signal, which is evidence that the marker may be the primary functional polymorphism.

Repeating linkage analysis conditional upon marker polymorphisms in the entire SHFS data set: Linkage analysis will be repeated upon completion of the Phase IV genotyping and data cleaning. If the linkage persists in the larger sample, we will test whether the putative functional polymorphisms we have detected using the QTN analysis explain the linkage. This will be done by genotyping those SNPs (we estimate 5 per gene) in the Phase IV SHFS subjects (~2,700), and repeating the linkage analysis conditional upon marker polymorphisms. If the putative functional polymorphisms detected in the Phase III families do not explain the linkage in the larger data set, we will continue with SNP discovery and additional QTN analysis.

Measured genotype analysis in the SHS cohort: One benefit of the SHS design is the opportunity to assess the effects of putative functional polymorphisms in the large SHS cohort. We will genotype these polymorphisms in the SHS cohort (~4000 individuals) and perform measured genotype analysis to determine the potential association of the polymorphism with the traits of interest. The results of these additional analyses in the cohort will not impact on the results of the QTN and conditional linkage analysis in the SHFS, since rare functional polymorphisms might not have a population-level effect. But for those polymorphisms that might not be rare, or might have a large effect, utilizing the cohort will confirm their effect and usefulness as markers of CVD risk in the SHS population as a whole.

Power Considerations for Genetic Analysis

We have performed an extensive series of computer simulations to evaluate our power to detect quantitative trait loci by genomic scanning in the Family Study. We assumed a sample size of 1,200 family members for each center, with structures like those of the families recruited in the pilot study. For a 10 cM map, a QTL will be at most 5 cM from a polymorphic marker. Table 1 indicates the QTL heritability for which we will have 80% power to detect the QTL for a range of LOD scores. A LOD of 1.175 corresponds to a p value of 0.01. It can be seen that even without typing additional markers in regions of interest, we will be able to obtain suggestive evidence for linkage (LOD > 2) for QTLs that account for as little as 18% to 21% of the residual variance in a CVD risk factor (after covariate effects have been taken into account) in separate analyses of each center, and for as little as 9% of the variance in situations in which it is appropriate to analyze the combined data across centers. The power to detect linkage is nearly as great for the variance component method, which does not require estimates of penetrance parameters, as for penetrance-based linkage analysis in which the model is known.

Table 1. Estimated QTL Heritability Detectable at Recombination Fraction $\theta = 0.05$ with Power = 80%.

	LOD score		
	>3	>2	>1.175
Arizona	0.24	0.21	0.16
Dakotas	0.24	0.18	0.14
Oklahoma	0.23	0.18	0.15
Combined	0.11	0.09	0.05

Table 2. Power for Projected Sample Size of 1,200 at Each Center.

Power to obtain a LOD score					Power to obtain a LOD score				
h^2_q	ELOD	>3	>2	>1.175	h^2_q	ELOD	>3	>2	>1.175
Arizona					**Oklahoma**				
0.05	0.7595	0.0324	0.1221	0.3242	0.05	0.7965	0.0358	0.1314	0.3406
0.10	1.7544	0.1909	0.4237	0.6971	0.10	1.7891	0.1986	0.4347	0.7069
0.15	2.6484	0.4112	0.6763	0.8782	0.15	3.3872	0.5920	0.8198	0.9477
0.20	4.6704	0.8214	0.9455	0.9896	0.20	5.1546	0.8760	0.9669	0.9946
0.25	6.3888	0.9561	0.9916	0.9990	0.25	7.2513	0.9804	0.9970	0.9997
0.30	9.1376	0.9972	0.9997	1.0000	0.30	10.0687	0.9990	0.9999	1.0000
Dakotas					**Combined**				
0.05	0.8950	0.0458	0.1575	0.3836	0.05	2.4510	0.3604	0.6273	0.8493
0.10	1.9475	0.2351	0.4840	0.7481	0.10	5.4910	0.9052	0.9769	0.9966
0.15	3.3470	0.5828	0.8136	0.9452	0.15	9.3826	0.9979	0.9998	1.0000
0.20	4.7829	0.8355	0.9514	0.9910	0.20	14.6079	1.0000	1.0000	1.0000
0.25	8.0876	0.9915	0.9989	0.9999	0.25	21.7276	1.0000	1.0000	1.0000
0.30	10.4270	0.9993	1.0000	1.0000	0.30	29.6334	1.0000	1.0000	1.0000

For any linkages detected in the genome screen, the next step is to saturate the region with additional markers, thus reducing the maximum distance of markers to the trait locus, and increasing the power to localize the gene. After a genomic screening using the 10 cM map, additional markers will be genotyped in the region. Results in Table 2 indicate power to detect a

QTL linked at recombination fraction $\theta = 0$ for a range of LOD scores, and with heritability (h^2_q) ranging from 0.05 to 0.30. Also shown are expected LOD scores (ELODs) for specific QTL heritabilities in each center and for the combined data set. For each of the three centers, power is greater than 80% to detect a QTL that accounts for as little as 20 percent of the variance, with a LOD greater than 3.0. In analyses across all three centers (which would be appropriate if there is linkage homogeneity across centers), a QTL with heritability of 0.10 will be detectable with a LOD greater than 3.0, with a power of 90%.

Note that these power calculations are for detection of a particular locus. Since we expect these traits to be influenced by multiple loci, our power to detect at least one of them is greater than our power to detect a particular locus. For example, while our power to obtain a LOD of 3 for a QTL that accounts for 10% of the variance is only 19% in the Arizona sample, if there are 5 such QTLs influencing the trait, our power to detect one or more of them would be $(1 - (1 - 0.19)^5)$ or 65%.

Power to detect a functional effect: We performed a large number of computer simulations to assess the power to detect a functional effect of a given relative size in the population. Table 3 shows the results of this simulation. The allele frequency of a QTL was varied (with three possible values, 0.5, 0.3, and 0.1) and the displacement between homozygous means was altered to obtain a total QTL-specific heritability of 0.01, 0.02, 0.03, and 0.04. We analyzed the simulated data using our QTN fixed-effect model. Our results indicate that we have outstanding power (>88%) to identify functional effects that account for as little as 2% of the total phenotypic variation in a trait.

Table 3. Power to Detect a QTL of a Given Relative Effect. Corrected for multiple SNP testing per positional candidate gene.

	QTL-specific heritability			
p_q	0.01	0.02	0.03	0.04
0.5	52.4	90.5	98.4	99.8
0.3	48.4	92.7	97.8	99.8
0.1	44.9	88.1	96.4	99.8

Molecular Genetic Techniques

Our strategy applied to the use of the following techniques is described in detail in the Statistical Functional Genomics section, above. Below are descriptions of each technique.

High-throughput SNP genotyping: We will use SNP genotypes in our measured genotype analyses and QTN analyses described above. Our method of choice for genotyping SNPs will be the allelic discrimination assay (Holland et al., 1991), which allows direct detection of the PCR product by the release of a fluorescent reporter as a result of PCR using the 5' nuclease. This technique is more robust, allows higher throughput, and requires less up-front assay development than other SNP genotyping assays (Holloway et al., 1999). For known SNPs, we will genotype our study subjects using the Applied Biosystems validated SNP genotyping assays and the TaqMan Universal PCR Master Mix PCR reagents on an ABI Prism 7900HT Sequence Detector. For novel SNPs that we identify, we will develop primers and probes for each SNP-specific assay using the Primer Express (Applied Biosystems) software, or we will use Applied Biosystems custom design service. Two probes that hybridize to the target sequence containing the SNP are used in the assay. Each probe consists of an oligonucleotide with a 5'-

reporter dye and a 3'-quencher dye. When the probe is intact, the proximity of the reporter and quencher dyes results in suppression of the reporter fluorescence. As the Taq polymerase cleaves the probe with its 5' to 3' nuclease activity, the reporter dye is separated from the quencher dye, resulting in increased fluorescence. This fluorescence is read and quantified on the ABI Prism 7900HT Sequence Detector.

DNA sequencing to identify polymorphisms in candidate genes: Our general approach and strategy applied to the selection of genes for re-sequencing is described above. For sequencing reactions, we will design PCR primers to amplify approximately 1 kb overlapping gene fragments, as well as internal sequencing primers for each fragment. PCR reactions will use standard conditions. The PCR products will be treated with enzymes to inactivate the unincorporated primers and deoxynucleotide triphosphates in the samples (Nickerson et al., 1998). The amplified fragments will be used in cycle sequencing reactions using the ABI PRISM BigDye Terminator Cycle Sequencing Ready Reaction Kit (Applied Biosystems, Foster City, CA), according to the manufacturer's instructions. The sequencing reactions will be precipitated with ethanol, re-suspended, and loaded into an ABI 3730XL DNA Analyzer (Applied Biosystems). The ABI sequence software will be used for lane tracking and first pass base calling, and the sequence data will be analyzed to identify polymorphisms using Sequencher Version 4.1 (Genecodes, Ann Arbor, MI), or transferred to a UNIX workstation (Sun Microsystems, Inc.) for analysis using the programs Phred, Phrap, PolyPhred, and Consed (Nickerson et al., 1997; 1998). Both strands will be sequenced to help resolve polymorphisms in heterozygous individuals.

Epidemiologic Analysis Methods

The second type of statistical analyses is characterized by epidemiologic analyses for the cohort and family study data (for Specific Aim #2 and the first part of Specific Aim #3). These analyses will be performed at the SHS Coordinating Center or by investigators at MedStar and Cornell, and are described below.

a. Power estimation and epidemiologic analysis for Specific Aim #2 (Morbidity and Mortality Surveillance)

In the following, we present our analysis plan and describe the adequacy of our sample size by providing power estimates. We address these issues for each question listed in the specific aim.

Question a. What risk factors are related to the incidence of CVD across different age strata? What are the age- and gender-adjusted risk factor profiles for premature CVD deaths vs. non-premature CVD deaths?

For the first question, we will use the data from those participants who were CVD-free at the baseline exam to assess the association of CVD incidence with potential risk factors measured at the baseline exam. The Cox proportional hazards model with stepwise selection procedure will be used to identify risk factors that are significantly related to the time to a CVD

event (first occurrence of a CVD event or censored at last follow-up or May 2009) within each age stratum and over all age strata. Interactions between risk factors will also be assessed.

The average CVD mortality and morbidity (M&M) surveillance follow-up time of the original SHS cohort from the baseline exam to May 2009 will be approximately 18 years. There was a total of 4372 CVD-free participants at the baseline exam (1467 in AZ, 1452 in OK, 1453 in SD/ND), or an average of 1457 per center. Our power analyses for detecting associations of the development of CVD/CHD with several major risk factors are based on the average 18 years of follow-up and the average numbers of participants per center. We selected the following risk factors for the power analysis: hypertension (HTN), LDL-C, diabetes (DM) and macro/micro albuminuria, based on analyses of the currently available surveillance data. Furthermore, from the mortality and morbidity surveillance data currently available, the overall CVD (CHD) incidence was 2.18 (1.79) per 100 person-years. Gender-specific incidence rates of CVD (CHD) were 1.85 (1.48) and 2.73 (2.32) per 100 person-years for women and men, respectively. Age-specific incidence rates were 1.51 (1.28), 2.61 (2.11) and 3.61 (2.91) per 100 person-years, respectively, for age groups 45-54, 54-64 and 65-74 years. There was an annual reduction of participants under M&M surveillance of 1.69%, due predominantly to non-CVD deaths of participants never having a CVD event, with a small number of participants lost to morbidity surveillance (only 0.2% cumulative loss to mortality follow-up). All of these figures were used in calculating statistical power.

Table 4. The smallest hazard ratio (SHR) of a risk factor for a disease that can be detected with 80% power at the 0.05 level of significance based on the average no. of participants per center, and the hazard ratio (HR) observed in preliminary analyses of the currently available data.

					Gender				Age					
	Risk	%	Per Center		Female		Male		45-54		55-64		65-74	
Disease	factor (RF)	with RF	N=1457		N=874		N=583		N=730		N=479		N=248	
			HR	SHR	HR	SHR	HR	SHR	HR	SHR	HR	SHR	HR	SHR
CVD	Hypertension	38	1.90	1.30	1.79	1.43	2.08	1.44	1.80	1.53	2.10	1.51	1.80	1.65
	DM	45	1.97	1.29	2.41	1.42	1.67	1.43	2.39	1.52	1.67	1.50	1.99	1.63
	LDL-C≥130 mg/dl	34	1.47	1.30	1.22	1.44	1.78	1.46	1.75	1.54	1.22	1.52	1.62	1.67
	Micro/Macro Albuminuria	29	1.75	1.32	1.80	1.46	1.72	1.48	1.73	1.57	1.79	1.55	1.69	1.70
	X	15		1.41		1.60		1.63		1.75		1.73		1.94
CHD	Hypertension	38	1.88	1.33	1.79	1.48	2.04	1.48	1.71	1.58	2.12	1.57	1.94	1.72
	DM	45	1.96	1.32	2.35	1.47	1.69	1.47	2.21	1.57	1.90	1.56	1.81	1.70
	LDL-C≥130 mg/dl	34	1.65	1.33	1.43	1.49	1.89	1.49	2.04	1.59	1.30	1.58	1.83	1.74
	Micro/Macro Albuminuria	29	1.69	1.35	1.78	1.52	1.61	1.52	1.67	1.62	1.58	1.61	1.87	1.78
	X	15		1.46		1.68		1.69		1.83		1.81		2.05

Table 4 gives the smallest hazard ratios (SHR) that can be detected with 80% power at the 0.05 level of significance. Table 4 above also gives the observed hazard ratios (HR) for the same risk factors according to the currently available data. The SHR with the estimated sample sizes are in most cases smaller than the HR based on existing data. In addition, we calculated the SHRs for risk factors with prevalence proportions of 10%, 15% or 20%. Even with a 10%

prevalence, the SHR obtained were mostly less than 2.0 with only one slightly above 2.0 for CVD in the 65-74 age group. Included in Table 4 as an example is a hypothetical risk factor (X), which has a prevalence proportion of 15%. The detectable SHRs are all less than 2.0 except one slightly above 2.0, in the 65-74 age group for CHD. Thus, our sample sizes are adequate to study the center-specific associations of CVD/CHD with risk factors with a reasonable range of prevalence proportions, as well as the gender- and age-specific associations within a center.

For the second question, we define premature CVD deaths as deaths before age 55 for men and age 65 for women. These age cut-points were selected based on the SHS age-specific CVD incidence rates provided above, the SHS community mortality data and age- and sex-specific CHD prevalence and mortality data from NHLBI. All of these indicate that CVD mortality and morbidity increase sharply after these ages. To address this question, we will include participants who were < 65 years (women, 2205) or <55 years (men, 961) at the baseline exam (total 3166) in the analysis of risk factors for premature CVD death. The follow-up time will be from the baseline exam to May 31, 2009, or age 65 for women and 55 for men, whichever comes first. Those participants who died of CVD during the follow-up period will be uncensored observations, and those who died of a non-CVD cause or those who are still alive at age 65 (women) or 55 (men) or alive at the end of May 2009 will be censored observations. We will use the Cox proportional hazards model to identify significant risk factors, adjusting for age and gender. For non-premature death risk factors, included in the risk factor analysis will be participants who were $\geq$ 65 (women) or $\geq$ 55 (men) at the baseline exam plus those individuals who were < 65 years (women) or <55 years (men) at the baseline exam and turned 65 (women) or 55 (men) at the second or third exam. Including the latter two groups will increase our sample size. The follow-up period will be from the baseline exam (first group), second exam (second group) or third exam (third group) to the end of May 2009. Those participants who died of CVD during the follow-up period will be uncensored observations and those who died of a non-CVD cause or are still alive will be censored observations. Similarly, we will use the Cox proportional hazards model, adjusting for age and gender. The stepwise selection method will be used in both analyses to obtain the most significant risk factors. Risk factors identified in these two models (both are age and gender adjusted) can then be compared.

The data from the 3166 participants at the SHS baseline exam will be used in analyses for premature CVD death. Based on currently available data, the annual reduction rate was 1.69%, and an estimate of the premature CVD death rate was 0.43 per 100 person-years and the prevalence proportions of diabetes and hypertension were 45% and 35%, respectively. With these figures, we can detect an HR for premature CVD death among diabetics as low as 1.58 compared to non-diabetics, and for hypertensives as low as 1.61 compared to normotensives, with 80% power at the 0.05 level of significance. The observed HRs using currently available surveillance data from the 3166 participants were 2.52 for diabetes and 1.8 for hypertension, which were higher than those we will be able to detect in Phase V. For risk factor analysis of non-premature deaths, we have 1383 participants who were $\geq$65 (women) or $\geq$ 55 (men) at baseline (possible follow-up time is 18 years), 501 participants who turned 65 or 55 at the second exam (possible follow-up time is 14 years), and an additional 544 participants who turned 65 or 55 at the third exam (possible follow-up time is 10 years). Thus, we have a total of 2428

participants with an average follow-up time of 15.4 years. Based on currently available data, an estimate of the non-premature CVD death rate was 1.55 per 100 person-years, and the prevalence proportions were 47% for diabetes and 50% for hypertension. With the same power (80%) and significance level (0.05), for non-premature CVD death, the smallest HRs we can detect are 1.27 for both diabetes and hypertension while the observed HRs were 2.34 for diabetes and 2.09 for hypertension based on currently available surveillance data.

Question b. How are incidence rates for various manifestations of CVD (e.g., coronary, cerebral, peripheral) influenced by age, gender and diabetes status?

To study the relationships between incidence rates for these various manifestations of CVD, we will apply the Cox proportional hazards model to the time from the baseline exam to the first occurrence of each individual type of CVD and potential risk factors such as age, gender and diabetes status. The significance level obtained for the coefficient of each of these risk factors and the HRs indicate if the specific risk factor has significant influence on the incidence of the specific manifestation. In addition, the age-, gender- or diabetes status-specific incidence rates for different types of CVD can be estimated separately by the respective fraction in which the sum of the disease-free time in the specific age (or gender, or diabetes status) group is the denominator and the number of disease cases in that specific group is the numerator. If we use the CVD-free time (the time from the baseline exam to the first occurrence of any one of the manifestations of CVD), the different manifestations of CVD can be treated as competing risks during the follow-up period for the participants who were CVD-free at the baseline exam. The competing risks model and stepwise selection method can be applied to the time to the first such event computed from the baseline exam with risk factors such as age, gender and diabetes. The coefficients and the HRs obtained for these risk factors will demonstrate their influence on the incidence of these various manifestations of CVD. Other potential risk factors can be used to adjust for possible confounding effects.

Based on the total 4372 CVD-free men and women at the baseline exam, incidence rates of 1.76, 0.39, and 0.03 per 100 person-years for CHD, stroke, and the other CVD, respectively, a 45% diabetes prevalence and a 38% hypertension prevalence in the 4372 participants, the smallest HR for developing CHD (stroke) that we can detect in Phase V is 1.17 (1.40) for diabetes and 1.18 (1.41) for hypertension, which are smaller than the observed HRs based on currently available data, i.e., 1.92 (2.05) for diabetes and 1.86 (2.49) for hypertension (these HRs are slightly different from those give in Table 4 for CHD because the competing risks model is used here). Thus, we have adequate power to estimate the associations of stroke/CHD/other CVD incidence with the potential risk factors. The above power analysis is based on the competing risks model, which is more conservative than that based on the analysis of each individual manifestation. Therefore, our sample size will provide adequate power for the association analyses of individual sub-types of CVD.

Question c. What are the relations between quantitative measures of systemic atherosclerosis, cardiac hypertrophy and cardiovascular dysfunction (e.g., LV mass, carotid plaque, carotid wall

thickness) and CVD incidence and mortality? Are these potential predictors related to other established risk factors such as diabetes?

For the echocardiographic and carotid ultrasound variables measured at the second and third exams, the average follow-up times to May 2009 are approximately 14 and 10 years, respectively. The Cox proportional hazards model will be applied to the CVD-free time (from the $2^{nd}/3^{rd}$ exam to 5/2009) to study its association with potential echocardiographic and carotid ultrasound variables and identify the significant variables with and without adjustment for other risk factors. By including other established CVD risk factors, we can study their relationships with the echocardiographic and carotid ultrasound variables. Because of the page limitations in this application, we will use LV mass and presence of carotid plaque as examples of risk factors and MI and stroke as examples of CVD outcomes to illustrate the adequacy of our sample size.

There were 2934 CVD-free participants who had measurements of LV mass in the second exam, and 25% of them were classified as having "high-risk" LV mass because of left ventricular hypertrophy. Based on an average follow-up of 14 years, an annual reduction rate of 1.69%, and estimated incidence rates of 0.81 and 0.44 per 100 person-years for MI and stroke, respectively, we can detect HRs as low as 1.41 for MI and 1.58 for stroke, for the high-risk LV mass group vs. the other LV mass group, with 80% power at the 0.05 level of significance. These estimated detectable HRs are smaller than those reported previously (2.0 for both MI and stroke). Similarly, there were 2456 CVD-free participants who had carotid ultrasound measurements at the 3rd exam. The prevalence of carotid plaque was 55%. With an average of 10 years of follow-up, we can detect HRs as low as 1.46 for MI and 1.66 for stroke in participants with and without carotid plaques, with 80% power at a significance level of 0.05. The observed HR associated with carotid plaques was 2.5 for both MI and stroke. Therefore, our sample sizes are adequate to perform longitudinal analyses of the associations of MI or stroke incidence with LV mass and carotid plaque.

Question d. What are the incidence rates and major risk factors for specific types of stroke (atherothrombotic, cardioembolic, hemorrhagic, etc), and do they differ by gender or diabetes status?

Eight subtypes of cerebral events (atherothrombotic infarction, cardioembolic infarction, lacunar infarction, other unknown infarction, subarachnoid hemorrhage, intraparenchymal hemorrhage, TIA, and unknown type of stroke) were included in the SHS surveillance. We will determine incidence rates for each subtype by dividing the number of participants who experienced a specific subtype of cerebral event by the total number of person-years of follow-up for participants who had not experienced a cerebral event at the baseline exam. The person-years will be computed from the baseline exam to the time of the cerebral event or last follow-up time. However, in identifying major risk factors, we will not be able to study every subtype individually because of the small number of incident cases for some sub-types. We will focus our analyses on the risk factors related to thrombo-embolic (cardioembolic and atherothrombotic) strokes.

The Cox proportional model with competing risks (thrombo-embolic strokes vs. other types of strokes) will be used to study the association of thrombo-embolic stroke incidence with potential risk factors in men and women, separately and in individuals with and without diabetes. Their risk factor profiles can then be compared.

Based on the current surveillance data, the incidence of thrombo-embolic strokes was 0.26 per 100 person-years. The prevalence proportions of diabetes and hypertension were, respectively, 45% and 38% in the 4372 participants who were CVD-free at baseline. Using these estimates and an average follow-up of 18 years, we will have 80% power at 0.05 significance level to detect an HR (of developing thrombo-embolic strokes) as low as 1.5 for participants with diabetes vs. those without, and an HR as low as 1.52 for participants with hypertension vs. those without, using the competing risks model. These estimates of the SHRs that can be detected with our sample size are less than the HRs (2.33 for diabetes and 2.29 for hypertension) obtained from our preliminary analyses.

Question e. What factors are significantly related to long-term survival? Are there differences in the factors that predict longevity between individuals with and without diabetes at baseline?

For the SHS population, which is known for high rates of the early death, we consider surviving to 75 or more years of age "long-term" survival. To identify factors that are related to "long-term" survival, we will use the data from participants in the 57-74 age group at the baseline exam (those who were 45-56 years of age at baseline will not reach 75 after 18 years of follow-up). We will apply the Cox proportional hazards model to the survival time of these participants, and use the stepwise selection method to identify significant factors that are associated with their "long-term" survival. The same method can be applied to groups of individuals with or without diabetes in the same age group at the baseline exam. The risk profiles so obtained can then be compared.

There were 1914 participants aged 57-74 at the baseline exam. These participants will be followed up for an average of 18 years to May 2009. Based on the current surveillance data, the incident rate of death before 75 was 2.74 per 100 person-years. With a sample size of 1914 participants, 51% prevalence of diabetes and 33% prevalence of micro/macro albuminuria in this group, we have 80% power at the 0.05 level of significance to detect an HR for dying before 75 among diabetics as low as 1.19 compared to non-diabetics, and as low as 1.2 for individuals who have micro/macro albuminuria compared to those without. These estimated SHRs are less than the observed HRs, 1.36 for diabetes and 1.89 for micro/macro albuminuria, based on currently available surveillance data.

Question f. What are the age-specific CVD incidence and mortality rates and all-cause mortality rates including rates of premature CVD death in American Indians in the three SHS geographic areas? Do these rates differ significantly among the three areas and if they do, what are the explanations for the differences?

We will determine the age-specific CVD incidence and mortality rates and all-cause mortality rates in the three geographical areas and center-specific risk factors using the same methods as we used in the past. To compute the age-specific mortality rates, the sum of the observation times in person-years of the participants in a specific age group at baseline (45-54, 55-64 and 65-74) will be the denominator and the number of deaths at those ages the numerator. To calculate the age-specific CVD incidence rates, we will use all of the participants who were CVD-free at the baseline examination. For each of these participants, we will compute the CVD-free time, i.e., the time from the baseline examination to the date of CVD death, or the date of first CVD event, or last follow-up, whichever comes first. The sum of the CVD-free-times will be the denominator and the numerator will be the number of new CVD cases identified until the last follow-up. The premature CVD death (before age 55 for men and 65 for women) rate will be calculated using participants who were, at baseline exam, 45-64 years old for women and 45-54 years old for men. The Cox proportional hazards model will be applied to survival/disease-free time to identify significant risk factors, including SHS center, for each age group. If the center effect is significant in an age group, the proportional hazards model and the stepwise selection method will be applied to center-specific data in that age group to obtain a risk factor profile for each center. The resultant risk factor profile for each center can then be used to explain differences in the center-specific incidence rates and to better understand the impact of risk factor prevalence and interaction within a center on disease risk. The power analysis provided for Question a. above is also applicable here. We have adequate power to answer this question.

Question g. Have age-specific mortality rates and proportional mortality ratios for CVD and other causes of mortality changed over the 20 years of the SHS follow-up (1989-2009)? Do changes differ between individuals with diabetes and without diabetes? If they do, what are the explanations for the differences?

First, the annual age-specific mortality rates (45-49, 50-54, 55-59, 60-64, 65-69, 70-74) for CVD and other causes will be calculated starting from 1990. To calculate these rates, the number of participants in the age group during that year will be the denominator and the number of CVD (or other causes) deaths in that age group during that year will be the numerator. The age-specific annual mortality rates of CVD and of other causes so obtained will be used to calculate the proportional mortality ratios for CVD and other causes of mortality. The annual mortality rates and proportional mortality ratios will be examined for possible variations and trends. Similar rates and ratios will also be calculated separately for individuals with and without diabetes and compared over the 20 years of the SHS. If meaningful differences are found between the two groups in any age group, attention will be focused on that age group; the proportional hazards model will be applied to the time to CVD death, and its relationship to diabetes and other risk factors, including interaction terms of diabetes and other variables (e.g., systolic blood pressure), will be examined. The coefficient for diabetes will be used to test if the difference between the two diabetes status groups is significant, and the coefficients for interaction terms such as diabetes by SBP and non-diabetes by SBP will be used to test the difference in the effect of SBP in the two diabetes status groups. The power analysis for Question a above is also applicable here. We have adequate power to answer this question.

Question h. What are the health-adjusted life expectancies (HALE) of the American Indians in the three geographic areas? What is the impact of chronic health conditions such as CVD, diabetes, obesity and renal disease on the HALE?

Health-adjusted life expectancies (HALE) will be calculated by combining the weighted age-specific health related quality of life (HRQOL) and age-specific mortality. The weighted age-specific HRQOL will be estimated from the MOS 36-item short-form health survey (SF-36) we collected in the second examination. Mortality information will be obtained from the mortality surveillance. One way to calculate HALE is to first use the life-table methods for gender-age-specific mortality rates for the participants with and without the health condition (e.g., obesity and diabetes) of interest. Second, by including the prevalence of the health condition of interest with the life-table method, the modified Sullivan method can be used to estimate the years of life lived free of the specific health condition. HALE can then be estimated by the years of life lived, weighted with the gender-age specific HRQOL indices. We will calculate the overall HALE and the center-specific HALE for various health conditions, including CVD, diabetes, obesity and renal disease, and compare them with national and respective state data and data from other ethnic groups.

b. Methods for analyses of data from the re-examination of family members (Specific Aim #3a)

One of the opportunities provided by the re-examination of family members (participants in the Phase IV exam) is the assessment of changes from the Phase IV to Phase V exam in key CVD risk factors that are the focus of the linkage analysis. Most of these key risk factors are continuous and these include BMI, LDL-C, HDL-C, TG, SBP, fasting glucose, insulin and fibrinogen. These risk factors and disease outcomes of interest measured from members of a family are considered related observations. We will use the marginal model designed for related observations to analyze the data. First, we will calculate the difference for each continuous risk factor observed between the Phase IV and Phase V exams for each participant. To compare the difference for a continuous risk factor (e.g., fasting glucose) among participants in different sub-groups (e.g., different age, gender, center or diabetes status) or to study the association of the difference with other risk factors, we will use the marginal model with the identity link function. For example, to study the association of the difference in fasting glucose with other factors, we will apply the marginal model with the identity link function and include the effects of age, gender, household, center, diabetes status, time between Phase IV and Phase V, BMI, albuminuria, etc. and interactions of these risk factors in the model. In this model we assume that the observed differences in fasting glucose between Phases IV and V from members in the same family are correlated according to an unstructured familial correlation structure.

c. Methods for analyses of longitudinal data from the SHS examinations

For data collected from the SHS cohort members in Phases I – III exams and even for some participants in Phases IV and V, we will use marginal models, which take into consideration the relatedness issue of the observations from a participant at different follow-up

exams. These data include disease outcomes such as hypertension, diabetes, and clinical conditions such as LVH and presence of carotid plaques, and potential risk factors that were collected only at the exams (not included in the surveillance). The analyses will include examination of the relationships of the cumulative incidence of a disease outcome to risk factors, the changes of a risk factor observed at different exams, and the association of a risk factor with other risk factors. For a categorical disease outcome, such as HTN or the presence of carotid plaques, we will use the marginal model with the logit link function to study its association with potential risk factors. To study the changes in a continuous risk factor, such as LV mass, at different follow-up exams, or to examine the association of a continuous risk factor with other risk factors, we will use the marginal model with the identity link function. We assume that the disease outcome or risk factor measurements obtained from a participant at different follow-up exams are related according to an unstructured correlation structure. Included in the model will be exam effects and other covariates to examine how a risk factor, e.g., LV mass, changed over repeated follow-up exams, after adjusting for other covariates. These studies will allow us to address developmental issues related to changes in risk factors over time.

1.7 PUBLICATION POLICY

The SHS Steering Committee appointed the following members to form a Publications and Presentations Committee (P&P Committee):

Dr. Elisa Lee (Chair)
Dr. Lyle Best
Dr. Richard Fabsitz
Dr. Barbara Howard
Dr. Jean MacCluer
Dr. Mary Roman

The P&P Committee shall review and approve/disapprove all paper and thesis proposals. When the P&P Committee does not reach a consensus on a proposal, or when issues concerning a proposal (or other publication matters) are particularly problematic, the matter will be referred to the SHS Steering Committee (SC). The P&P Committee will present the issues and any of its recommendations to the SC, which shall have final authority for approval or disapproval of the paper or thesis proposal (or other publication matters).

The P&P Committee shall meet or discuss by telephone, monthly, or as needed, proposals submitted for a paper or a thesis (and any other publication matters).

1.7.1 Submission of a Paper Proposal

I. Proposal

A formal paper proposal (see Appendix 8 below - this form can be downloaded – see SHS website: http://strongheart.ouhsc.edu) must be submitted to the Chair of the P&P Committee (Elisa T. Lee, PhD at elisa-lee@ouhsc.edu) at least one week prior to the P&P meeting. Upon review for completeness (including preliminary review of the analysis plan by a statistician), the proposal will be added to the agenda of the next P&P Committee meeting for action. The Chair is responsible for distributing copies of the proposal to the members of the Committee.

A formal paper proposal must include the following as a minimum:

1. Title (To maintain a cohesive body of literature, each publication using SHS data should include the phrase "Strong Heart Study" in its title and listed as a keyword whenever possible. Titles not meeting this guideline must be justified at the time of manuscript proposal submission.)

2. Primary author's name, contact information including fax and e-mail, and affiliation. Via distribution of P&P Committee minutes, the P&P Committee will periodically report its

decisions to the SHS Steering Committee (SC), and SC may nominate additional co-authors for any papers that have been approved by the P&P Committee.

3. Suggested co-authors

4. Suggested key words

5. A detailed outline which includes:
   a) Introduction (rationale)
   b) Methods
   c) General analysis plan

6. Analysis responsibility (authors or Coordinating Center, CC)

7. References (the timeliness and originality of a proposal should be supported by the supplied references).

8. When submitting a proposal, authors are encouraged to send a copy of any journal articles that would support their choices for methods of statistical analysis. This will simplify the review process on the part of the statistician performing the preliminary review of the proposal.

9. Prior to submission, all proposals must be approved by an SHS P.I. For manuscripts written by investigators outside of SHS, the SHS PI co-author or the SHS PI who is closely affiliated with any of the authors must advise the P&P Committee during the review of the manuscript proposal whether the penultimate manuscript should be sent to the P&P Committee for review prior to submission to a journal. Additionally, if no SHS PI is a co-author and if the analysis was not performed by the CC, the final manuscript must be sent to CC for statistical review.

II. Review of Paper Proposal by the P&P Committee

The P&P Committee shall review all formal proposals and make the following decisions:

1. Approval (or approval with recommendation), deferral, or disapproval (with reasons).

2. Upon approval, the paper is given an SHS Paper Approval Number.

3. In the event a proposal does not receive full approval (approved with recommendations or disapproved), the P&P Committee will supply the author with a complete explanation and recommendations for re-submission, when applicable.

4. The decision of the P&P Committee will be forwarded to the submitting author.

5. Along with an approval memo from the Chair, the author of each approved manuscript proposal will receive an Agreement for Data Distribution/Paper/Thesis Proposal form (an SHS author/investigator agreement must be signed by the author obtaining SHS data for a paper), Request for Data form, a Request for Data Analysis form, and a Data Analysis Monitoring System form (Data Request/Analysis forms are to be used by the author as needed). For maintaining better tracking, each form will be marked with the assigned SHS Paper Approval Number (see forms in Appendix 8 below). The author needs to complete, sign, and return the forms to the P&P Committee. CC (or the appropriate SHS PI) then provides required data to the authors. All primary authors must sign an agreement form before CC or the appropriate PI will provide the data.

6. The P&P Committee recommends that authors requesting data from the CC understand that a clear and concise rationale for data extraction is imperative. Representatives of the CC are well capable of streamlining the extraction of the database and analysis processes when supplied with this rationale.

7. If data analysis from the Coordinating Center (CC) is requested, the CC will assign a statistician to work with the primary author after the proposal is approved and all the required forms are returned to P&P Committee by the author. The paper may then be given a priority score if analyses are to be done by the CC. For those authors who choose to analyze their own data, CC representatives will be available for consultation.

8. For manuscripts written by investigators outside of SHS, the SHS PI co-author or the SHS PI who is closely affiliated with any of the authors must advise the P&P Committee during the review of the manuscript proposal whether the manuscript should be sent to the P&P Committee for review prior to submission to a journal. The Chair will send the paper to 2 or more reviewers, and the comments of the reviewers will be communicated to the submitting author. Additionally, if no SHS PI is a co-author and if the analysis was not performed by the CC, the final manuscript must be sent to CC for statistical review.

9. Prior to submission to a journal, the paper must be submitted by the author to NHLBI for review and to the IHS Area IRBs and the tribes for review and approval (see details in section IV below). **Please note that as an integral part of the manuscript approval process, the IHS IRBs in the three centers require that <u>all SHS manuscripts must contain the following disclaimer (verbatim)</u>: "The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the views of the Indian Health Service."** A cover letter must be attached, requesting review and approval. The paper may not be submitted to a journal until the authors have received the NIH review (normally within one month of submission to NIH). The primary author is responsible for making sure that all Tribal/IHS approvals have been obtained prior to publication by contacting the responsible individual at each of the three field centers (see section IV below).

10. Minutes from the P&P Committee are circulated to the Steering Committee.

III. Analysis

If CC is responsible for the analysis, CC will assign a statistician to work with the author upon receiving the completed and signed "Request for Data Analysis Form" from the author. The statistician is the CC representative to the writing group. Whenever the workload for CC is heavy, CC will work with the investigators in analyzing the data according to the priority scores assigned by the P&P Committee.

Guidelines for authors to use in dealing with CC are:

1. Communicate with the CC representative on the writing group and discuss the objectives of the paper, appropriate statistical methods to be used, format of presentation (tables and figures), etc.

2. Determine a timetable with the CC representative. Be sure that analysis requests are made clearly and in writing (using the "Request for Data Analysis" form) and in a way that will allow sufficient time to complete the analyses.

3. If CC falls behind, the investigator should inform the P&P Committee; if there is a problem, deadlines can be changed.

4. For manuscripts written by investigators outside of SHS, if no SHS PI is a co-author and if the analysis was not performed by the CC, the final manuscript must be sent to CC for statistical review.

IV. Summary of Paper Publication Process

1. An author submits a paper proposal in standard format (see form in Appendix 8 below) to the P&P Committee Chair. (Note: the phrase "Strong Heart Study" should be included in the title and listed as a keyword whenever possible).

2. The P&P Chair notifies the author of the committee decision.

3. Prior to submission, all proposals must be approved by an SHS P.I. For manuscripts written by investigators outside of SHS, the SHS PI co-author or the SHS PI who is closely affiliated with any of the authors must advise the P&P Committee during the review of the manuscript proposal whether the manuscript should be sent to the P&P Committee for review prior to submission to a journal. The Chair will send the paper to 2 or more reviewers, and the comments of the reviewers will be communicated to the submitting author.

4. For manuscripts written by investigators outside of SHS, if no SHS PI is a co-author and if the analysis was not performed by the CC, the final manuscript must be sent to CC for statistical review.

5. Prior to submission to a journal, the paper must be submitted by the author to NHLBI for review (to be returned to the author within 1 month of submission) and to the IHS Area IRBs and the tribes with a lay summary and an attached cover letter requesting review and approval. These approvals are obtained through the following procedures:

   a. The primary author will first send the paper to the co-authors for their input. **When the primary author feels the paper is ready for NIH review and IHS Institutional Review Board (IRB) and Tribal approval, he/she will send a copy of the manuscript (including a Tribal/lay summary) simultaneously to the following with the clear designation that the paper is being sent for such approval:**

      1) Dakota Center: LaVonne Looking Elk
      Strong Heart Study - Dakota Center
      P.O. Box 9010
      Rapid City, SD 57709
      Phone: (605) 355-2377
      Fax: (605) 355-2502
      email: LaVonne.LookingElk@ihs.gov

      2) Oklahoma Center: Lee Keesee
      Univ of Oklahoma Health Sciences Center
      CHB 112
      P.O. Box 26901
      Oklahoma City, OK 73190
      Phone: (405) 271-3090
      Fax: (405) 271-4390
      email: Lee-Keesee@ouhsc.edu

      3) Arizona Center: Nanette Taho
      Aztec Building - Ste 250
      1616 E Indian School
      Phoenix, AZ 85016
      Phone: (602) 277-0488
      Fax: (602) 277-5979
      email: Nanette.W.Taho@MedStar.net
      with cc to: Marie Russell, MD
      Director, MedStar Phoenix Field Center
      email: Marie.Russell@MedStar.net

4) NHLBI: NHLBI has an electronic means for submission of manuscripts for NHLBI review, and authors are instructed to use this system for NHLBI REVIEW. Comments will be returned to the email address provided by the author in the submission process. All manuscripts need to be submitted to the following email address for NHLBI Review: ebpdocs@nhlbi.nih.gov

NOTE: Please cc Dr. Richard Fabsitz, Project Officer-Strong Heart Study, (FabsitzR@nhlbi.nih.gov) when emailing your manuscript to the above NHLBI email address.

The three individuals listed in 1-3 above are responsible for sending the manuscript for approval by Indian Health Service IRBs and the Tribes.

b. **The author must include a Tribal/lay summary** for all manuscripts, since such summaries are essential for obtaining Tribal and IHS IRB approval. The Tribal/lay summary should be no longer than one page of easily understandable text. One or two graphics illustrating major points could be included. Such summaries are critical to ensure tribal understanding of research results, and, hopefully, maintain tribal support for SHS research. **The intended journal should be mentioned for all papers in the cover letter/memo.**

c. The paper may not be submitted to a journal until the authors have received NIH review (see #4 above). Authors must check with the Oklahoma, Arizona, and Dakota Centers (see contact info in #1-3 above) to ensure that IHS IRB and Tribal approvals have been obtained; this should be done at the time when the author receives reviewers' comments from the journal and is in the process of making final revisions. The primary author is responsible for making sure that all approvals have been obtained prior to publication.

d. The manuscript must include the following disclaimer (verbatim) (usually in the Acknowledgments or in a footer on the first page)**: "The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the views of the Indian Health Service."**

The intention of this multi-step procedure is to ensure that all principal investigators are aware of the status of publications and also to ensure that appropriate review by NIH and approval by IHS and the Tribes occur prior to publication.

6. After the article is published, the primary author must send at least one reprint of the published article to the NHLBI Project Officer:

Richard Fabsitz, PhD
Project Officer-Strong Heart Study
Two Rockledge Center-Rm 8164
6701 Rockledge Dr. MSC

Bethesda, MD 20892-7938
Phone: (301) 435-0458
Fax: (301) 480-1667 or 480-1455
email: FabsitzR@nhlbi.nih.gov

and to each of the three persons designated in the field centers (as listed above in #1-3), who will then distribute the published articles to Tribes and IHS IRBs for their centers. The primary author should also send reprints of the published article to all co-authors.

7. **NOTE:** Papers that are likely to result in press coverage or substantial press/media interest require notice in advance to the NHLBI (contact Dr. Fabsitz) so that the staff and public information office can be prepared.

8. The P&P Chair will maintain a list of published and in press SHS papers (posted on the SHS website: http://strongheart.ouhsc.edu)and papers in various stages of preparation. In order to help update the status of papers in the SHS publication list, authors are required to notify the P&P committee by sending the cover letter each time when submitting their papers to the NIH/IRBs and to a journal. Also, authors are required to notify the P&P when papers are accepted by a journal for publication and when published. If using electronic transmission to submit papers, authors need to copy Dr. Momotaz Begum (momotaz-begum@ouhsc.edu).

9. To track the progress of approved paper proposals, the P&P Committee distributes a status survey of the approved papers by emailing a Paper Tracking Status Form every six months. The authors must fill out the respective space regarding the progress/current status of their paper(s) and return the form to the committee.

10. If the P&P Committee determines that progress on a manuscript is taking an unduly long time, the Chair will communicate with the author, asking for a plan of action for completing the paper or for the author(s) to release the topic for authorship by someone else.

11. In rare cases, the P&P Committee may need to make a recommendation to the Steering Committee regarding reassignment of a paper topic.

NOTE: It must be recognized that any step of this approval process may entail requested revisions and re-submissions by the authors.

V. Approval of Abstracts (Please note that authors must submit a Lay Summary along with the abstract, as required by the IHS IRB of the Dakota Center)

1. It is assumed that all SHS abstracts will have at least one SHS PI as a co-author. The PI co-author is responsible for ensuring that the abstract abides by SHS standards and guidelines. If none of the PIs is a co-author, the abstract must be approved by the PI who works most

closely with the authors. The title of the abstract should include the phrase "Strong Heart Study" whenever possible.

2. Abstracts must be submitted for NHLBI review. NHLBI has an electronic means for submission of abstracts and manuscripts for NHLBI review, and, PRIOR TO submission of SHS abstracts to a conference, all authors MUST submit their materials using this NHLBI REVIEW system. Comments will be returned to the email address provided by the author in the submission process. All abstracts need to be submitted to the following email address for NHLBI review: ebpdocs@nhlbi.nih.gov

3. Abstracts must also be sent to the Dakota Center for approval by their IRB. (The Oklahoma and Arizona Centers do not have this requirement.) In addition to the abstract, please include a brief LAY SUMMARY of the work to be presented. Please specify that the abstract is being forwarded for Dakota Center IRB approval, include information about the meeting or other venue intended for the presentation, and send the abstract to:

   LaVonne Looking Elk
   Strong Heart Study - Dakota Center
   P.O. Box 9010
   Rapid City, SD 57709
   Phone: (605) 355-2377
   Fax: (605) 355-2502
   email: LaVonne.LookingElk@ihs.gov

4. Prior to presenting the paper, the presenting author should verify (if notice has not been received) that the NHLBI review and Dakota Center IRB approval have been received.

VI. Summary of Thesis/Dissertation Approval Process

1. A college student who wishes to use SHS data for a thesis or dissertation must submit a thesis proposal to the P&P Committee Chair. (See Thesis Proposal Form below in Appendix 8 below - also, the form can be downloaded – see SHS website: http://strongheart.ouhsc.edu)

2. The Thesis/Dissertation Proposal must include the Prospectus for the Doctoral Thesis/Dissertation or an Outline for a Masters/Bachelor Thesis. If a prospectus is not required by the doctoral degree program, the student needs to submit a detailed outline.

3. A thesis/dissertation proposal (see Appendix 8 below) must include: Title of Thesis/Dissertation, Name of Degree Candidate, Type of Degree, Candidate Affiliation including the contact information (full address, telephone, fax and email) and name of the Primary Mentor, including the same type of contact information.

4. Upon approval, the thesis/dissertation is given an SHS Thesis/Dissertation Number, and the P&P Chair notifies the student of the committee decision. The student is provided with the Agreement for Data Distribution/Paper/Thesis/Dissertation Proposal form, Request for Data form, and a Data Analysis Monitoring System form to complete, sign, and return to the P&P Committee (see forms in Appendix 8 below). CC (or the appropriate SHS PI) then provides required data to the student.

5. As part of the agreement, the student agrees to write at least one paper based on the approved thesis/dissertation proposal. At the time the student is ready to develop a paper for publication, the student must submit a separate paper proposal to the P&P Chair and follow all of the P&P paper approval procedures described above.

VII. Forms for Paper and Thesis/Dissertation Proposals

Appendix 8 below contains the desired formats for paper and thesis/dissertation proposals submitted to the P&P Committee. Also, the forms can be downloaded from the Internet – see SHS website: http://strongheart.ouhsc.edu . Additionally, upon receiving requests from the SHS authors, these forms will be transmitted electronically by email. For the electronic forms, email or word processing software may be easily implemented for form completion and submission. "Cut and Paste" or other electronic means may be used to download the proper form, to fill it in (electronically expanding the space as much as needed for each section), and to submit the form to the P&P Chair by email, or more traditional means if desired. An electronic file containing the SHS Publication Policy will also be included with the proposal form to make the prospective authors aware of the rules and procedures of the SHS P&P Committee.

The SHS P&P paper, thesis/dissertation, and ancillary study proposal forms (see Appendix 8 of this Volume) are:

1. Strong Heart Study Paper Proposal

2. Sample of paper proposal approval Memo

3. Strong Heart Study Thesis/Dissertation Proposal Form

4. Sample of thesis/dissertation proposal approval Memo

5. Agreement for Data Distribution/Paper/Thesis/Dissertation Proposal

6. Strong Heart Study Request For Data

7. Strong Heart Study Request For Data Analysis

8. Strong Heart Study Data Analysis Monitoring System

9. Strong Heart Study Ancillary Study Proposal Form

10. Strong Heart Study Data and/or Materials Distribution Agreement Form

11. Strong Heart Study Annual Update on Ancillary Study

1.8. ANCILLARY STUDIES POLICY **revised: 06/15/2006**

(SHS home page: http://strongheart.ouhsc.edu/)

1.8.1 General Policy

To enhance the value of the Strong Heart Study (SHS) and to ensure the continued interest of the investigators, the Steering Committee (SC) welcomes proposals from individual investigators to carry out ancillary studies and to promote the advancement of science. Nevertheless, to protect the integrity of SHS and the privacy of its participants, such ancillary studies, before their inception, must be reviewed and approved by the SC and by the NHLBI through its SHS Observational Study Monitoring Board (OSMB). In general, ancillary studies require outside (non-SHS) funding.

1.8.2 Definition of Ancillary Study

The SHS Steering Committee has defined an ancillary study as a project that imposes additional burdens on the SHS participants, or is outside of the goals of SHS, or has commercial aspects (patents, profit, etc). Ancillary studies require tribal and IRB approvals and separate consent forms. An SHS substudy is one that is consistent with the goals of SHS as stated in the consent form, involves no additional participant burden, and has no commercial aspects. For some SHS centers, the investigators submit protocol modification paperwork to their IRBs regarding substudies. The tribes are informed of substudies through the SHS newsletter, community meetings, or similar means.

An ancillary study is one based on information from SHS participants in an investigation that is not described in the SHS protocol and involves data collection or data analyses that are not included as part of the routine SHS dataset or data analyses. The core Strong Heart Study includes the use of blood, DNA, and urine stored for additional studies not described within the original protocol, but within the scope of the participant consents and approved by the SC; these are considered to be SHS substudies, not ancillary studies. In general, ancillary studies require external (non-SHS) funding. Funding must cover any costs incurred by the SHS lab(s) (Penn Medical Laboratory (PML) and/or the Southwest Foundation for Biomedical Research (SWF), e.g., cost reimbursement for sample handling & shipping), the Cornell Ultrasound/EKG Reading Center (RC) (e.g., any customized selection or reading of clinical material), and by the Coordinating Center (CC) (e.g., for tasks such as sample selection, preparing and documenting analysis files, participating in statistical analysis, and integrating the new ancillary data back into the combined SHS database). No funds for this purpose are available within the Study.

1.8.3 Requirements for Approval of an Ancillary Study

An ancillary study must receive SHS/OSMB approval (see 1.8.05 below) before a grant application to support it is submitted. Approval will be based on finding that the ancillary study will have scientific merit but will not do any of the following:

a. Interfere with the completion of the main objective of SHS.

b. Adversely affect participant cooperation.
c. Create a serious diversion of study resources (personnel, equipment or study samples), either locally or centrally.
d. Jeopardize the public image of SHS and/or the Study relationship with the tribes.
e. Use SHS grant resources without reimbursement.

1.8.4 Preparation of Request for Approval of an Ancillary Study

For approval of an ancillary study, a written request on the SHS Ancillary Study Proposal Form (see Appendix 8 below) must be submitted to the Steering Committee (via the SC Chair, Barbara V. Howard, PhD). The Ancillary Study Proposal Form collects the following information:

a. Identifiers:
Title of proposal
Initiating investigators (with PI contact information) and collaborators
Planned starting date
Funding plans and estimated cost

b. Design and methods:
Brief background and rationale
Study questions or hypotheses
Methods, data to be collected
Proposed statistical analyses
List of all analytes to be measured using SHS biological samples (for novel analytes, document that the (within person plus laboratory variability)/(total variability) is acceptably low)
Analyte assay methods to be used
Burden on SHS participants
Burden on SHS CC, PML, SWF, RC, and Field Center Staffs - summary of tasks involved for each of the SHS centers and how each would be reimbursed (e.g., by subcontracts, with amounts approved by the participating SHS centers)
Impact on the main Study and potential utility of the new data for collaboration with other investigators

c. Data or specimen requirements:
Data needed from SHS datasets
Specimens needed from SHS repositories, specifying SHS Phase # (I, II, etc), type, and amount
Address whether previously thawed specimens are adequate

d. Handling of SHS data and specimens:
Disposition of stored samples from main Study and those processed by ancillary study
Disposition of ancillary study data at the conclusion of the ancillary study

1.8.5 Review of Ancillary Study Proposals

The Steering Committee, often in consultation with the SHS Sample Committee, will review and will approve, reject or request modification of ancillary study proposals in a timely manner (generally 8 weeks plus the time needed for OSMB review (in case of participant burden) and/or IRB review (e.g. for use of stored samples)). Ancillary studies using stored biological samples must be recommended for approval by the SHS Sample Committee. Exceptions to the need for OSMB approval may be granted by the SHS SC Chair in case of studies with no participant risk or burden.

At least one SHS investigator must be included as a co-investigator in each proposal. This investigator, collaborating with the ancillary study PI, will facilitate preparation of the ancillary study proposal, its submission to the SHS SC, and subsequent communications between the collaborating studies. Other SHS investigators may request to become collaborators on a proposal. The key criteria for approval of proposals are scientific merit and impact on SHS. In addition, the plan for reimbursing SHS components for all ancillary study-related costs must be adequate.

Formal IRB approval will be required, if such studies require further interaction with SHS participants (e.g., interviews or additional procedures). The principal investigator (PI) of the ancillary study, working with the three SHS field centers, is responsible for obtaining approval from the Indian communities, the grantee institution IRBs, and the three area IHS IRBs.

Proposals related to cardiovascular and pulmonary diseases and their risk factors, which include measurements (even of stored samples) that are not specifically described in the original SHS protocol must obtain approval from some SHS IRBs. If the SHS Steering Committee feels that the ancillary study will result in a major change in the protocol, the PI will be required to seek IRB approval prior to conducting the study. Any ancillary study that is not related to cardiovascular or pulmonary diseases or their risk factors will require IRB and tribal approval.

1.8.6 Amendments of Ancillary Study Proposals

Amendments to ancillary study proposals (e.g., adding analytes to be measured) require approval via submission of a revised proposal with a note describing the changes. It should be noted that such amendments may require further review and approval by the SHS IRBs.

1.8.7 Yearly Progress Report for Ancillary Study

Following approval of an ancillary study, a yearly progress report must be submitted to the Coordinating Center PI (Elisa T. Lee, PhD). CC will include these annual progress reports in its annual report to the OSMB regarding overall progress of SHS. The annual ancillary study progress report should follow the format contained in the Strong Heart Study Annual Update on Ancillary Study form (see Appendix 8 below).

1.8.8 Analysis and Publication of Results of Ancillary Studies

The goals of this policy are to provide participant protection (ensure use of data does not exceed informed consent), coordination of efforts to avoid duplication of work, and to minimize barriers to publication of Ancillary Studies.

The PI or other representative of the ancillary study, and if necessary the SHS SC, will consult with the CC during data analysis to ensure that all study data used in analysis of ancillary results are consistent with data in the main SHS database. Manuscript proposals must be approved in advance by the SHS Publications and Presentations Committee (P&P). This procedure is necessary to establish authorship and prevent overlap in the publication effort. Approval of manuscript proposals is sought by submitting the proposal using standard SHS format (see SHS Paper Proposal form in Appendix 8 below) to the P&P. The ancillary study PI will be required to sign an Ancillary Study Proposal Form (see form in Appendix 8 below). This agreement stipulates that the ancillary study investigators agree to submit paper proposals for approval by the SHS P&P and to submit draft manuscripts for review by the NHLBI and approval by the IHS IRBs and the tribes (see section 1.7 above). Additionally, abstracts for presentations at meetings require review by the NHLBI and approval by the Dakota Center IHS IRB (see section 1.7 above). The investigator who assumes lead responsibility for the ancillary study shall generally be listed as an author. Whenever possible, the phrase "Strong Heart Study" should be included in the manuscript title and listed as a key word. Manuscripts will also contain an acknowledgment section listing individual SHS investigators and staff as deemed appropriate. Upon publication, reprints must be distributed as specified above in section 1.7.

1.8.9 Feedback of Results of Ancillary Studies to Participants

Results of ancillary studies shall be reported to participants and/or their physicians if such reporting is medically useful and approved by the relevant IRBs and SHS. Once approved, such reporting should follow standard SHS protocol for notification of participants. Overall results of ancillary studies shall be reported to participating tribes via lay language articles in the SHS Newsletter and/or by oral presentations of results at tribal meetings.

1.8.10 Handling of SHS Data and Specimens

At the time of distributing SHS specimens and/or data, the SHS Collaborating Investigator, with help from SHS CC and Lab (PML and/or SWF), makes explicit arrangements with the ancillary study PI for:

1. security of these study materials
2. completion of the SHS Ancillary Study Proposal Form and the SHS Data and/or Materials Distribution Agreement Form (See Appendix 8 below)
3. documentation of IRB approval
4. final disposition of study materials at the conclusion of the ancillary study

The safety and confidentiality of the SHS data at the collaborating institution are the responsibility of the ancillary study PI, as is the appropriate disposition of data and remainders of SHS samples after the ancillary study has been completed. Leftover DNA and any other types of laboratory specimens must be returned to PML or SWF. Files of SHS data must be returned or deleted, as established and agreed at the outset of the collaboration. An archival copy of the

newly collected data and/or laboratory results must be sent in a secure manner to the SHS CC one year after the conclusion of the data cleaning and closure or one year after acceptance of the primary publication, whichever comes first. This should allow sufficient time for publication of the main (ancillary) study hypothesis. This transfer is the responsibility of the SHS representative(s) collaborating with the ancillary study. The data from the ancillary study will be included in the SHS dataset for distribution according to procedures currently under negotiation with the involved tribes, the IHS, and the NHLBI.

The SHS Steering Committee monitors the development of the ancillary studies, receipt of funding, initiation dates, and progress. A written progress report on ancillary studies is to be made annually to the SHS CC, who will include the summary in the annual report to the SHS OSMB (NHLBI). This annual report should include a list of data collected and/or analytes measured. For the convenience of the collaborators, a shell document for these reports (SHS Annual Update on Ancillary Study form) is provided in Appendix 8 below.

The ancillary study PI will send the completed SHS Data and/or Materials Distribution Agreement Form to the SHS Coordinating Center PI (Dr. Lee) (see contact info immediately below). The CC will review the agreement, sign the agreement on behalf of SHS, and forward the agreement to the SHS NHLBI Program Officer (Richard Fabsitz, PhD). A file copy with all required signatures will be retained by CC, and a copy will be returned to the Ancillary Study Principal Investigator.

Elisa T. Lee, PhD, SHS PI and CC Director
SHS Ancillary Study Correspondence
Center for American Indian Health Research
College of Public Health
University of Oklahoma Health Sciences Center
PO Box 26901 - Room CHB-112
Oklahoma City, OK 73190

Express Svc:
Center for American Indian Health Research
College of Public Health
801 NE 13th St, Room CHB-100
Oklahoma City, OK 73104

Phone: 405-271-3090
Fax: 405-271-4390
Email: Elisa-Lee@ouhsc.edu

1.8.11 Ancillary Studies Using DNA or Other Stored Samples

SHS represents a unique public resource to be used by the American Indian communities in conjunction with clinical, public health, and scientific entities to better understand the etiology and epidemiology of cardiovascular and pulmonary diseases and their risk factors, and clinical

sequelae. The SHS investigators are committed to managing the stored biologic material for the good of this endeavor in the manner agreed to and expected by the participating tribes and Study participants. This resource includes blood, DNA, and other biological samples obtained from the SHS participants and stored at PML or SWF for future studies of scientific merit related to cardiovascular and pulmonary diseases and their risk factors that are proposed by SHS or collaborating investigators.

With respect to use of DNA, proposals will need to be as specific as possible, describing the genetic hypothesis of interest, the specific genes or chromosomal sequence to be analyzed, the laboratory method, the primary dependent variable (if applicable), endpoint or risk factor of interest, preferred sampling design, and sources of funding. Strong Heart Study DNA samples are maintained by PML and the SWF. PML maintains DNA samples from the original cohort collected in Phases I through III. SWF maintains DNA samples on participants in the Strong Heart Family Study (SHFS) collected in phases III, IV, and V. For studies requiring genotyping of polymorphisms, STRONG preference will be given to those investigators who agree to have PML (through Children's Hospital and Dr. Joseph Devaney) and/or SWF perform the genotyping (as opposed to studies requesting DNA for genotyping at the collaborating institution). For genotyping polymorphisms at collaborating institutions, if the identity of the variant is known *a priori*, it should also be included in the proposal. If the identify of the variant is not known *a priori*, such information should be transmitted to the SHS Steering Committee for approval prior to genotyping, and certainly before data analysis and publication. The CC maintains a database of single nucleotide polymorphisms (SNPs) typed (or being typed) on SHS cohort participants, and SWF maintains the same for SHFS participants. Interested investigators must contact Dr. Lyle Best, Chair of the SHS Sample Committee or Dr. Shelley Cole of SWF to inquire about particular SNPs:

Lyle Best, M.D.
Principal Investigator, Strong Heart Study-Dakota Center
Chair, SHS Sample Committee
PO Box 9010
Rapid City, SD 57709
Express Service, change last two lines to:
3200 Canyon Lake Drive
Rapid City, SD 57702
Office: (605) 355-2401
FAX: (605) 355-2502
E-mail: sbest@utma.com

Shelley A. Cole, Ph.D.
SHS Co-Investigator
Director, Genetics Core Laboratory
Southwest Foundation for Biomedical Research
P.O. Box 760549
San Antonio, TX 78245-0549

Express Service, change last two lines to:
7620 NW Loop 410
San Antonio, TX 78227-5301
Office: (210) 258-9688
FAX: (210) 670-3344
E-mail: scole@darwin.sfbr.org

In general, all costs attributed to this ancillary study are the responsibility of the originating investigator. The proposal will be reviewed by the SHS Sample Committee to assess scientific merit and possible overlap with existing activities. The Sample Committee will recommend approval or disapproval to the SC. In the event that a study is disapproved, the investigator will be notified of the reason for the decision.

When a study is approved, the SHS CC has the responsibility of generating a list of SHS participant IDs to be included, which is consistent with the approved design and objectives of the ancillary study. In general, it is better for ancillary studies to take advantage of case-control, case-cohort, and other contrasts that have already been generated and investigated for other analyses or hypotheses. In addition, preference will be given to proposals focusing on polymorphisms with documented functional significance. Due to the limited resources of PML and SWF that can be devoted to servicing requests of collaborating studies, it is STRONGLY suggested that investigators request genotyping by PML (though Children's Hospital) and/or SWF as opposed to requesting DNA samples for genotyping at the collaborating institution. In this way, the work can be carried out quickly and efficiently without wasting DNA and time spent on the aliquoting, shipping, genotyping, and monitoring the return of sample remainders to SWF, and logging and re-storage of DNA. The resulting genotype data will be provided to the investigator by PML and/or SWF, and the other SHS data needed to address the approved hypotheses will be provided by CC. There should be no loss of the originating investigator's proprietary (if any) or publication rights. In the rare instances when SC approves genotyping by a collaborating lab, PML or SWF will aliquot DNA into 96-well plates. The amount of DNA to be supplied will be determined by the SHS Sample Committee. In general, no more than 50 ng will be provided for typing six to ten polymorphisms.

All costs of the approved ancillary DNA study are the responsibility of the initiating investigators. SWF and PML (through Children's Hospital) will work with the investigators to supply accurate information about charges for genotyping and other aspects of needed support, and such charges will closely reflect best estimates for actual costs to be incurred. Any sub-contractual arrangements will need to be made in coordination with NHLBI staff, the involved SHS Centers, and the participating collaborating institution(s). Resulting data from the ancillary study must be made available in a timely manner to the SHS CC, as specified above. In this way the value of SHS resources will continue to grow as the foundation database enlarges in size and scope, and analyses can be verified when necessary.

APPENDIX

APPENDIX 1

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PRINCIPAL AND CO-INVESTIGATORS

Arizona Center and Core Laboratory

Barbara Howard, Ph.D.
Principal Investigator
MedStar Research Institute
6495 New Hampshire Ave., Ste. 201
Hyattsville, MD 20783
Office: (301) 560-7302
FAX: (301) 560-7307
Pager & Cell: (301) 602-0125
Phoenix Office: (602) 277-0488
E-mail: Barbara.V.Howard@medstar.net

Jason G. Umans, M.D., Ph.D.
Director, Penn Medical Laboratory
MedStar Research Institute
108 Irving Street, NW, Annex 2
Washington, DC 20010-2933
Office: (202) 877-7352
FAX: (202) 877-7342
E-mail: Jason.G.Umans@MedStar.net

William James Howard, M.D.
Adjudicator, Mortality Review
Vice President for Academic Affairs
Washington Hospital Center
110 Irving Street, NW, Rm. 6A-126
Washington, DC 20010
Office: (202) 877-5285
FAX: (202) 877-8024
E-mail: Wm.James.Howard@medstar.net

Helaine Resnick, Ph.D.
Co-Investigator
Director, Department of Epidemiology
MedStar Research Institute
6495 New Hampshire Ave., Ste. 201
Hyattsville, MD 20783
Office: (301) 560-7615
FAX: (301) 853-7321
E-mail: Helaine.E.Resnick@medstar.net

Marie Russell, M.D.
Coordinator, Field Studies
The Aztec Building – Strong Heart Study
1616 E. Indian School, Ste. 250
Phoenix, AZ 85016
Office: (602) 277-0488
FAX: (602) 277-5979
Cell: (602) 363-7554
E-mail: Marie.Russell@Medstar.net

Dakotas Center

Lyle Best, M.D.
Principal Investigator
Strong Heart Study-Dakota Center
PO Box 9010
Rapid City, SD 57709
Express Service, change last two lines to:
3200 Canyon Lake Drive
Rapid City, SD 57702
Office: (605) 355-2401
FAX: (605) 355-2502
Home Address/Info:
R.R. 1, Box 88
Rolette, ND 58366
(For Express Service add: Missouri Breaks Industries Research Inc., 1 Airport Rd. to address)
Home: (701) 246-3884
FAX: (701) 246-3698 **(notify by phone before sending fax)**
E-mail: sbest@utma.com

Jeffrey A. Henderson, M.D., M.P.H.
Co-Investigator
President and CEO
Black Hills Center for American Indian Health
701 St. Joseph Street, Suite 204
Rapid City, SD 57701

Office: (605) 348-6100
FAX: (605) 348-6990
E-mail: jhenderson@bhcaih.org

Thomas K. Welty, M.D., M.P.H.
Co-Investigator
Strong Heart Study-Dakota Center
5990 East Jeremy Lane
Flagstaff, AZ 86004
Home: (928) 526-0955
Cell: (208) 989-0340
FAX: (928) 526-9059
E-mail: twelty@earthlink.net

Ellie Zephier, R.D., M.P.H.
Principal Investigator
Strong Heart Dietary Study
Acting Diabetes Consultant
Area Diabetes & Dietetics Program
Aberdeen Area Indian Health Service
Federal Building, Rm. 309
115 4th Avenue, SE
Aberdeen, SD 57401
Office: (605) 226-7238
FAX: (605) 226-7733
E-mail: ellie.zephier@ihs.gov

Oklahoma Center and Coordinating Center

Elisa T. Lee, Ph.D.
Principal Investigator
Center for American Indian Health Research
University of Oklahoma Health Sciences Center
P. O. Box 26901, Rm. CHB100
Oklahoma City, OK 73190
Express Service, change last two lines to:
801 NE 13th St., Rm. CHB100
Oklahoma City, OK 73104
Office: (405) 271-3090
FAX: (405) 271-4390
E-mail: elisa-lee@ouhsc.edu

Tauqeer Ali, M.D., Ph.D.
Strong Heart Study
USPHS Indian Hospital
1515 NE Lawrie Tatum Rd.
Lawton, OK 73507
Office: (580) 353-0350 x322
FAX: (580) 351-9107 (notify by e-mail when sending fax)
Cell: (580) 678-0676 (let ring 6 or 7 times; leave message on voice mail)
E-mail: tauqeer-ali@ouhsc.edu

Linda D. Cowan, Ph.D.
Department of Biostatistics and Epidemiology
University of Oklahoma Health Sciences Center
P. O. Box 26901, Rm. CHB301
Oklahoma City, OK 73190
Express Service, change last two lines to:
801 NE 13th St., Rm. CHB301
Oklahoma City, OK 73104
Office: (405) 271-2229 x48066
FAX: (405) 271-2068
E-mail: linda-cowan@ouhsc.edu

Jeunliang Yeh, Ph.D.
Center for American Indian Health Research
University of Oklahoma Health Sciences Center
P. O. Box 26901, Rm. CHB100
Oklahoma City, OK 73190
Express Service, change last two lines to:
801 NE 13th St., Rm. CHB100
Oklahoma City, OK 73104
Office: (405) 271-3090 x46716
FAX: (405) 271-4390
E-mail: jeunliang-yeh@ouhsc.edu

ECG and Ultrasound Reading Center

Richard B. Devereux, M.D.
Principal Investigator
Director, Laboratory of Echocardiography
Weill Medical College of Cornell University
New York – Presbyterian Hospital
525 East 68th Street, Rm. K415 (Box 222)
New York, NY 10021
Office: (212) 746-4655
FAX: (212) 746-8561
E-mail: rbdevere@med.cornell.edu or
Home: cdevereux@mem.po.com

Mary J. Roman, M.D.
Co-Investigator

Office: (212) 746-4685
FAX: (212) 746-8561
E-mail: mroman@med.cornell.edu

Peter Okin, M.D.
ECG
Office: (212) 746-4688
E-mail: pokin@med.cornell.edu

Giovanni de Simone, M.D., F.A.C.C., F.A.H.A.
Associate Professor of Medicine
Director, Echocardiography Laboratory
Department of Clinical and Experimental Medicine
Federico II University Hospital – School of Medicine
Via S. Pansini 5
80131 Napoli – Italy
Office: +39(081)746-2013
Fax: +39(081)546-6152
E-mail: echocard@unina.it
Alternate e-mail: simogi@unina.it

SHS Family Study Center

Jean W. MacCluer, Ph.D.
Principal Investigator
Department of Genetics
Southwest Foundation for Biomedical Research
P.O. Box 760549
San Antonio, TX 78245-0549
Express Service, change last two lines to:
7620 NW Loop 410
San Antonio, TX 78227-5301
Office: (210) 258-9490
FAX: (210) 670-3317
E-mail: jean@darwin.sfbr.org

Laura Almasy, Ph.D.
Co-Investigator
Department of Genetics
Southwest Foundation for Biomedical Research
P.O. Box 760549
San Antonio, TX 78245-0549
Express Service, change last two lines to:
7620 NW Loop 410
San Antonio, TX 78227-5301
Office: (210) 258-9690
FAX: (210) 258-9444
E-mail: almasy@darwin.sfbr.org

Shelley A. Cole, Ph.D.
Co-Investigator
Director, Genetics Core Laboratory
Southwest Foundation for Biomedical Research
P.O. Box 760549
San Antonio, TX 78245-0549
Express Service, change last two lines to:
7620 NW Loop 410
San Antonio, TX 78227-5301
Office: (210) 258-9688
FAX: (210) 670-3344
E-mail: scole@darwin.sfbr.org

Harald H.H. Göring, Ph.D.
Co-Investigator
Department of Genetics
Southwest Foundation for Biomedical Research
P.O. Box 760549
San Antonio, TX 78245-0549
Express Service, change last two lines to:
7620 NW Loop 410
San Antonio, TX 78227-5301
Office: (210) 258-9764
FAX: (210) 258-9444
E-mail: hgoring@darwin.sfbr.org

Xing-Li Wang, Ph.D.
Co-Investigator
Department of Genetics
Southwest Foundation for Biomedical Research
P.O. Box 760549
San Antonio, TX 78245-0549
Express Service, change last two lines to:
7620 NW Loop 410
San Antonio, TX 78227-5301
Office: (210) 258-9846
FAX: (210) 670-3317
E-mail: xwang@darwin.sfbr.org

NHLBI Program Office

Richard R. Fabsitz, Ph.D.
Project Manager

NHLBI
Two Rockledge Center
6701 Rockledge Dr., MSC
Bethesda, MD 20892-7938
Express Service, change last two lines to:
6701 Rockledge Drive, Rm. 8164
Bethesda, MD 20817-8178
Office: (301) 435-0458
FAX: (301) 480-1667 or 480-1455
E-mail: rrf@nih.gov

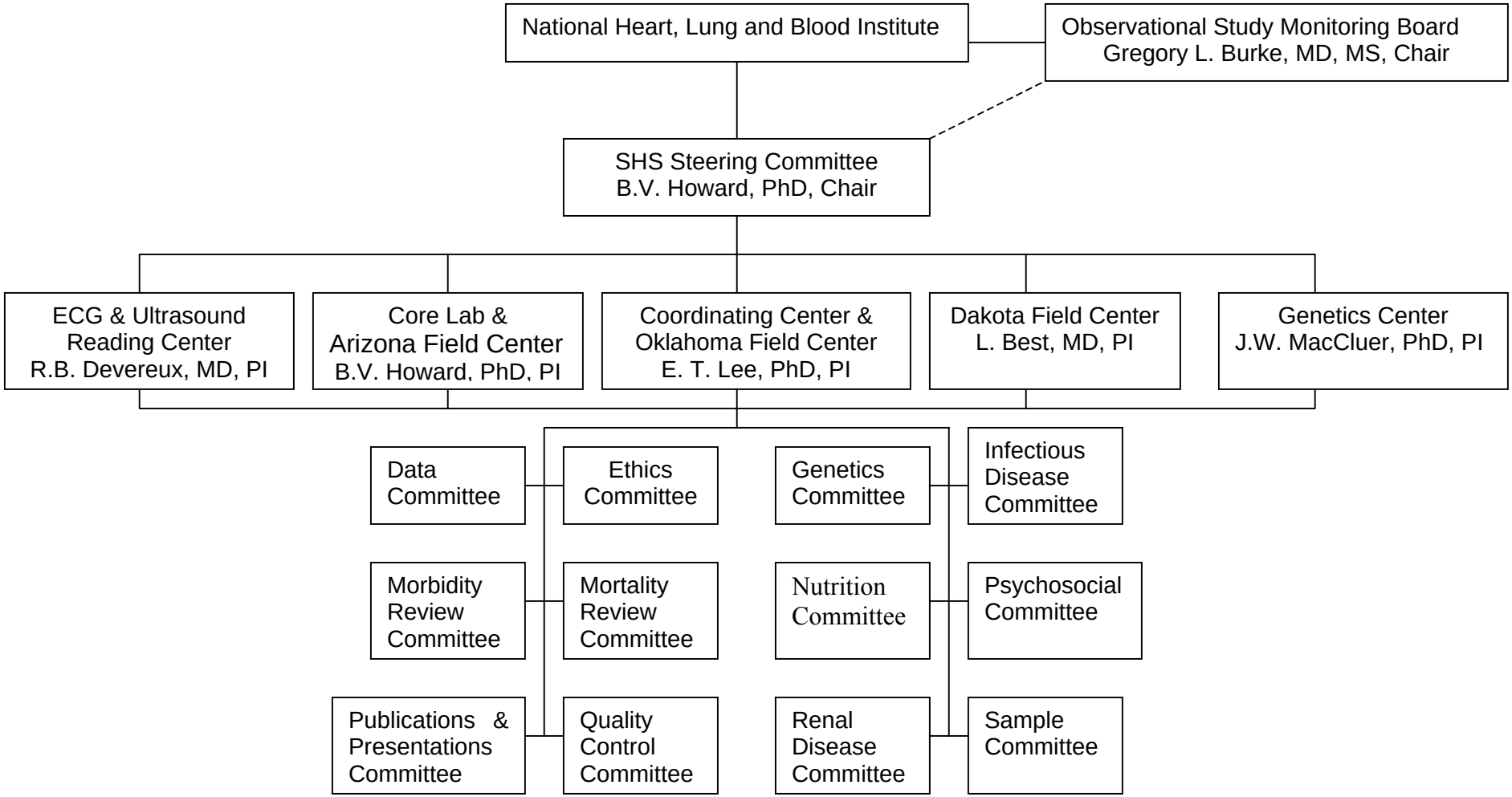
Peter Savage, M.D.
Director, DECA
NIH/NHLBI/DECA
Two Rockledge Center
6701 Rockledge Dr., MSC
Bethesda, MD 20892-7938
Express Service, change last two lines to:
6701 Rockledge Drive, Rm. 8104
Bethesda, MD 20817
Office: (301) 435-0421
FAX: (301) 480-1864
E-mail: savagep@gwgate.nhlbi.nih.gov

Paul Sorlie, Ph.D.
Acting Director
Epidemiology and Biometry Program
NIH/NHLBI/DECA
Two Rockledge Center
6701 Rockledge Dr., MSC 7934
Bethesda, MD 20892-7938
Express Service, change last two lines to:
6701 Rockledge Drive, Bldg. RKL2, Rm. 8176
Bethesda, MD 20817
Office: (301) 435-0456
FAX: (301) 480-1667
E-mail: sorliep@nhlbi.nih.gov

APPENDIX 2

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

ORGANIZATIONAL CHART



APPENDIX 3

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

ORGANIZATIONAL STRUCTURE

STEERING COMMITTEE

Chairperson: Barbara V. Howard, Ph.D., Principal Investigator – Arizona Center

Members:
Lyle Best, M.D., Principal Investigator – Dakota Center
Linda D. Cowan, Ph.D., Co-Investigator – Oklahoma Center
Richard B. Devereux, M.D., Principal Investigator – ECG and Carotid Ultrasound Reading Center
Richard R. Fabsitz, Ph.D., Project Manager – NIH/NHLBI/DECA
Jeffrey Henderson, M.D., Co-Investigator – Dakota Center
Elisa T. Lee, Ph.D., Principal Investigator – Oklahoma Center
Jean W. MacCluer, Ph.D., Principal Investigator – Genetics Center
Helaine Resnick, Ph.D., Co-Investigator – Arizona Center
Everett R. Rhoades, M.D., Co-Investigator – Oklahoma Center
Marie Russell, M.D., Director – Phoenix Field Center
Jason G. Umans, M.D., Ph.D., Co-Investigator – Director, Core Lab
Thomas K. Welty, M.D., Co–Investigator – Dakota Center
Jeunliang Yeh, Ph.D., Co-Investigator – Coordinating Center
Ellie Zephier, RD, MPH, Co-Investigator – Dietary Study Center

APPENDIX 4

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

SUBCOMMITTEES

Data Committee
Linda D. Cowan, Ph.D.
Richard B. Devereux, M.D. – Chair
Richard R. Fabsitz, Ph.D.
Barbara V. Howard, Ph.D.
Elisa T. Lee, Ph.D.
Helaine E. Resnick, Ph.D. – Co-Chair
Jeunliang Yeh, Ph.D.
Ying Zhang, M.D., Ph.D.

Ethics Committee
Sonja Antone
Lyle Best, M.D.
Jeffrey A. Henderson, M.D., M.P.H.
Bert Lewis
Jean W. MacCluer, Ph.D.
Everett R. Rhoades, M.D. – Chair

Genetics Committee
Lyle Best, M.D.
Shelley A. Cole, Ph.D.
Jeffrey A. Henderson, M.D., M.P.H.
Jean W. MacCluer, Ph.D. – Chair
Everett R. Rhoades, M.D.
Francine Welty, M.D.

Infectious Disease Committee
Lyle Best, M.D. – Chair
Linda D. Cowan, Ph.D.
Richard Devereux, M.D.
Jeffrey A. Henderson, M.D., M.P.H.
Thomas K. Welty, M.D., M.P.H.

Morbidity Review Committee

Reviewers
Jonathan Bella, M.D.
Lyle Best, M.D.
Richard B. Devereux, M.D. – Chair
Richard Rodeheffer, M.D.
Marie Russell, M.D.

Stroke Morbidity
Jorge Kizer, M.D.

Mortality Review Committee

First Review
Maurice Sievers, M.D.

Second Review
James M. Galloway, M.D.
Jeffrey A. Henderson, M.D., M.P.H.
Dorothy A. Rhoades, M.D., M.P.H.
Everett R. Rhoades, M.D.
Thomas K. Welty, M.D., M.P.H.

Adjudicator
Wm. James Howard, M.D.

Stroke Mortality
Jorge Kizer, M.D.

Coordinating Center
Linda D. Cowan, Ph.D.
Amir Butt, M.D.
Jeunliang Yeh, Ph.D.

Nutrition Committee
Sigal Eilat-Adar, Ph.D., R.D.
Barbara V. Howard, Ph.D.
Catherine Loria, Ph.D.
Claudia Mattil, M.S.,R.D., C.C.R.C-Chair
Helaine Resnick, Ph.D.
Susan Xu, Ph.D.
Ellie Zephier, M.P.H., R.D.

Psychosocial Committee
Jan Beals, Ph.D.
Lyle Best, M.D.
Gary Leonardson, Ph.D.
Marcia O'Leary, R.N.
Linda Poolaw
Everett R. Rhoades, M.D.
Thomas K. Welty, M.D., M.P.H. – Chair

Publications and Presentations Committee
Lyle Best, M.D.
Richard R. Fabsitz, M.A.
Barbara V. Howard, Ph.D.
Elisa T. Lee, Ph.D. - Chair
Jean W. MacCluer, Ph.D.
Mary J. Roman, M.D.

Quality Control Committee
Tauqeer Ali, M.D., Ph.D.
Richard R. Fabsitz, Ph.D.
Callen Hull, R.N.
Marcia O'Leary, R.N.
Jason G. Umans, M.D., Ph.D.
Jeunliang Yeh, Ph.D. – Chair

Renal Disease Committee
Andrew Narva, M.D.
Jason G. Umans, M.D., Ph.D. - Chair
Thomas K. Welty, M.D., M.P.H.
Susan Xu, Ph.D.
Jeunliang Yeh, Ph.D.

Sample Committee
Lyle Best, M.D. – Chair
Shelley A. Cole, Ph.D.
Linda D. Cowan, Ph.D.
Jean W. MacCluer, Ph.D.
Jason G. Umans, M.D., Ph.D.

APPENDIX 5

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

OTHER KEY PERSONNEL

Arizona
Field Center
The Aztec Building – Strong Heart Study
1616 E. Indian School, Ste. 250
Phoenix, AZ 85016
Phone: (602) 277-0488
FAX: (602) 277-5979

Callen Hull, R.N.
Research Nurse
E-mail: Callen.P.Hull@Medstar.net

Bert Lewis
Personnel Manager
Cell: (602) 363-9405
E-mail: Allen.B.Lewis@MedStar.net

Mary E. Rybka, RHIT
Outcomes Coordinator-Arizona
E-mail: Mary.E.Rybka@MedStar.net

Maurice Sievers, M.D.
Consultant, Mortality Surveillance

Nanette Taho
SHS Phlebotomist
E-mail: Nanette.W.Taho@MedStar.net

Sharon Taho
Sr. Administrative Assistant
E-mail: Sharon.E.Taho@MedStar.net

Damon Davis, R.N.
SHS Field Nurse/SANDS Coordinator
E-mail: Damon.W.Davis@medstar.net

Tanya Molina
Clinical Research Assistant/SHS Phlebotomist
E-mail: Tanya.R.Molina@medstar.net

Bernadette Cooper
SHS Field Recruiter/Clerk
E-mail: Bernadette.M.Cooper@medstar.net

Kristina Thomas
Data Entry Clerk
E-mail: Kristina.K.Thomas@medstar.net

Rosinna Briones
Sonographer
E-mail: Rosinna.Briones@MedStar.net

Christina Chiago, L.P.N., Coordinator
NIH-NIDDK
Hu Hu Kam Hospital
Sacaton, AZ 85247
Office: (602) 528-1225

Laboratory Center
Penn Medical Laboratory
MedStar Research Institute
108 Irving Street NW, Annex 2
Washington, DC 20010-2933
FAX: (202) 877-7342

Jianhui Zhu
Technical Director
Office: (202) 877-5630
FAX: (202) 877-7342
E-mail: Jianhui.Zhu@medstar.net

Sophia Rushton-Reid, M.T. (ASCP)
Research Study Coordinator/Clinical Research Associate, PML
Office: (202) 877-8379
FAX: (202) 877-7342
E-mail: Sophia.Rushton-Reid@medstar.net

MedStar Research Institute
MedStar Research Institute
6495 New Hampshire Ave., Ste. 201
Hyattsville, MD 20783
Main Phone: (301) 560-7395
FAX: (301) 560-7307

Angela Silverman, M.S.N., CANP
Administrative Director

Office: (301) 560-7304
E-mail: Angela.Silverman@medstar.net

Sabrina Smith
AVP, Office of Contracts and Grants Management
Office: (301) 560-7383
FAX: (301) 560-7388
E-mail: Sabrina.L.Smith@medstar.net

Michele Clements, B.A.
Executive Assistant
Office: (301) 560-7303
FAX: (301) 560-7307
E-mail: Michele.L.Clements@medstar.net

Dakotas Center
Strong Heart Study
Missouri Breaks Industries Research, Inc.
HCR 64, Box 52
Timber Lake, SD 57656
(Address good for Express Service)
Office: (605) 964-3418 or 964-3419
FAX: (605) 964-3415

Timber Lake Area
Marcia O'Leary, R.N.
Coordinator
E-mail: mol@mbiri.com

Marie Gross, R.N.
Morbidity/Mortality Coordinator
Office: (605) 865-3526
FAX: (605) 865-3615
E-mail: mgross@mbiri.com

Jason "Jay" Kunf
Data Manager
E-mail: jdkunf@mbiri.com

Sue Sherwood
Administrative Officer
E-mail: ssherwood@mbiri.com

Eagle Butte Area
Eagle Butte Clinic
239 Elm Street
Eagle Butte, SD 57625
Office: (605) 964-1260
FAX: (605) 964-1263

Wendy Lawrence, R.N.
Supervisor
E-mail: wlawrence@mbiri.com

Lillian Brown
Senior Recruiter

Kendra Enright
Research Assistant

Melissa Kunf, R.N.
Ultrasound Technician
E-mail: makunf@mbiri.com

Millie Afraid of Hawk, R.N.
Research Assistant
E-mail: mafraidofhawk@mbiri.com

Kyle Clinic
Dakota SHS
Lakota Fund Building, Suite 105
P.O. Box 515
Kyle, SD 57752
Office: (605) 455-2955
FAX: (605) 455-2568

Laurie Bickel, R.N.
QA/QC
Supervisor, Pine Ridge Clinic
E-mail: lbickel@mbiri.com

Lois Bettelyoun
Recruiter/Interviewer
E-mail: lbettelyoun@mbiri.com

Mary Merrival
Recruiter

Earline "Arie" Shiroma
Research Assistant
E-mail: ashiroma@mbiri.com

Rapid City Area
Strong Heart Study – Dakota Center
PO Box 9010
Rapid City, SD 57709-9010
Express Service, change last two lines to:
3200 Canyon Lake Drive
Rapid City, SD 57702
FAX: (605) 355-2502

LaVonne J. Looking Elk
Executive Assistant
Office: (605) 355-2377
E-mail: LaVonne.LookingElk@ihs.gov

Sheila Romero
Research Assistant
Phone: (605) 355-2346
E-mail: Sheila.Romero@ihs.gov

Oklahoma Center (OC) and Coordinating Center (CC)

Oklahoma City Area:
Center for American Indian Health Research
University of Oklahoma Health Sciences Center
P.O. Box 26901, Rm. CHB100
Oklahoma City, OK 73190
Express Service, change last two lines to:
801 N.E. 13th Street, Rm. CHB100
Oklahoma City, OK 73104
FAX: (405) 271-4390

Momotaz Begum, M.P.H., M.B.B.S.
P&P Coordinator
Office: (405) 271-3090 x46734
E-mail: momotaz-begum@ouhsc.edu

Jill Black
Sr. Administrative Manager
Office: (405) 271-3090 x46726
E-mail: jill-black@ouhsc.edu

Amir Butt, M.D.
SHS Morbidity & Mortality Coordinator
Office: (405) 271-3090 x46778
E-mail: amir-butt@ouhsc.edu

Debra Gates
Data Manager
Office: (405) 271-3090 x46724
E-mail: debra-gates@ouhsc.edu

Lee Keesee
Administrative Secretary
Office: (405) 271-3090 x46712
E-mail: lee-keesee@ouhsc.edu

Karen Kimbley
Data Abstractor
Office: (405) 271-3090 x46732
E-mail: karen-kimbley@ouhsc.edu

Carl F. Schaefer, Ph.D.
Office: (405) 271-3090 x46725
E-mail: carl-schaefer@ouhsc.edu

Martha Stoddart, M.S.
Quality Control Analyst
Office: (405) 271-3090 x46721
E-mail: martha-stoddart@ouhsc.edu

Mushfiq Tarafder
Graduate Research Assistant
Office: (405) 271-3090 x46887
E-mail: mushfiqur-tarafder@ouhsc.edu

Wenyu Wang, Ph.D.
Senior Statistician
Office: (405) 271-3090 x46723
E-mail: wenyu-wang@ouhsc.edu

Yiming Wang, M.S.
Webmaster
Office: (405) 271-3090 x46728
E-mail: yiming-wang@ouhsc.edu

Susan Xu, Ph.D.
Statistician
Office: (405) 271-3090 x46722
E-mail: susan-xu@ouhsc.edu

Fawn Yeh, Ph.D.
Epidemiologist
Office: (405) 271-3090 x46733
E-mail: fawn-yeh@ouhsc.edu

Ying Zhang, Ph.D.
Statistician
Office: (405) 271-3090 x46731
E-mail: ying-zhang4@ouhsc.edu

Anadarko Area:
Strong Heart Study
Anadarko Indian Health Clinic
Box 828, 115 NE Old Town Dr.
Anadarko, OK 73005
FAX: (405) 247-6653

Stephanie Gomez, L.P.N.
Medical Assistant
Office: (405) 247-9053
E-mail: stephanie-gomez@ouhsc.edu

Linda Poolaw
Tribal Liaison
Office: (405) 247-2458 x249
E-mail: linda-poolaw@ouhsc.edu

Donna Smith
Tribal Liaison
Office: (405) 247-9053
E-mail: donna-l-smith@ouhsc.edu

Lawton Area:
Strong Heart Study
USPHS Indian Hospital
1515 NE Lawrie Tatum Rd.
Lawton, OK 73507
Office: (580) 353-0350 x350
FAX: (580) 531-9107

Kathe Samuelson, R.N.
Supervisor
E-mail: kathe.samuelson@ouhsc.edu

Verna Cable
Tribal Liaison
E-mail: verna-cable@ouhsc.edu

Tristian Ferguson
Medical Assistant
E-mail: tristian-ferguson@ouhsc.edu

Carmen Klinekole
Medical Assistant
E-mail: carmen-klinekole@ouhsc.edu

Shelby Santos
Office Clerk
E-mail: shelby-santos@ouhsc.edu

SHS Nosologist
Karl E. Wise
Nosologist
4705 Glen Coe St., Royal Highlands
Leesburg, FL 34748-2327
Office: (352) 728-2172

ECG and Ultrasound Reading Center
Weill Medical College of Cornell University
New York - Presbyterian Hospital
525 East 68th Street, Rm. K415 (Box 222)
New York, NY 10021
FAX: (212) 746-8561 or 746-8451

Virginia Burns, B.A.
Secretary
Office: (212) 746-4655 or 746-4650
E-mail: vmburns@med.cornell.edu

Dawn Fishman
Office: (212) 746-2198 or 746-4654
E-mail: dfishman@med.cornell.edu

Jennifer Liu, M.D.
Office: (212) 746-2437
E-mail: jeliu@med.cornell.edu

Technician Reader

Mary Paranicas, B.S.
Office: (212) 746-4654 or 746-4655
E-mail: mfparan@med.cornell.edu

Lily S. Yee, B.S.
Office: (212) 746-4655 or 746-4650

Family Study Center
Department of Genetics
Southwest Foundation for Biomedical Research
P.O. Box 760549
San Antonio, TX 78245-0549
Express Service, change last two lines to:
7620 NW Loop 410
San Antonio, TX 78227-5301
SFBR Main Phone: (210) 258-9400

Teresa Cantu
Office: (210) 258-9651
FAX: (210) 670-3337
E-mail: tcantu@darwin.sfbr.org

Vanessa Fehlinger
Office: (210) 258-9562
FAX: (210) 258-9883
E-mail: vfehling@darwin.sfbr.org

Sandra Laston, R.N., Ph.D.
Office: (210) 258-9536
FAX: (210) 670-3317
E-mail: slaston@darwin.sfbr.org

Charlotte Wenger
Office: (210) 258-9691
FAX: (210) 670-3317
E-mail: cwenger@darwin.sfbr.org

Kari North, Ph.D.
Assistant Professor
Department of Epidemiology
University of North Carolina Chapel Hill
Bank of America Center
137 E. Franklin St., Suite 306
CB#8050
Chapel Hill, NC 27514-3628
Office: (919) 966-2148
FAX: (919) 966-9800
E-mail: kari_north@unc.edu

Dietary Study
Strong Heart Dietary Study
Aberdeen Area Indian Health Service
Federal Building, Rm. 309
115 4th Ave., S.E.
Aberdeen, SD 57401

Alice Seversen
Data Entry
Office: (605) 226-7491
FAX: (605) 226-7733
E-mail: alice.severson@ihs.gov

APPENDIX 6

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

CONSULTANTS

Jan Beals, Ph.D.
Co-Director of Research
Division of American Indian & Alaska Native Programs
Box A011-13, UNP
4455 E. 12th Avenue
Denver, CO 80220
Office: (303) 315-9229
FAX: (303) 315-9579
E-mail: jan.beals@uchsc.edu

Jonathan Bella, M.D.
Bronx Lebanon Hospital
Division of Cardiology, 12th Floor
1650 Grand Concourse
Bronx, NY 10457
Office: (718) 518-5222
FAX: (718) 518-5585
E-mail: jonnbella@earthlink.net

Peter Bennett, M.D.
NIH-NIDDK
1550 E. Indian School
Phoenix, AZ 85014
Office: (602) 200-5219
FAX: (602) 200-5225

Mark Daniels, Ph.D.
Department of Psychology
University of South Dakota
414 East Clark St., SDU 107
Vermillion, SD 57069
Office: (605) 677-5353
FAX: (605) 677-6604
E-mail: mdaniels@usd.edu

Michael Davidson, M.D.
4132A W. 88th St.
Anchorage, AK 99502
Phone: (907) 245-0508
E-mail: mdavidso@cesmail.net

Bennett Dyke, Ph.D.
Southwest Iconics
98 Cliffside Dr.
San Antonio, TX 78231
Office: (210) 492-5947
FAX: (210) 492-1813
E-mail: bdyke@satx.rr.com

Paul Enright, M.D.
Respiratory Sciences
University of Arizona
1501 N. Campbell Ave., Rm. 2342
Tucson, AZ 85724
Office: (520) 626-6114
Home: (520) 577-8254
E-mail: lungguy@aol.com

Stephen Epstein, M.D.
Executive Director
Cardiovascular Research Institute
110 Irving St., N.W. 4B-1
Washington, DC 20010
Office: (202) 877-5977
FAX: (202) 877-2715
E-mail: Stephen.Epstein@medstar.net

James Everhart, M.D., M.P.H.
Chief, Epidemiology and Clinical Trials Branch
Division of Digestive Diseases and Nutrition
National Institute of Diabetes and Digestive and Kidney Diseases
Two Democracy Plaza, Room 673
6707 Democracy Boulevard, MSC 5450
Bethesda, MD 20892-5450
Office: (301) 594-8878
FAX: (301) 480-8300
E-mail: je17g@nih.gov

James M. Galloway, M.D.
Director, Native American Cardiology Program
University Medical Center
1501 N. Campbell Ave., Rm. 4612
Tucson, AZ 85724
Office: (520) 694-7000
FAX: (928) 694-6712
Use following address when sending M&M charts:
1215 N. Beaver St., Ste. 201
Flagstaff, AZ 86001
Office: (928) 214-3920
FAX: (928) 214-3924
E-mail: jgalloway@umcaz.edu
Send cc to Diane if pressing:
dsteuart@umcaz.edu

Betty Jarvis, R.N.
6869 E. Kelton Lane
Scottsdale, AZ 85254
Phone: (480) 951-5079
Cell: (602) 448-1774
E-mail: bjarvis27@qwest.net

Dr. George King
Research Division
Joslin Diabetes Center
1 Joslin Place
Boston, MA 02215
Office: (617) 732-2622
FAX: (617) 732-2637

Jorge Kizer, M.D.
Division of Cardiology
Weill Medical College of Cornell University
New York – Presbyterian Hospital
525 East 68th Street, Rm. K415 (Box 222)
New York, NY 10021
Office: (212) 746-4655
FAX: (212) 746-8561 or 746-8451
E-mail: JOK2007@med.cornell.edu

William Knowler, M.D., Dr. P.H.
Chief, Diabetes & Arthritis Epidemiology Section
NIH-NIDDK
1550 E. Indian School
Phoenix, AZ 85014
Office: (602) 200-5206
FAX: (602) 200-5225
E-mail: wknowler@phx.niddk.nih.gov
Alternate E-mail: wk2c@nih.gov

Brett Koplin, M.D.
Department of Child and Adolescent Psychiatry
Mayo Clinic
200 First Street S.W.
Rochester, MN 55905
Office: (507) 284-1043
FAX: (507) 284-4158
E-mail: koplin.brett@mayo.edu

Andrea Kriska, Ph.D.
University of Pittsburgh
Graduate School of Public Health
Department of Epidemiology
130 DeSoto St., Room 505B
Pittsburgh, PA 15261
Office: (412) 624-3996
FAX: (412) 624-7397
E-mail: aky+@pitt.edu

Gary Leonardson, Ph.D.
55 Rodeo Trail
Dillon, MT 59725
Office: (406) 683-6424
FAX: (406) 683-4090
E-mail: gary@avicom.net

Andrew Narva, M.D.
Indian Health Service
801 Vassar Drive, N.E.
Albuquerque, NM 87106
Office: (505) 248-4018
FAX: (505) 248-7697
E-mail: anarva@albmail.albuquerque.ihs.gov

Dr. Donna Nelson
Rt. 2, Box 770
Laveen, AZ 85339
Office: (520) 550-3829
FAX: (520) 550-3555

Frederic Ness, M.D.
Physician
PHS Indian Hospital
3200 Canyon Lake Dr.
Rapid City, SD 57702
Office: (605) 355-2552 or 355-2285
FAX: (605) 355-2502
E-mail: fness@rapidcity.aberdeen.ihs.gov

Vittorio Palmieri, M.D.
Federico II University Hospital II Policlinico
via Pansini 5
Naples, Italy 80131
Office: ++39 081 7462025
FAX: ++39 081 5466152
E-mail: vpalmier@med.cornell.edu

Chani Phillips, M.A.
Mind, Body, Heart & Spirit
P.O. Box 212
Yakima, WA 98907
Office: (509) 457-4104
FAX: (509) 966-4482
E-mail: chani@ChaniPhillips.com

Dorothy A. Rhoades, M.D., M.P.H.
4034 30th Ave., West
Seattle, WA 98199
Office: (206) 270-9290
FAX: (206) 341-0735 (notify by e-mail when sending fax)
E-mail: drhoades@u.washington.edu

Everett R. Rhoades, M.D.
Center for American Indian Health Research
University of Oklahoma Health Sciences Center
P. O. Box 26901, Rm. CHB100
Oklahoma City, OK 73190
Express Service, change last two lines to:
801 NE 13th St., Rm. CHB100
Oklahoma City, OK 73104
Phone: (405) 271-3090
FAX: (405) 271-4390
E-mail: everettrhoades@msn.com

Richard J. Rodeheffer, M.D.
Cardiovascular Disease
Mayo Clinic
200 First Street S.W.
Rochester, MN 55905
Office: (507) 284-0294
FAX: (507) 266-0228
E-mail: rodeheffer.richard@mayo.edu

Dr. Debra Rowse
Rt. 1, Box 216
Scottsdale, AZ 85256
Office: (602) 379-4281
FAX: (602) 379-4958

Kurt Schweigman, MPH
Tobacco Program Coordinator
California Rural Indian Health Board
4400 Auburn Blvd., 2nd Floor
Sacramento, CA 95841
Phone: (916) 929-9761
Fax: (916) 929-7246
Email: kurt.schweigman@ihs.gov

Vallabh Shah, Ph.D.
Asst. Professor, Department of Internal Medicine/Nephrology
University of New Mexico
5th Floor-ACC
2211 Lomas Boulevard, N.E.
Albuquerque, NM 87131-5271
Office: (505) 272-9615
FAX: (505) 272-2349
E-mail: vshah@salud.unm.edu

Anthony Sidawy, M.D.
Peripheral Vascular Diseases
VA Medical Center
Washington, DC

Jay M. Sosenko, M.D.
Director, Research Standards
School of Medicine
University of Miami
P.O. Box 016960 (M-809)
Miami, FL 33101
Office: (305) 243-6499
FAX: (305) 483-3328
E-mail: jsosenko@mednet.med.miami.edu

Kristi Storti, M.S., M.P.H.
University of Pittsburgh
Graduate School of Public Health
Department of Epidemiology
515 Parran Hall
130 DeSoto Street
Pittsburgh, PA 15261
Office: (412) 624-0188
FAX: (412) 624-7397
E-mail: klsst75@pitt.edu

Russell P. Tracy, Ph.D.
Professor of Pathology and Biochemistry
Director, Laboratory for Clinical Biochemistry Research
University of Vermont
208 South Park Dr.
Colchester, VT 05446
Office: (802) 656-8968
FAX: (802) 656-8965
E-mail: Russell.Tracy@uvm.edu

Francine Welty, M.D.
1 Autumn Street
5th Floor
Boston, MA 02215
Office: (617) 632-7659
FAX: (617) 632-7675
E-mail: fwelty@caregroup.harvard.edu

Jack P. Whisnant, M.D.
Mayo Stroke Center
Mayo Clinic
200 First Street S.W.
Rochester, MN 55905
Office: (507) 284-2720
FAX: (507) 284-1516
E-mail: whisnant.jack@mayo.edu

David O. Wiebers, M.D.
Principal Investigator
Mayo Stroke Center
Mayo Clinic
200 First Street S.W.
Rochester, MN 55905
Office: (507) 284-9735
FAX: (507) 284-4270
E-mail: wiebers.david@mayo.edu

Charlton Wilson, M.D.
Director, Diabetes Center of Excellence
Phoenix Indian Medical Center
4212 N. 16th Street
Phoenix, AZ 85016
Office: (602) 263-1587
FAX: (602) 263-1624
E-mail: Charlton.Wilson@ihs.gov

Phil Zager, M.D.
Professor of Medicine
Director, Nephrology
University of New Mexico
2211 Lomas Boulevard, N.E.
Albuquerque, NM 87131-5271
Office: (505) 272-4661
FAX: (505) 272-4628
E-mail: pzag@unm.edu

APPENDIX 7

THE STRONG HEART STUDY V

CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

Confidentiality Pledge

I, _____ understand that data obtained for subjects of research projects are confidential.

I will not reveal to unauthorized persons any patient's name or any identifying information or any other information obtained from subjects of the project entitled, "Cardiovascular Disease in American Indians (The Strong Heart Study)".

I will not allow any persons who are not authorized members of the Strong Heart Study staff to have access to any information collected from or about the subjects.

I will properly store the data forms, computer printouts and other documents in locked file cabinets or drawers to protect confidentiality.

I understand that breach of this confidentiality pledge is grounds for dismissal from employment on the Strong Heart Study.

I will return all data to the Principal Investigator when my employment terminates.

_____
Staff Member

_____
Principal Investigator

_____
Date

APPENDIX 8

P&P FORMS

STRONG HEART STUDY

PAPER PROPOSAL

Title of Paper: (include the phrase "Strong Heart Study" whenever possible)

Name of Primary Author:

Author Affiliation:

Suggested Co-Authors:

Suggested Key words:

Outline of Paper:

a) **Introduction (Rationale)**
b) **Methods**
c) **General analysis plan**

Analysis Responsibility: (authors or Coordinating Center)

Note: 1) If no SHS PI is a co-author and if the analyses are not performed by the CC, the authors must agree to submit the penultimate (next to final) draft to the Coordinating Center for statistical review.

2) Authors must comply and respond regularly to the status survey on their approved paper proposals conducted by the SHS P&P Committee twice a year.

3) Papers lacking a PI as a co-author. P&P will advise the primary author whether a near final draft will need to be sent to the P&P committee for review by at least two (2) reviewers (selected by the Chairperson). This review is the first step that must be completed prior to review of the penultimate draft by NHLBI/Tribes/IHS.

Submitted by: (Corresponding author, address, telephone, fax and e-mail for correspondence)

Date:

STRONG HEART STUDY

FAX TRANSMITTAL

TO: FAX NO.:

FROM: P&P Committee FAX NO.: (405) 271-4390

DATE:

SUBJECT: Paper proposal entitled:

SHS P&P Committee decision:

____ Approval with recommendations as listed below:

____ Disapproval (Please see recommendations below)

____ Deferred (Please see recommendations/comments below)

Recommendations:

Assigned paper no.:

Please fill out and return all the forms attached with this memo. Refer to the above number for all correspondence about this paper. If no SHS PI is a co-author and if the analyses are not performed by the CC, the penultimate (next to final) draft must be sent to the Coordinating Center for statistical review. Please inform us when this paper is approved by the NIH or accepted by a journal and if there is a change of the title. <u>It is very important that you respond promptly during our 'Paper Progress Survey' done twice a year.</u>

PLEASE NOTE: A **<u>Lay Summary</u>** is required **<u>when submitting the completed draft</u>** for NHLBI review and IHS IRB and tribal approvals. **Also, the IHS IRBs require that <u>all SHS manuscripts must contain the following disclaimer (verbatim)</u>: "The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the views of the Indian Health Service."**

Center for American Indian Health Research, College of Public Health, University of Oklahoma Health Sciences Center, P.O. Box 26901, Oklahoma City, OK 73190
Phone: (405) 271-3090

STRONG HEART STUDY

THESIS/DISSERTATION PROPOSAL FORM

Title of Thesis/Dissertation:

Name of Degree Candidate:

Type of Degree:

Candidate Affiliation:

Primary Mentor: (With e-mail, telephone and fax numbers, and address for correspondence)

Descriptions of Thesis/Dissertation Plan:

1. **Prospectus - for Doctoral Thesis/Dissertation (if prospectus is not required by your degree program submit a detailed outline).**
2. **Outline - for Masters/Bachelor Thesis**

Submitted by: (Corresponding candidate, with telephone and fax numbers and address for correspondence)

Date:

THE UNIVERSITY OF OKLAHOMA
HEALTH SCIENCES CENTER
CENTER FOR AMERICAN INDIAN HEALTH RESEARCH

FAX TRANSMITTAL

TO: FAX NO.:

FROM: Elisa T. Lee, PhD
SHS P&P Committee
FAX NO.: (405) 271-4390

DATE:

SUBJECT: Thesis/Dissertation proposal entitled:

SHS P&P Committee decision:

____ Approval with recommendations as listed below:

____ Disapproval

Recommendation:

Assigned thesis/dissertation approval no.: **T**

Please fill out and return all forms attached with this memo to SHS P&P Committee. Please include the above thesis/dissertation approval number in all correspondence with us about this thesis/dissertation. Also, be advised that you need to write a paper for publication based on the SHS data used for this thesis/dissertation, and you must submit a paper proposal to the SHS P&P Committee prior to writing that paper.

NUMBER OF PAGES ____ (INCLUDING COVER SHEET)

College of Public Health, P.O. Box 26901, Oklahoma City, OK 73190, Phone: (405) 271-3090

Agreement for Data Distribution/Paper/Thesis/Dissertation Proposal*

To: Strong Heart Study Coordinating Center

From: _____(Principal Investigator / First Author)

Institution/Address: _____

_____

Name of the associated SHS PI / Mentor:_____

Title of Study, Paper, Thesis or Dissertation: _____

_____

Paper/Thesis/Dissertation Number (if known): _____

I agree to read and follow the SHS protocol with regard to distribution and analysis of Strong Heart Study data that I request or that I generate in my research/paper/thesis/dissertation. I have attached a research protocol or a paper/thesis/dissertation proposal describing how I will use these data to better understand cardiovascular disease and its related diseases in American Indians.

I agree to protect the confidentiality and privacy of the SHS participants and the security of the data. I am not to transfer or disclose any individually identifiable information about the SHS participants at any time. Violation of the confidentiality agreement is considered a breach of confidentiality and may leave requesting investigator liable to legal action on the part of Study participants and their families. I also agree that the SHS data provided to me by the SHS Coordinating Center or SHS investigators are to be used **only** for the research protocol or the paper/thesis/dissertation approved by the SHS P&P Committee or the Steering Committee. **I further agree not to distribute SHS data to anyone else.**

For each paper I wish to write using any SHS data, I agree to comply with the SHS Publication Policy and to submit a paper proposal for review and approval of the SHS P&P Committee. Further approvals from the NHLBI, IHS, and the participating tribes will be needed prior to submission to any journal for publication. **If approval from the SHS P&P Committee, the NHLBI, IHS, or the participating tribes is not granted, I agree not to publish these results.**

I understand that the SHS P&P Committee or Steering Committee will assist me in revising my paper in such a way that will make it acceptable for publication. I agree to include at least one of the SHS investigators as a co-investigator and a co-author. I will send a reprint of my published article to the NHLBI Program office, and all other as detailed in the **SHS P&P Publication Policy.**

Signed: _____ Date: _____

***** Each requesting investigator must complete this agreement separately.

STRONG HEART STUDY

REQUEST FOR DATA

(Please fill out and request the data needed for ONLY this approved paper/thesis. Data requested in excess will not be honored)

Title of paper or thesis:

Number assigned for this paper or thesis:

Primary author:

Purpose (Please check one):

___Paper
___Thesis
___Abstract for professional conference
___Invited talk
___Pilot data for grant or contract submission
___Quality control or local monitoring
___Other

Date Needed: __/__/__ ***(please allow 1-2 weeks from data request received)***
mm dd yy

Data for Study Period: (mark **ONLY** the phase you need the data from)

Phase-I Phase-II Phase-III Phase-IV

Center:

Arizona Oklahoma South/North Dakota All 3 centers

Variables Needed: (List **ONLY** the variables you need for this approved paper/thesis)

****

COORDINATING CENTER USE ONLY:

Date Received:

Date Data Delivered:

STRONG HEART STUDY

REQUEST FOR DATA ANALYSIS

Title of project:

Major hypotheses: 1)

2)

3)

4)

5)

Purpose:

Paper
Abstract for professional conference
Invited talk
Pilot data for grant or contract submission
Quality control or local monitoring
Other

Investigator(s):

Expected date of completion: _____/_____/_____
mm dd yy

Variables to used: (List all the variables)

Statistical methods to be used (check all that apply):

Summary statistics and frequencies
Simple correlation and partial correlation
Regression analyses
t-test, ANOVA, and multiple comparison
Logistic regression
Other
(Specify)

Comments:

****

COORDINATING CENTER USE ONLY:

STRONG HEART STUDY PAPER NUMBER:

ANALYSIS NUMBER:

DATA ANALYST:

DATE REQUEST RECEIVED:

DATE RESULTS SENT OUT:

STRONG HEART STUDY

DATA ANALYSIS MONITORING SYSTEM

When authors/researchers request Strong Heart Study (SHS) data for any purpose, the Strong Heart Study Coordinating Center (SHS-CC) would like to know how you manage and analyze the data. By answering the following questions, the SHS-CC is better able to track SHS data utilization patterns and to provide needed information for quality control. Thank you for your cooperation.

1. Do you use any of the following statistical package(s) for data analyses? Check all applicable.

___ a. SAS

___ b. SPSS

___ c. BMDP

___ d. S+

___ e. Statistic

___ f. StatXact

___ g. Other, specify: _____

2. Other than the routine SHS derived variables, do you plan to derive any variables for your analysis purposes?

___ Yes. ___ No.

3. If you plan to derive your own variable(s), will you consult with the SHS-CC?

___ Yes. ___ No.

If you derive certain variables for your analysis purpose, please attach a copy of the algorithm that you will use to define your variable(s) and the program to generate the variable(s)

4. Do you usually use any of the following procedures in your statistical analyses? Check all applicable.

___ a. Multiple regression

___ b. Logistic regression

___ c. Time-related variables analysis

___ d. Modeling

___ e. Simulation

___ f. Other, specify: _____

5. What training does your statistician(s) have? Check all applicable.

___ a. Doctoral degree in statistics/biostatistics/math statistics.

___ b. Doctoral degree in other field but with quantitative training.

___ c. Master degree in statistics/biostatistics/math statistics.

___ d. Master degree in other field but with quantitative training.

___ e. Bachelor degree in statistics/biostatistics/math statistics.

___ f. Bachelor degree in other field but with quantitative training.

___ g. Other, specify: _____

Feedback:

Please return to Strong Heart Study-Coordinating Center either by email or fax as soon as possible.

STRONG HEART STUDY

ANCILLARY STUDY PROPOSAL FORM

I. Basic Study Information and Projected Impact on SHS

1. Title of ancillary study:

2. Ancillary study PI(s) contact information (name, address, phone and fax numbers, e-mail address):

3. Proposed collaborators (must include at least one SHS investigator):

4.

Summary of tasks involved for SHS Centers (NA=not applicable)

Center	Enroll or examine participants (N)	Assay samples (N participants)	Provide samples (N participants)	Provide data (yes/no)	Analyze data (yes/no)
SHS CC	NA	NA	NA		
PML (Central Lab)	NA				NA
SWF (DNA Lab)	NA				NA
RC (Ultrasound & ECG Reading Center)	NA	NA	NA		
AZ Field Center (FC)		NA	NA	NA	NA
SD/ND FC		NA	NA	NA	NA
OK FC		NA	NA	NA	NA

5. SHS participant and staff involvement:

   A. Participants:
   Describe number of participants needed; special characteristics of participant group(s); age, and gender distribution. Will participants be contacted, interviewed, or examined? If so, describe participant involvement. Will biologic samples be collected from participants? If so, provide details. Estimate time required of each participant.

   B. Stored SHS specimens:
   Describe materials to be used (e.g., stored plasma, urine, DNA).

      i. SHS Phase(s) (e.g., I, II, etc) from which samples are to be obtained
      ii. Sample type (eg., serum, EDTA, citrate, DNA)
      iii. Ability to use previously thawed samples
      iv. Sample volume (or weight for DNA) (conservation of samples is a critical factor in obtaining approval)
      v. Efforts to integrate sample needs with those of other studies to conserve sample and/or limit freeze-thaw cycles.

   C. SHS Field Centers:
   Describe effort (and estimated time) required of SHS staff at each participating FC.

   D. SHS Coordinating Center/US&EKG Reading Center/SWF Genetic Center/PML:
   Describe effort (and estimated time) required of SHS staff. Specifically:

      i. Will the Coordinating Center be involved in data collection, tracking, or preparation of forms or software? If so, provide details. If not, will these tasks be completed locally by the ancillary study, and a data file sent to the CC?
      ii. If the Reading Center, Genetic Center, or PML is involved, will data be sent directly from that entity to the CC for processing (dataset construction, data cleaning, data analyses, etc) or will processing be done by the ancillary study?
      iii. Will data analyses be done by the ancillary study or by the CC? If analyses will be done locally, the CC must verify analyses prior to publication of resulting paper(s).
      iv. How many ancillary study papers do you estimate will be written?

6. Variables/measurements from the SHS database to be analyzed:

7. Genomic information (defined as any data from a participant's DNA):

   A. Does your proposal include any genomic materials? (please check one)
   ___ No (go to question 8) ___ Yes (see question 7B)

   B. Name the gene(s), chromosomal regions, genotypes, SNPs to be investigated.

   C. Is genetic information used to address a primary aim or secondary aim of SHS?
   (please check one or both)
   ____ Primary aim (heart/vascular/pulmonary disease)

____ Secondary aim (other health conditions)
List the conditions addressed: _____

8. Proposed starting and ending dates:

9. Estimated cost by year; number of years:

10. Source of funding; projected date of submission:

11. Please indicate whether this ancillary study involves the support or collaboration of a for-profit corporation; if it does, please affirm that the data will not be use to patent or profit from any process, aspect or outcome of the analysis (as stipulated in the SHS consent forms).

12. What is/are the advantage(s) to American Indian communities, to the participants, to SHS, and to yourself of conducting the study within the SHS cohort versus another population?

13. Possible/probable impact on ongoing SHS studies (SHS or other ongoing SHS ancillary studies):

14. Provide the following assurances (answer each):

(1) Who (name, position (and contact information, if different from above)) will provide the annual progress reports? (ancillary study PI or designate)

(2) How will confidentiality of SHS participants be maintained?

(3) The ancillary study PI will be given the first and exclusive opportunity to analyze, present and publish data collected by the ancillary study. Recipient agrees that an archival copy of the newly collected data and/or laboratory results, with documentation, will be sent in a secure manner to the SHS CC one year after the conclusion of the data cleaning and closure or one year after acceptance of the primary publication, whichever comes first. This should allow sufficient time for publication of the main (ancillary) study hypothesis. This transfer is the responsibility of the SHS representative(s) collaborating with the ancillary study. The data from the ancillary study will be included in the SHS dataset for distribution by the SHS CC and/or the NHLBI according to procedures currently under negotiation with the involved tribes, the IHS, and the NHLBI. Recipient agrees that it is the responsibility of the ancillary study PI to state in writing to the SHS SC any special circumstances that might warrant an exception to these guidelines for data sharing. In the spirit of encouraging collaboration, reasonable and justified requests for limiting such routine SHS access to the data will be honored, or some compromise will be worked out.

15. Ancillary Study PI signature:

I agree to comply with the SHS Ancillary Studies Policy (for current version, see the SHS website at: http://strongheart.ouhsc.edu/T)

Signed: _____ Date: _____
(Ancillary Study PI)

II. Abbreviated Ancillary Study Proposal

Please provide a brief (2 to 4 page) description of the proposed study. Include the following:

Purpose:

Background:

Hypothesis(es):

Experimental Design (include sample size justification):

Methods, including:

- **Participant involvement (if any)**
- **Data and/or samples to be collected by the ancillary study (attach questionnaires and forms)**
- **Statistical and Laboratory Analysis methods**

Literature cited:

Please send (electronically or by surface mail) the completed proposal to:

Barbara V. Howard, PhD
Chair, SHS Steering Committee
President, MedStar Research Institute
6495 New Hampshire Ave Suite 201
Hyattsville, MD 20783
Phone: 301-560-7302
Fax: 301-560-7309
PAGER AND CELL PHONE: 301-602-0125

For Coordinating Center Use Only

Approved? _____ Date _____ If approved, ancillary study # _____

STRONG HEART STUDY

DATA AND/OR MATERIALS DISTRIBUTION AGREEMENT FORM

[For Data Alone, Materials Alone, or for Materials and Data Combined]

The undersigned parties hereby enter into this Distribution Agreement as of the date specified in the signature section at the end of this agreement.

PRELIMINARY STATEMENT

The National Heart, Lung, and Blood Institute (NHLBI), in collaboration with the SHS Investigators, the participating American Indian tribes, and the IHS, has supported collection of biological samples and clinical and other data from participants in the SHS. This clinically and genetically well-characterized population is a valuable scientific resource that is maintained under the joint stewardship of the SHS Investigators, the NHLBI, the participating tribes, and the IHS. Promoting use on a national scale of such a resource will require a large and concerted effort, which may involve investigators not currently part of the SHS. The NHLBI and the researchers it supports have a responsibility to the American Indian communities, the general public, and the scientific community to encourage as rapid scientific progress as possible using these resources, subject to appropriate terms and conditions. In order to take full advantage of such resources and maximize their research value, it is important that samples and data collected with public funds be made available, under appropriate terms and conditions, to the largest possible number of qualified investigators in a timely manner.

Biological samples and clinical and other data collected by the SHS have been stripped of all personal identifiers. However, identification of individual participants is made less difficult due to 1) public awareness of the Indian communities who participate in SHS, 2) public knowledge of the geographic areas from which the SHS participants were drawn, and 3) the wealth of data available in the SHS datasets. To protect the confidentiality and privacy of these participants and their families, investigators granted access to these data and materials must adhere to the requirements of this Distribution Agreement. Failure to comply with this Agreement will result in denial of further access to SHS samples and data. Violation of the confidentiality requirements of this agreement may leave requesting investigators liable to legal action on the part of the SHS participants and/or the US Government (NHLBI and/or IHS).

The SHS investigators have made a substantial long-term contribution in establishing, maintaining, and expanding the database and samples. The NHLBI, the tribes, the IHS, and the SHS investigators seek to encourage appropriate collaborative relationships by outside investigators with the SHS investigators, which will increase the value of this research in improving the health of American Indians and people in general. In all such collaborations, the contributions of the tribes and of the SHS investigators must be appropriately acknowledged.

The NHLBI, the tribes, the IHS, and the SHS Investigators further seek to promote the development of valuable discoveries and inventions beneficial to the public health based upon use of the SHS data and samples repositories. Sample materials from the SHS field centers are

stored in a central facility (the Penn Medical Lab for all samples except the SHS Family Study DNA (SHS Phases II, IV, and V), which are stored at the SHS Genetic Center at the Southwest Foundation for Biomedical Research). A single agreement for distribution of data and/ or materials has been developed by SHS in the interest of efficiency and simplicity.

DEFINITIONS

For purposes of this agreement,

"Data" refers to data and associated records collected and recorded from SHS participants through periodic examinations conducted pursuant to the SHS Investigators' contract with the NHLBI,

“Materials" refers to “biological materials” of participants (urine, blood samples, and products thereof, including extracted DNA) collected and prepared in SHS pursuant to the SHS Investigators' contract with the NHLBI;

"Genetic Analysis Data" refers to "molecular genetic data", which consists of data derived from analyses of DNA samples contained in biological materials including but not limited to genotyping analysis, anonymous marker polymorphisms, DNA sequence information, mutation analysis, and other genetic analyses.

RECIPIENT

_____, a **non-profit** organization governed by the laws of the State of _____ with a principal address at _____

("Recipient") requests access to SHS data and materials at its sole risk and at no expense to the SHS or NHLBI.

AGREED TERMS AND CONDITIONS

It is mutually agreed as follows:

1. Data. The SHS, the NHLBI, the participating tribes, and the IHS agree to provide Recipient with SHS data described as follows for use by the Recipient's principal investigator named below ("Principal Investigator"):

_____

_____

2.: Materials. The SHS, the NHLBI, the participating tribes, and the IHS agree to transfer to Recipient SHS materials described below to conduct the research described in paragraph 3 below. These materials (including numbers of samples) are described as follows:

_____

_____

3. Research Project.

3.1 The SHS materials and/or data will be used by Recipient's Principal Investigator solely in connection with the following research project ("Research Project"), specifically described below or in an attached Exhibit A:

_____

_____

_____

3.2 The Research Project involves the following SHS investigator(s) as co-investigator(s). His/her/their name(s) and the work he/she/they will perform are described below or in an attached Exhibit B:

_____

_____

3.3 This Distribution Agreement covers only the above-described Research Project. Recipient must complete and submit a separate Data and/or Materials Distribution Agreement for each research project for which SHS data and/or materials are requested.

3.4 Recipient agrees to follow the current SHS Ancillary Studies Policy in conducting this Research Project. As the ancillary study progresses, the Principal Investigator will find the most up-to-date SHS policy by visiting the SHS website at: http://strongheart.ouhsc.edu .

4. Non-transferability. This Agreement is not transferable. Recipient agrees that substantive changes made to the Research Project described above, and/or appointment by Recipient of another Principal Investigator to complete the Research Project, require execution of a new Agreement in which the new Principal Investigator and/or new Research Project are designated.

5. Publication. Prompt publication of the results of the Research Project is encouraged. The PI or other representative of the ancillary study, and if necessary the SHS SC, will consult with the CC during data analysis to ensure that all study data used in analysis of ancillary results are consistent with data in the main SHS database. Manuscript proposals must be approved in advance by the SHS Publications and Presentations Committee (P&P). This procedure is necessary to establish authorship and prevent overlap in the publication effort. Approval of manuscript proposals is sought by submitting the proposal using standard SHS format (see SHS Paper Proposal Form in Appendix 8 of SHS V Manual of Operations, Volume 1) to the SHS P&P. The SHS Ancillary Study Proposal Form (form can be found in Appendix 8), as signed by the ancillary study PI, stipulates that the ancillary study investigators agree to submit paper proposals for approval by the SHS P&P and to submit draft manuscripts for approval by the NHLBI, the IHS IRBs, and the tribes (for full details see section 1.7 of SHS V Manual of Operations, Volume 1). Additionally, abstracts for presentations at meetings require approval by the NHLBI and the Dakota Center IHS IRB (see section 1.7). The investigator who assumes lead responsibility for the ancillary study shall generally be listed as an author. Whenever possible, the phrase "Strong Heart Study" should be included in the manuscript title and listed as a key word. Upon publication, reprints must be distributed as specified in section 1.7.

6. Acknowledgments. Recipient agrees to acknowledge, as deemed appropriate, the contributions of the participating tribes, the IHS, the SHS investigators and staff, and the NHLBI in any and all oral and written presentations, disclosures, and publications resulting from any and all analyses of the SHS data and/or materials.

6.1 Collaborations/Acknowledgments. Recipient will acknowledge the SHS co-investigators as co-authors, as appropriate, on any publication and will use the acknowledgment printed below.

"The Strong Heart Study (SHS) is conducted and supported by the National Heart, Lung, and Blood Institute (NHLBI) in collaboration with the SHS Investigators, the participating tribes, and the Indian Health Service (IHS). This manuscript has been reviewed by the SHS and NHLBI for scientific content and consistency of data interpretation with previous SHS publications and significant comments have been incorporated prior to submission for publication. Additionally, this manuscript has been reviewed by the participating tribes and the IHS IRBs involved. The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the views of the Indian Health Service."

7. Non-Identification. Recipient agrees that SHS materials and/or data will not be used, either alone or in conjunction with any other information, in any effort to determine the individual identities of any of the participants from whom data and/or materials were obtained.

8. Use Limited to Research Project. Recipient agrees that SHS data and/or materials, their progeny, and unmodified or modified derivatives thereof will not be used in any experiments or procedures that are not disclosed and approved as part of the Research Project.

9. Compliance with Participant's Informed Consent and HIPAA form. Recipient agrees that SHS data and/or materials, their progeny, and unmodified or modified derivatives thereof will not be used for any purpose contrary to a participant's applicable signed informed consent document(s). It is the responsibility of the Recipient's Principal Investigator to consult with the SHS investigators and ascertain, specifically and in detail, the terms and conditions of applicable SHS informed consent documents. In keeping with the Health Insurance Portability and Accountability Act (HIPAA) guidelines, participants have consented to having their data used by investigators outside of SHS to study the causes of cardiovascular disease, lung disease, and their risk factors and to conduct genetic research regarding cardiovascular disease, lung disease, and their risk factors. Recipient will make no attempt to access Protected Health Information including, but not limited to, their identities, their medical records, family information, employer or insurance information, or previous medical or genetic conditions not included as part of the limited data set or materials provided to the Recipient by the SHS or obtained by the Recipient in conducting IRB-approved procedures of the ancillary study.

10. No Distribution, Avoidance of Waste, Return of Materials. Recipient agrees to retain control over SHS data and materials, their progeny, and unmodified or modified derivatives thereof, and further agrees not to transfer data and/or materials, their progeny, or unmodified or modified

derivatives thereof, with or without charge, to any other entity or any individual. Recipient agrees, in handling the SHS biological materials, to make reasonable efforts to avoid contamination or waste of the samples. When the Research Project is completed, or three (3) years have elapsed from the effective date of this Distribution Agreement, whichever occurs first, the SHS materials will be either returned to the SHS lab (PML or SWF, as appropriate) or disposed of as mutually agreed upon by the SHS Investigators, NHLBI, IHS, participating tribes, and Recipient, unless an extension of this Agreement is obtained. A record of how SHS biological materials have been handled and stored during that time must be submitted to the SHS lab (PML or SWF, as appropriate) prior to the end of the Recipient's project to facilitate decisions as to appropriate handling of the remaining SHS materials.

11. Ancillary Study Annual Reports. Recipient agrees to provide the SHS Coordinating Center (and thereby the NHLBI) with a report every twelve (12) months during the term of this Agreement containing a summary of findings derived by Recipient in the performance of the Research Project. Such report will summarize all data derived by Recipient up to six (6) months before the reporting date.

12. Costs/No Warranties. Costs for DNA or other material distribution (retrieval, processing, and shipping) will be borne by the Recipient at no cost to SHS. NO WARRANTIES, EXPRESS OR IMPLIED, ARE OFFERED AS TO THE MERCHANTABILITY OR FITNESS FOR ANY PURPOSE OF THE DATA AND/OR MATERIALS PROVIDED TO RECIPIENT UNDER THIS AGREEMENT.

13. Recipient's Responsibility for Handling Biological Materials. Recipient acknowledges that biological materials may carry viruses, latent viral genomes, and other infectious agents. The Recipient agrees to treat Biological Materials as if they are not free of contamination, and that SHS biological materials will be handled only by trained persons under laboratory conditions that afford adequate biohazard containment. By accepting SHS biological materials, Recipient assumes full responsibility for their safe and appropriate handling.

14. Non-Endorsement, Indemnification. Recipient agrees not to claim, infer, or imply Governmental endorsement of the Research Project, the entity, and personnel conducting the Research Project except as described in paragraph 6 above. To the extent permitted by law, Recipient agrees to hold the United States Government, the SHS investigators, and all other investigator(s) who generated SHS data and materials, and the agents and employees of each of them, harmless and to defend and indemnify all such parties for all liabilities, demands, damages, expenses, and losses arising out of Recipient's use for any purpose of SHS data and materials, their byproducts, or modified or unmodified derivatives.

15. Accuracy of Data. The United States Government and the SHS investigators are not responsible for the accuracy of SHS data or materials provided.

16. Recipient's Compliance with IRB Requirements. Recipient acknowledges that the conditions for use of the SHS data and/or materials have been approved by the Recipient's Institutional

Review Board (IRB) in accordance with Department of Health and Human Services regulations (45 CFR Part 46). Recipient agrees to comply fully with all such conditions and with the participants' informed consent and HIPAA documents, and any additional conditions that may be imposed by the SHS Centers' IRBs (IRBs of all grantee institutions and the IHS IRBs for each of the 3 field centers) and relevant HIPAA approval bodies. Recipient agrees that any proposed change in the approved ancillary study protocol must be submitted to SHS for approval, and that such change may require review and approval of all of the aforementioned SHS IRBs. Furthermore, any unanticipated problems involving risks to subjects or others must be promptly reported to SHS and the SHS IRBs. Recipient remains subject to all applicable State and local laws and regulations and institutional policies that provide additional protections for human subjects.

17. Amendments. Amendments to this Distribution Agreement must be made in writing and signed by authorized representatives of both parties.

18. Conflict of Interest. The Recipient agrees to disclose promptly any direct or indirect conflicts of interest, such as affiliation(s) with any organization with any financial interest in the subject matter of the proposed research employing SHS data and/or materials. Examples of such affiliations are employment, consultancies, expert testimony, honoraria, stock, or retainers that may affect the work being considered.

19. Termination. The SHS Steering Committee, in consultation with the NHLBI, may terminate this Distribution Agreement if Recipient is in default of any of its conditions and such default has not been remedied within 30 days after the date of written notice to the Recipient by the SHS of such default. Upon termination of this Distribution Agreement, Recipient agrees to return all SHS data and materials to SHS.

20. Disqualification, Enforcement. Failure to comply with any of the terms specified herein may result in disqualification of Recipient from receiving additional SHS data and/or materials. The United States Government (on behalf of NHLBI and/or IHS), the SHS investigators, and the participating tribes shall have the right to institute and prosecute appropriate proceedings at law or in equity against the Recipient for violating or threatening to violate the confidentiality requirements of this agreement, the limitations on the use of SHS data and/or materials provided, or both. Proceedings may be initiated against the violating party, or legal representatives, and assigns, for a restraining injunction, compensatory and punitive damages, mandamus, and/or any other appropriate proceeding in law or equity, including obtaining the proceeds from any intellectual property or other rights that are derived in whole or in part from the breach of the confidentiality requirements or use limitations of this agreement. In addition, Recipient acknowledges that a breach or threatened breach of the confidentiality requirements or use limitations of this agreement may subject Recipient to legal action on the part of SHS participants, their families, or both.

21. Accurate Representations. Recipient certifies that to the best of his/her knowledge and belief the contents of any statements made or reflected in this document are truthful and accurate.

22. Prior Distribution Agreements. The following stipulation applies only to Recipients who have entered into a previous Distribution Agreement with SHS or NHLBI: Execution of this Distribution Agreement is contingent upon Recipient's compliance with all terms and conditions of existing Distribution Agreements with SHS or NHLBI.

23. Recipient's Ancillary Study Results to be Provided to SHS. The ancillary study PI will be given the first and exclusive opportunity to analyze, present and publish data collected by the ancillary study. Recipient agrees that an archival copy of the newly collected data and/or laboratory results, with documentation, will be sent in a secure manner to the SHS CC one year after the conclusion of the data cleaning and closure or one year after acceptance of the primary publication, whichever comes first. This should allow sufficient time for publication of the main (ancillary) study hypothesis. This transfer is the responsibility of the SHS representative(s) collaborating with the ancillary study. The data from the ancillary study will be included in the SHS dataset for distribution by the SHS CC and/or the NHLBI according to procedures currently under negotiation with the involved tribes, the IHS, and the NHLBI. Recipient agrees that it is the responsibility of the ancillary study PI to state in writing to the SHS Steering Committee any special circumstances that might warrant an exception to these guidelines for data sharing. In the spirit of encouraging collaboration, reasonable and justified requests for limiting such routine SHS access to the data will be honored, or some compromise will be worked out.

In any instance when genotyping is performed in the collaborating lab (as opposed to SWF), as soon as the variant information is known (before genotyping and certainly before data analysis and publication), the SNP information must be conveyed to the SHS Steering Committee. Recipient will provide Genetic Analysis Data, indexed by genotyping ID number in the precise electronic format specified by the SHS CC and/or SWF and/or NHLBI. When genotyping has been conducted, DNA marker names and allele names will be provided for each individual subject as indexed by the SHS participant ID number. Descriptive information about each typed marker, preferably obtained from public databases, when applicable, must be provided, including any Human Genome SNP database information (nlm/ncbi) and the SNP database name, the chromosomal physical map location and source of map location, gene name (if relevant) and location in gene relative to transcriptional start site, and surrounding DNA sequence or PCR primers used.

Recipient agrees that the safety and confidentiality of the SHS data and/or materials at the collaborating institution are the responsibility of the ancillary study PI, as is the appropriate disposition of data and remainders of SHS samples after the ancillary study has been completed. Leftover DNA and any other types of laboratory specimens must be returned to PML or SWF. Files of SHS data must be returned to the SHS CC or deleted, as established and agreed at the outset of the collaboration.

This Distribution Agreement is entered into as of _____ (effective date)

RECIPIENT:
Name of Recipient Entity:

Name and Title of Recipient's Authorized Representative:

Signature and Date of Recipient's Authorized Representative:
_____Date:_____

PRINCIPAL INVESTIGATOR:
Principal Investigator's Name and Title:

Principal Investigator's Surface Mail Address:

Principal Investigator's Email Address: _____
Principal Investigator's Telephone Number: _____
Principal Investigator's Fax Number: _____

Signature and Date: Principal Investigator:
_____Date:_____

STRONG HEART STUDY:
Name and Title of SHS Authorized Representative:

Signature and Date of SHS Authorized Representative:
_____Date:_____

NHLBI:
Name and Title of NHLBI's Authorized Representative:
_____
Signature and Date of NHLBI Authorized Representative:
_____Date:_____

STRONG HEART STUDY

ANNUAL UPDATE ON ANCILLARY STUDY

Please provide an update on the SHS Ancillary Study under your direction by answering the questions listed below. The information will be provided to the SHS Steering Committee and will also be included in the annual report to the SHS Observational Study Monitoring Board.

Send the completed report to:

Elisa T. Lee, Ph.D.
SHS PI and Director of the SHS Coordinating Center
Center for American Indian Health Research
College of Public Health
University of Oklahoma Health Sciences Center
PO Box 26901 - Room CHB-112
Oklahoma City, OK 73190

Express Svc:
Center for American Indian Health Research
College of Public Health
801 NE 13th St, Room CHB-100
Oklahoma City, OK 73104

Phone: 405-271-3090
Fax: 405-271-4390
Email: Elisa-Lee@ouhsc.edu

Ancillary Study Title: _____ (Please use the title as supplied in your study proposal, which was approved by SHS.)

Ancillary Study #: _____ (This is the study number which was listed on your SHS agreement form and assigned to your ancillary study by SHS when approved)

Date (day/month/year) _____ (This report should be submitted to Dr. Lee on or about the anniversary date of the SHS approval of your ancillary study)

Current Status:
_____Not yet started.
_____In Progress.
_____Data collection completed.
_____Publication Stage.

Please give comments to explain any conditions that are noteworthy (such as funding not yet received, but expected in next 6 months, funding received and hiring in progress, problems encountered, etc)

Please provide a one-paragraph summary of your progress and findings, which can be reported to the SHS SC and OSMB.

Does this ancillary study or its parent study have a website? □ Yes □ No If yes, the URL is:

Please answer the following questions:

1. Any change in study status since your last update? (e.g., in data collection, data analysis, manuscript preparation, etc - or are all activities now completed?)

2. Was new funding received since your last update? What is the new funding source?

3. What is the status of each publication and presentation derived from the study? Provide full citations for published papers.

4a. Did you complete data collection and cleaning more than one year ago or was the primary manuscript accepted for publication more than one year ago?

4b. If yes to Q4a, have you sent the dataset to the SHS Coordinating Center? _____ If so, when? _____
If not, when do you plan to do so? _____

A dataset containing the important analytic variables should be sent to the SHS Coordinating Center (see the reminder below). Please send the data & documentation separately from this progress report. Please contact the CC regarding appropriate format, manner of transmission of data, data security, etc prior to sending your data.

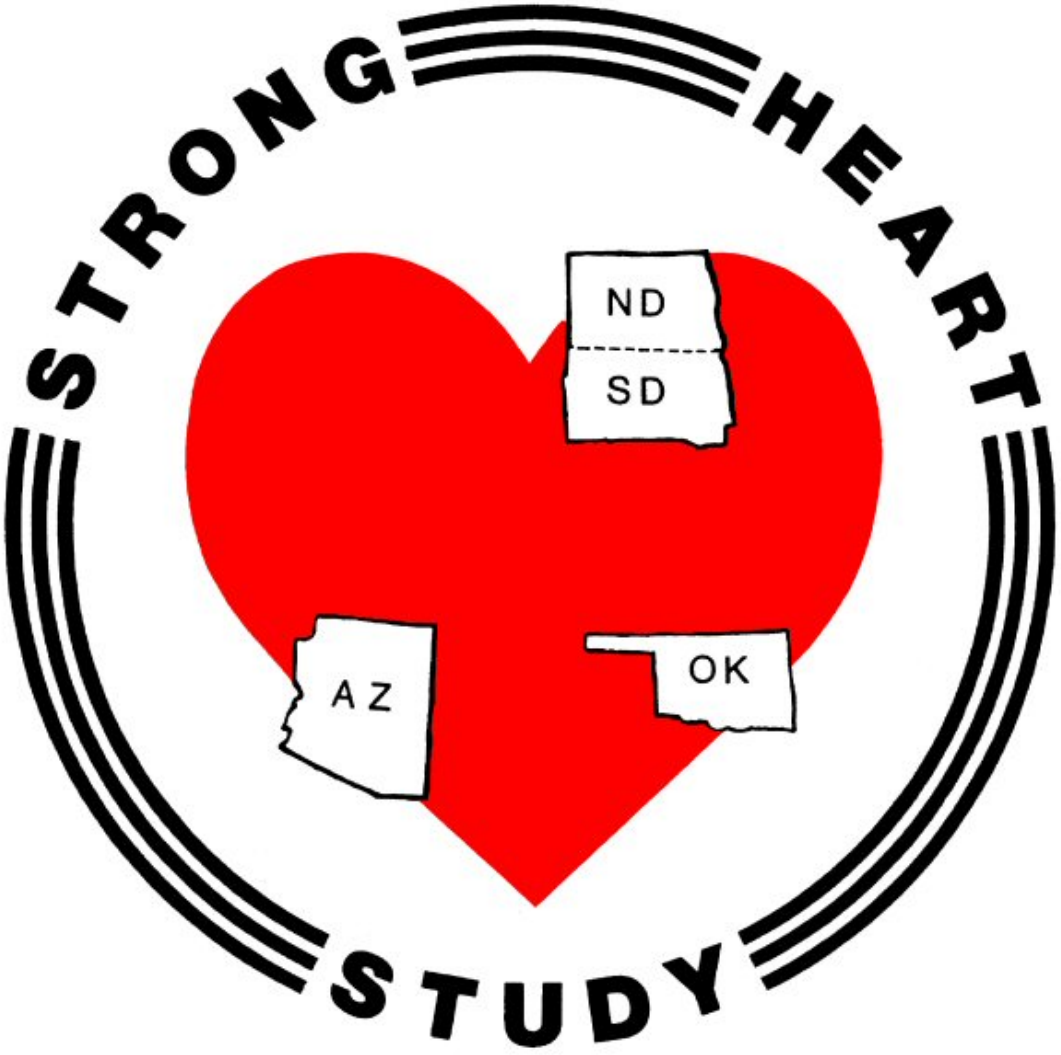
5. Have there been any changes in your mailing address, phone and fax numbers, and e-mail address since you submitted your last annual report? _____ If so, please provide your current contact information:

A reminder regarding Publications and Presentations:

You should be aware that publication of SHS ancillary study data requires review by the SHS Publications and Presentations Committee, the NHLBI, the tribes, and the IHS IRBs. All manuscripts must be preceded by an approved manuscript proposal. Abstracts and presentations must be based on an approved manuscript proposal and must be approved by the NHLBI and the Aberdeen Area IHS IRB (please see section 1.7 of the SHS V Manual of Operations, Volume 1for details).

A reminder regarding Ancillary Study data:

SHS policy requires that data collected by the ancillary study must be provided, with documentation, to the SHS Coordinating Center for integration into the main database. The ancillary study PI will be given the first and exclusive opportunity to analyze, present and publish data collected by the ancillary study. One year after data cleaning is complete or one year after the primary manuscript has been accepted for publication, whichever comes first, ancillary study data will be made available for additional uses by other SHS investigators. It is the responsibility of the ancillary study PI to state in writing to the SHS Steering Committee any special circumstances that would warrant an exception to these guidelines for data sharing. In the spirit of encouraging collaboration, reasonable and justified requests for limiting Steering Committee access to the data will be honored or some compromise will be worked out.



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Two

MORBIDITY AND MORTALITY SURVEILLANCE PROCEDURES

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Two

MORBIDITY & MORTALITY SURVEILLANCE PROCEDURES

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME II

MORBIDITY AND MORTALITY SURVEILLANCE PROCEDURES

Table of Contents

CHAPTER ONE

OVERVIEW OF STRONG HEART STUDY PHASE V MORTALITY AND MORBIDITY SURVEILLANCE

1.1 OBJECTIVES

All surviving participants from the SHS Phase I examination are eligible for morbidity and mortality follow-up in Phase V. Surveillance methods used in Phase V of the SHS are the same as those used successfully in Phases II-IV. Mortality surveillance includes annual ascertainment of deaths in survivors of the original cohort and in participants in the SHFS of all ages (i.e., age 15 years and older at the Phase IV examination). Inclusion in the mortality surveillance of SHFS members will add over 3000 new individuals from the SHFS to the annual mortality surveillance cohort and permit continued examination of CVD risk factors in relation to "early" events and comparisons of these factors to those associated with CVD at older ages. Focusing on age-specific risks will allow us to indirectly take into account the "relatedness" of participants from the SHFS, who have now been added to the surveillance cohort. Because we will not examine the original SHS cohort as part of Phase V, surveillance is the only tool for identification of incident CVD events. In 2006, the SHS cohort will range in age from about 62 to 91 years with a mean of 75. These participants constitute a cohort of elders who have been under repeated observation for about 20 years. The primary objectives of surveillance of the exam cohort are to capture events that can be related to possible risk factors for CVD and to provide annual mortality and morbidity rates in these populations. Table 1.1 summarizes the non-fatal endpoints ascertained in the SHS by various mechanisms. All deaths in cohort members will be identified and the cause of death determined by review of medical records information.

Morbidity surveillance will be done in the original SHS cohort using the same methodology as in Phase IV. For participants in the SHFS, non-fatal CVD events that have occurred since their Phase IV examination will be identified at the time of the Phase V re-examination by means of a physical examination, ECG, and history and through review of the participants' medical records covering the time period between the Phase IV and Phase V examinations. Surveillance activities in Phase V will continue until May 31, 2009.

It is important in designing and implementing the surveillance protocol that the intensity of ascertainment is the same at all three centers; otherwise, there is likely to be bias in both the frequency and nature of events ascertained, and what may appear to be center differences would, in fact, be artifactual.

1.2 OVERVIEW OF SURVEILLANCE PROCEDURE

1.2.1 General Surveillance Methodology

The general approach to cohort surveillance at each center continues as done previously, namely, dividing the total number from a listing of surviving Phase I participants into twelfths, ordered by calendar time from least to most recent cohort exam date. This results in an approximately equal distribution of participants across the calendar year. Using this monthly division, the persons listed for that month are followed up (methods described below) to determine their vital status and if living, whether any of the study events of interest had occurred since last contact. The monthly listing provided by the Coordinating Center includes all known identifying information for the individual, their Phase I, II, and III exam dates, and the dates of any morbid events already ascertained (providing an event history that is useful when doing the follow-up). A sample of the tracking form is given in Figure 1.1. When a new event (either fatal or non-fatal) is identified, procedures for obtaining the necessary information for physician review are implemented. Using this approach, each member of the cohort is contacted (either directly or indirectly) once a year, and the physicians' review of events are done on an on-going basis.

Mortality surveillance includes annual ascertainment of deaths in the Phase I examination cohort (N = 4,549), regardless of whether they participated in other SHS examinations and in the Phases III and IV Family Study participants of all ages. Local newspapers and community notices, community and tribal members, and IHS, tribal and Bureau of Indian Affairs records are used to identify deaths in each SHS community. The Tribes are excellent sources of information concerning recent deaths, since family members may make claims for death benefits through the tribal office. Mortality surveillance of the cohort and SHFS participants includes identification of deaths, obtaining death certificates, collecting medical records data, and completing and forwarding death packets for coding and review on a monthly basis. All deaths, regardless of cause or residence at the time of death, are ascertained and reviewed for determination of cause of death. All death certificates are centrally coded according to the Ninth Revision of the International Classification of Diseases by a single nosologist who has been with the SHS since it began. Medical records, autopsy data, and other supplemental material for all deaths, regardless of cause, are obtained and reviewed by two members of the SHS Mortality Committee using standardized criteria. All fatal events judged to be strokes are directly forwarded to Dr. Jorge Kizer at Cornell Medical Center, Division of Cardiology New York-Presbyterian Hospital for review. Both underlying and contributing causes of death are coded. In the final year of Phase V, the names and identifying information for all SHS and SHFS participants who have been lost to follow-up will be submitted to the National Death Index to determine their vital status.

For participants in the SHFS, non-fatal CVD events that have occurred since their Phase IV examination (or Phase III pilot study exam) are identified at the time of the Phase V re-examination by means of a physical examination, ECG, and history and through review of the participants' medical records covering the time period between the Phase IV (or Phase III) and Phase V examinations.

Figure 1.1 Example of Tracking Form

SHS ID:	10xxxx	DOB:	4/27/40
NAME:	Smith, James	DOD:	
SSN:	000-00-0000	SHS-II Exam:	09/20/93
Address:	PO Box 5, Rapid City, SD 57577	SHS-III Exam:	
Home Phone:	(605) 555-5555	IHS Rec #:	000000
Work Phone:	(605) 555-5556		

EVENTS ABSTRACTED: None

Contact Date	Method of Contact	Result	INIT	MI/Stroke Other CVD	Comments

NOTES:

Table 1.1 Endpoints for Phases I, II, and III

Endpoints/Events	Type of Rate	Source of Data
Primary Clinical Endpoints		
Myocardial Infarction	I	S, E III
Stroke	I	S, E III
Congestive Heart Failure	I	S, E III
ECG evidence of new MI	I	E III
Coronary bypass surgery/angioplasty	I	S, E* III
Secondary Events of Interest/Pre-clinical Disease		
Valvular Heart Disease	P	E III
Angina	I	E III
Peripheral Vascular Disease	I	E III
Cardiac catheterization, positive	I	S, E* III
Positive treadmill test	I	S, E* III
Left ventricular hypertrophy (LVH)	P	E III
Global evaluation of LV function	P	E III
Cardiac wall motion abnormalities	P	E III
Obstructive lung disease (Ratio FEV1/FVC or FEV1/SVC)	P	E III
End-stage renal disease (ESRD)	I	E*III

I = Incidence P = Prevalence S = Surveillance contact
E = Examination, Phase II or Phase III E* = By interview, with medical record confirmation

Endpoints for Phases I, II, and III are listed above in Table 1.1. For each event, there is a designation as to whether it is an incident or prevalent event and the source(s) through which it was initially ascertained. Because baseline data for the primary endpoints are available from Phase I, new events ascertained in Phase II and Phase III were incident events, and all of the primary endpoints, with the exception of ECG evidence of new myocardial infarction, were identified through surveillance contacts. The majority of secondary events of interest shown in the table were not specifically ascertained in Phase I, and thus, persons identified with these conditions in Phase II were prevalent cases. Subsequent new onset events would be incident.

Identification of non-fatal CVD events in the SHS cohort continues in Phase V. The specific events are listed below (Table 1.2). Persons are also asked, or records are reviewed, to determine whether certain treatments or diagnostic procedures were done, including cardiac bypass surgery or angioplasty, cardiac catheterization, stress testing, radionuclide imaging studies, dialysis or renal transplant. The occurrence of non-fatal events in the SHFS non-cohort participants since their Phase IV examinations (or Phase III pilot exam if a pilot family participant did not return for the Phase IV exam) will also be ascertained at the time of their Phase V examination.

Table 1.2 Endpoints in Phases IV and V

Endpoints/Events	Type of Rate	Source of Data
Primary Clinical Endpoints		
Myocardial Infarction	I	S
Stroke	I	S
Congestive Heart Failure	I	S
Coronary bypass surgery/angioplasty	I	S
ESRD	I	S+
Valvular heart disease	I	S+
Procedures for the treatment of Peripheral vascular disease	I	S+

S+ = added to surveillance as of January 1, 2003

Secondary Events of Interest/Pre-clinical Disease		
Cardiac catheterization, positive	I	S
Positive treadmill test	I	S

I = Incidence P = Prevalence S = Surveillance contact

1.2.2 Specific Surveillance Approaches

Table 1.3 presents the percentage of each SHS center's population who have a telephone and who have a P.O. address.

Table 1.3 Frequency of Home Telephones and P.O. Mailing Addresses by SHS Center (SHS Phase II, 8/96)

Type of Contact		AZ	OK	SD/ND
Home Telephone				
	N	640	964	767
	%	55%	77%	65%
Mailing Address is PO Box	N	654	427	863
	%	56%	34%	74%

It is clear that the ability to contact individuals by typical follow-up measures varies by center. The percent of participants who get their care exclusively through IHS and thus, for

whom monitoring of IHS user listings would be nearly complete, also varies by center. IHS computerized user listings are a useful source for each center; however, they are augmented with other methods, especially in Oklahoma. Thus, the following approaches, to be carried out in the order listed, are used for monthly surveillance contacts of Phase I cohort members.

For each name on the monthly list, check:

1. IHS computerized user listings (both inpatient and outpatient) for the occurrence of SHS events of interest
2. For participants who do not regularly receive care at IHS facilities:
   a. check with physicians who have previously provided information to the SHS for that participant
   b. if feasible at your center, send a follow-up questionnaire by mail to the participant, with a telephone call to non-respondents within 4 weeks of mailing (telephone could be used first).
   c. make a home visit to obtain surveillance information if there is no telephone and contact questionnaire is not returned.
3. After 3 months of repeated attempts to contact an individual have passed without success, contact efforts should be terminated for that contact year.
4. The National Death Index will be queried near the end of the study to determine whether SHS participants who are lost to follow up have died. If they have died, then copies of their death certificates will be obtained so that they can be included in the mortality review process.

Other methods specific for each center may be developed in collaboration with the M&M coordinators, but these methods must be reviewed and approved by the Steering Committee prior to implementation to ensure equal ascertainment across all three centers.

1.3 SURVEILLANCE STAFF

FIELD CENTERS: Each field center has an individual specifically responsible for mortality and morbidity follow-up of the cohort (the Mortality and Morbidity (M&M) Coordinator). The M&M Coordinator is responsible for the monthly surveillance contacts of cohort members, obtaining and forwarding the requisite medical records information for review for fatal and non-fatal events, and completing the monthly surveillance report and forwarding it to the Coordinating Center. Mortality surveillance includes annual ascertainment of deaths in survivors of the original cohort plus follow-up of any deaths among family study participants whenever recognized by the Center staff. For participants in the SHFS, non-fatal CVD events that have occurred since their Phase IV examination are identified at the time of the Phase V re-examination by means of a physical examination, ECG, and history and through review of the participants' medical records covering the time period between the Phase IV and Phase V examinations. During the Phase V examination process, the field staffs of each center identify potential events for the family portion of Phase V surveillance and provide the M&M Coordinators with a list for abstraction, thus assisting their M&M Coordinators in carrying out the greatly expanded mission of M&M surveillance in Phase V.

COORDINATING CENTER: The Coordinating Center has a specific individual designated as responsible for all aspects of M&M surveillance, including the distribution of packets for QC review, monitoring of progress at each center, and processing of data received.

1.4 SURVEILLANCE REPORTING

Monthly surveillance is done to account for all of the surviving SHS cohort members at least once each year. Deaths of family members are documented and abstracted whenever recognized by the Center staff. Identification of non-fatal CVD events in the SHS cohort continues in Phase V, and, additionally, ascertainment of any non-fatal events in the SHFS non-cohort participants since their Phase IV examinations (or Phase III pilot exam if a pilot family participant did not return for the Phase IV exam) occurs at the time of the Phase V examinations. An example of the monthly reporting form for cohort surveillance is given in Figure 1.2 below.

Monthly reports are provided as a cumulative total since the start of surveillance for that contact year. The contact rate (# contacted ÷ target number) and the abstraction rate (# abstracted ÷ (# events identified)) will be used to track the field staff's surveillance completion rate. The following are explanations of each of the entries in the report.

TARGET NUMBER: The number of persons for whom M&M information should be determined. This number is equivalent to approximately 1/12th of the total surviving cohort at each center.

NUMBER CONTACTED: This is the number of target persons who have been accounted for. To account for someone means to determine whether or not they are alive or dead, and if alive, whether or not they MAY HAVE had an event of interest since the date of last contact. If NO information is available for someone, then that participant has NOT been accounted for yet and is pending contact.

CONTACT METHODS CAN INCLUDE:

1) IHS computerized user listings.
2) Telephone call with short questionnaire.
3) Letter, with short questionnaire.
4) Home visit to complete short questionnaire.
5) Chart review

 # PARTICIPANTS WITH POTENTIAL EVENTS: This is the number of people for whom contact has been made and who MAY have a morbid event of interest or who are reported to be deceased. Mortality and morbidity are reported separately. Included here can be persons who are known to have been hospitalized, but for whom the reason for hospitalization is unknown.

Figure 1.2 Monthly Surveillance Progress Report

Site	Month	Target#	Contacted	Participants With Potential Events		Total # of Potential Events		Events Abstracted		Ineligible Events		Packets Forwarded For Review		Rates		
				Mort	Morb	Mort	Morb	Mort	Morb	Mort	Morb	Mort	Morb	Contrate	Abmtrate	Abmbrate
OK	Dec00	1246	1191	179	159	179	224	154	200	0	20	154	126	0.956	0.860	0.980
OK	Jan01	101	101	179	15	179	15	155	12	0	2	155	12	1.000	0.866	0.923
OK	Feb01	202	202	182	24	182	35	159	31	0	3	159	19	1.000	0.874	0.969
OK	Mar01	304	304	184	35	184	52	160	43	0	6	160	26	1.000	0.870	0.935
OK	Apr01	406	406	188	45	188	65	165	53	0	9	165	32	1.000	0.878	0.946
AZ	Dec00	1093	1093	242	148	242	392	234	392	0	0	234	148	1.000	0.967	1.000
AZ	Jan01	87	87	246	10	246	22	237	22	1	0	237	10	1.000	0.967	1.000
AZ	Feb01	169	169	249	20	249	48	240	48	0	0	240	20	1.000	0.964	1.000
AZ	Mar01	258	258	250	33	250	69	243	69	0	0	243	33	1.000	0.972	1.000
AZ	Apr01	347	347	256	40	256	90	244	90	0	0	244	40	1.000	0.953	1.000
SD	Dec00	1140	1106	208	213	208	591	196	591	0	0	196	213	0.970	0.942	1.000
SD	Jan01	95	20	211	16	211	16	196	6	0	0	196	6	0.211	0.929	0.375
SD	Feb01	190	155	218	30	218	30	196	6	0	0	196	6	0.816	0.899	0.200
SD	Mar01	190	155	218	30	218	30	196	6	0	0	196	6	0.816	0.899	0.200
SD	Apr01	285	255	233	38	233	38	206	31	0	0	206	22	0.895	0.884	0.816
SHS	Dec00	3479	3390	629	520	629	1207	584	1183	0	20	584	487	0.974	0.928	0.997
SHS	Jan01	283	208	636	41	636	53	588	40	1	2	588	28	0.735	0.926	0.784
SHS	Feb01	561	526	649	74	649	113	595	85	0	3	595	45	0.938	0.917	0.773
SHS	Mar01	752	717	652	98	652	151	599	118	0	6	599	65	0.953	0.919	0.814
SHS	Apr01	1038	1008	677	123	677	193	615	174	0	9	615	94	0.971	0.908	0.946

05/03/2001

 # EVENTS IDENTIFIED: This is the total number of CVD EVENTS (there may be multiple events per participant) and total number of reported deaths (this number will match the number of participant deaths) that need to be abstracted. Included here can be events of hospitalization for which the reason is unknown prior to checking the record.

 # ABSTRACTED: This is the total number of potential events for which abstracts have been completed.

FORWARDED PACKETS: These are the total numbers of mortality and morbidity packets, which have been forwarded for panel review. These numbers are used to track the work-loads and completion rates of the review panels.

1.5 GENERAL GUIDELINES FOR PROCESSING MORTALITY AND MORBIDITY PACKETS

Mortality and morbidity packets are assembled by the M&M Coordinators in each field center according to the checklists provided in Appendix C below. All mortality packets are forwarded to Dr. Maurice Sievers at the Arizona center. After review by Dr. Sievers, the original non-stroke mortality packet, *excluding* Dr. Sievers' decision form, is forwarded to the next member of the Mortality Review Panel listed on the assignment sheet provided by the Coordinating Center. Thus, all deaths are reviewed by two members of the Mortality Review Committee, one of whom is always Dr. Sievers. Discrepancies between the 1st and 2nd reviewers are identified by the Coordinating Center. In instances when both reviewers determine the death to be non-CVD, but the assigned causes differ, Dr. Sievers' decision will be taken as the cause of death. For those cases in which one of the two reviewers assigns a CVD cause or when there is a discrepancy in type of CVD, the chart will be forwarded for mortality adjudication. Dr. James Howard and the adjudicators will have the results of the other two reviews available to them so that the process in Phase V is consistent with that used in Phases I through IV. All fatal events judged to be strokes by Dr. Sievers will be directly forwarded to Dr. Jorge Kizer at Cornell Medical Center, Division of Cardiology New York-Presbyterian Hospital but not to the next member of the Mortality Review Panel.

Lists of reviewers for morbidity packets are provided to each center by the Coordinating Center for forwarding morbidity packets to members of the Morbidity Review Committee on a prescribed, alternating schedule. All non-stroke morbidity packets will be forwarded to Morbidity Review Committee members. Suspected non-fatal stroke events (without any other event of interest to the SHS) abstracted by the M&M coordinator in each field center are forwarded to Dr. Jorge Kizer at Cornell Medical Center, Division of Cardiology New York-Presbyterian Hospital for review by him but not to the other members of Morbidity Review Committee. Participants with suspected non-fatal stroke events plus other events of interest will have their charts abstracted, the stroke portion forwarded to Dr. Kizer and the non-stroke events forwarded to the next member on the list of the Morbidity Review Panel.

A complete listing of the members of each of the physician review panels is given in Volume 1, Appendix 4, M&M Review Committee, of this manual.

When either a set of mortality or morbidity packets are forwarded by the field to the reviewers, the M&M Coordinator should do the following:

a. include inside the box a copy of the shipping list of the contents of the box.
b. FAX or e-mail a copy of the shipping list to the recipient and a copy to the M&M contact person at the CC (so they know what has been sent).

When preparing morbidity and mortality packets for forwarding to the physician reviewers, the guidelines below should be followed:

a. Materials are organized IN ORDER according to the photocopy checklist for that event. Multiple events should be organized IN CHRONOLOGICAL ORDER from least to most recent.

b. Include in the packet a copy of the monthly tracking sheet (provided by the CC) for the individual for whom you are doing a packet. This is because the tracking sheets include listings of all events previously reviewed and entered in the CC database and having this history is useful to the reviewers. This sheet is also intended to be useful to the field centers by providing a listing of what work has already been done for that participant.

c. All relevant information FOR A GIVEN EVENT is collected before sending the packets off for review.

d. The CC provides the reviewers with blank decision forms.

e. Reviewers contact the M&M Coordinator at the field site from which the packet was sent, if they need additional material or require clarification of something in the packet.

Specific instructions for reviewing and assigning causes of death and for documenting non-fatal CVD events are given in the next two sections of this manual.

** When packets are ready to be sent to the Coordinating Center, send the box(es) by FED EX economy service using forms provided by the Coordinating Center that include the CC account number for payment. Packets should be sent to:

Center for American Indian Health Research
University of Oklahoma Health Sciences Center
801 NE 13th Street, CHB-100
Oklahoma City, OK 73104

Attn: M&M Surveillance Coordinator
Phone No.: (405) 271-3090

CHAPTER TWO

MORTALITY SURVEILLANCE

2.1 MORTALITY SURVEILLANCE

The cohort members are monitored in an on-going fashion to identify deaths. Deaths of family study members are documented and abstracted whenever recognized by the Center staff. The following sources will be monitored on a regular basis to identify deaths in the cohort and family participants as they occur: local newspapers and community notices, community and tribal members, and IHS, tribal and BIA records. Near the end of 2009, the final year of data acquisition in Phase V, the State Health Departments will be contacted to identify death certificates in the study communities for those deaths that may have been missed using other sources. A combined list from all three centers of "missing " participants will also be sent to the National Death Index.

2.1.1. Detailed Procedures for Mortality Surveillance

a. Cohort and Family Member Mortality Surveillance (through May 31, 2009)

Of the original 4,549 members of the Phase I cohort, it is estimated that 3,000 surviving individuals are eligible for mortality surveillance for Phase V. All members of the Phase I examination cohort, regardless of whether they participated in the Phases II and III exams, are eligible for ongoing cohort mortality surveillance. Each member of the cohort will be contacted annually during Phase V to determine his/her vital status. Based on the death rates experienced thus far in the cohort, it is anticipated that collection of mortality data will be required for approximately 30-35 deaths from each center each year.

Inclusion in the mortality surveillance of SHFS members will add over 3000 new individuals from the SHFS to the mortality surveillance cohort and permit continued examination of CVD risk factors in relation to "early" events and comparisons of these factors to those associated with CVD at older ages. Focusing on age-specific risks will allow us to indirectly take into account the "relatedness" of participants from the SHFS, who will have been added to the surveillance cohort.

When a death is identified, the death certificate will be obtained and sent to the Study nosologist, Mr. Karl Wise, to be coded. All deaths will be investigated, regardless of the cause indicated on the death certificate. In order to conduct an independent, standardized review of participant deaths, the following types of information will be collected (processing forms are given in Appendix C of this volume).

1) discharge summary of the terminal hospital admission and all other admissions within one year of death
2) emergency room report and related information
3) ambulance report and any clinical notes regarding those dead on arrival

4) autopsy report (if done)
5) pathology report (if done)
6) laboratory reports from the terminal visit (or those obtained closest to the date of death) for tests relevant to the possible causes of death, including X-ray, ECG, enzymes, liver function tests, cultures, etc. For non-CVD deaths, cause-specific tests will be used.
7) consultation reports regarding diagnoses pertinent to possible causes of death
8) medical examiner, coroner reports / police reports for unattended, out-of-hospital deaths, and special tests, such as toxicology studies.
9) informant interview (see Appendices B and C of this volume) for possible CVD deaths when medical records data are not sufficient or for deaths listed as "unknown".
10) if not hospitalized in the year prior to death, copies of notes and test results from the last IHS outpatient visit (IHS records only).

The following information should be collected for specific types of non-CVD causes listed:

1) CANCER:

   a) pathology report on which the original diagnosis was based, or if not available
   b) any diagnostic reports that may help to determine the ***primary*** site of the tumor (i.e., X-ray, CT, MRI, ultrasound) or a later report with information on cell type and origin of the tumor.

2) INFECTIONS:

   a) culture results or, if not available or culture negative
   b) diagnostic serology
   c) TB or other skin test results, if relevant
   d) CBC and differential
   e) temperature record from nurses notes.

3) LIVER FAILURE OR OTHER GI CONDITION
   a) liver function tests (SGOT, Alkaline phosphatase, GGT, Bilirubin (direct and indirect), LDH, CPK, Ammonia levels)
   b) biopsy results
   c) reports of other diagnostic tests (e.g., CT, MRI, endoscopy).

4) MULTI-SYSTEM PROBLEMS -- obtain all consultant reports when the cause is not clear-cut (e.g., cancer, septic shock, gunshot wound).

5) INTENTIONAL OR UNINTENTIONAL INJURY -- Police and EMS reports, if available. Alcohol use information, including blood alcohol.

Potential CVD deaths are documented and reviewed by the SHS Mortality Review Committee. In addition, the SHS Mortality Review Committee will review the material obtained

for each non-CVD death among SHS participants according to the procedure described by Sievers, et al. Underlying and contributing causes of death will be coded. All causes of death will be coded from this review, but analyses will generally be restricted to a slightly modified list of the 15 leading causes of death (and their inclusive ICD-9 codes) used by Sievers, et al. These causes are: diseases of the heart, malignant neoplasms, cerebrovascular disease, unintentional injuries, and adverse effects, chronic obstructive pulmonary disease and allied conditions, pneumonia and influenza, diabetes mellitus, chronic liver diseases and cirrhosis, atherosclerosis, suicide, homicide and legal intervention, nephritis, nephrotic syndrome and nephrosis, septicemia, and HIV/AIDS. Each death will be coded by two members of the review committee, and discrepancies in CVD diagnosis will be adjudicated by Dr. James Howard and the Mortality Committee.

Eligible deaths outside of the study area, but within the State, are included in the review and confirmation procedure. For eligible out-of-state deaths, attempts will be made to obtain an abstract or summary from the hospital where they died, and an interview will be done with an informant concerning the circumstances of death. Local medical records for the decedent will also be reviewed.

b. Procedure

The identification and confirmation of CVD deaths will involve the following steps: (1) identification of all deaths, (2) obtaining all death certificates, (3) coding of all death certificates by the central nosologist, (4) obtaining Coroner's/Medical Examiner's report, (5) review autopsy reports, (6) chart review, and (7) independent confirmation of cause of death by the Mortality Review Committee.

STEP 1: Identification of all deaths

All deaths will be identified by each center from tribal records, IHS hospitals, BIA, State Department of Health and/or the National Death Index. The name, date of birth, date of death and place of death will be obtained for each eligible death. Persons who died out-of-state when visiting other states will be included.

STEP 2: Obtaining death certificates and reviewing charts

With the names of the decedents, dates of birth, dates of death, and places of death, copies of death certificates of all deaths will be obtained from the State Department of Health. The Death Certificate Form (see Appendix B-1 for form instructions and Appendix C for the form) will be completed by the local data abstractor and transmitted to the Coordinating Center.

STEP 3: Coding of death certificates by central nosologist

The local center will record the ID on the back of the death certificate and send only the death certificate to the central nosologist:

Mr. Karl E. Wise
36 Fox Grape Lane
Southern Shores
Kitty Hawk, NC 27949

Mr. Wise will code the death certificate of the cause of death. The corresponding Death Certificate Forms will simultaneously be sent to the Coordinating Center. Mr. Wise will, in a standardized approach using ICD 9th Revision, record the codes on the back of the death certificate and return it to the Coordinating Center. The nosologist's codes will be entered into the computer. A copy of the codes will be sent to the Study Center by the Coordinating Center.

STEP 4: Obtaining Coroner's/Medical Examiner's / Police Report

If it is indicated on the death certificate that an autopsy was performed, the autopsy report and Coroner's/Medical Examiner's Report will be obtained by each study center. Police report should also be obtained for injury deaths, if available. Photocopy the autopsy report, complete the Photocopy Checklist, attach both to the death certificate, and send the entire package to Dr. Sievers for confirmation. Dr. Sievers will fill out the autopsy report form (Appendix C) based on the cause(s) listed on the report.

STEP 5:

Review medical chart to see if the decedent was hospitalized within one year prior to death and fill out Photocopy Checklist (Appendix C). All hospital admissions between exam and death must be reviewed.

STEP 6: Confirmation of Cause of Death

a. If the decedent was hospitalized within one year prior to death, the Photocopy Checklist will be completed. The Photocopy Checklist, Mortality Survey Packet Checklist, the death certificate, the autopsy report, the Coroner's/Medical Examiner's report, and police report, if available, and relevant medical records information are sent to Dr. Sievers for confirmation. (Mortality Survey Final Decision Form, Appendix C).

b. If the decedent died prior to arrival at the hospital, upon arrival, or in any other non-hospital location (e.g., home, nursing home), and if available information is not sufficient to determine whether the death was due to a cardiovascular problem, the attending physician or nursing home staff, and an informant will be identified from the death certificate or other sources and contacted for an interview. The Informant Interview Form, and the Photocopy Checklist will be completed (Appendix C). These two forms as well as the death certificate, autopsy report, and coroner's/medical

examiner's report (if available) will be forwarded to Dr. Sievers. The Informant Interview is done for: 1) deaths that were not medically attended (traumatic or violent are excluded), and 2) those that are requested by a member of the Mortality Review Committee. Unattended deaths in persons with end-stage renal disease who have voluntarily discontinued dialysis and those occurring in persons with cancer who are in hospice care and for whom there is no suspicion of CVD do NOT require an Informant Interview. Deaths for which an autopsy was done also do NOT require an Informant Interview. If there is any question as to whether or not an interview is needed in a particular circumstance, field staff should consult with their local Mortality Review Committee physician.

c. Dr. Sievers will return the completed Final Decision Form to the Coordinating Center for data entry. All of the mortality packets will be forwarded to the next reviewer for independent classification of cause of death. Once their review is completed, their Final Decision Form and the mortality packet are forwarded to the Coordinating Center.

2.1.2 Review of Medical Charts of the Decedents

Unless the Coroner's / autopsy report is conclusive, medical records of the decedent will be reviewed and pertinent data photocopied using the Photocopy Checklist. For deaths that occurred in hospitals other than IHS hospitals, additional efforts will be made to secure medical information. If the patient was hospitalized in more than one facility without intervening discharge, all available medical records will be reviewed. Discharge summaries, ECGs, X-ray reports, etc. will be photocopied and attached to the Checklist. If the patient died in a hospital as an in-patient, data accumulated in the period of hospitalization will be reviewed. If the patient died out-of-hospital or died upon arrival at the hospital, available information in the medical records for relevant hospitalizations and outpatient visits within one year prior to death will be reviewed.

2.1.3 Informant Interview

Informant interviews are very helpful in deaths that occur outside the hospital, especially if no autopsy, coroner, or medical examiner reports are available. It is important to note that the most useful portion of the interview is that which describes what happened to the person during the last few hours (day) of his or her life. Often these descriptions of the person’s symptoms or behaviors are the best indicators of likely cause of death. Thus, this portion of the interview should be a major focus, as well as questions regarding timing of any symptoms in relation to death. Using name and address information from the death certificate, an attempt will first be made to contact and interview the spouse or a first-degree relative (i.e., parent, son, daughter, or sibling) of the decedent, or someone else who witnessed the death including nursing home staff, if applicable. The following procedure will be followed:

(1) Find the informant's telephone number and/or address.

(2) If the telephone number is available, call him/her to request permission to interview and to set up an interview appointment. The interview may be conducted over the telephone, or if necessary, in person using the Informant Interview Form.

(3) If phone contact is not possible, the local community health representative or public health nurse will be asked to assist in arranging the interview.

(4) If the informant cannot be contacted by phone or in person, a form letter, a reply letter and a self-addressed and stamped envelope will be sent asking the informant for permission for an interview and convenient time for the interview. If the form letter is sent and no reply is received in three weeks, another such letter is sent by certified mail. If no reply is received within one month, no further effort to contact the individual is made.

When the death is witnessed by someone other than a member of the decedent's family, both a family member and the witness are interviewed. In such a case, the information from both interviews is recorded on separate Informant Interview Forms. Up to three (the three best) Informant Interview Forms may be completed for a given event.

The SHS field coordinators oversee the informant interview to ensure that the staff members who conduct such interviews are appropriately trained and not overly stressed by the conduct of the interview. Informant interviewers will be trained in bereavement counseling when possible, and the SHS center coordinator will debrief the interviewer after each interview is complete. In this way, SHS staff will assist the family with bereavement, and necessary support will be provided to the interviewers, who conduct these difficult interviews.

2.1.4 Death Occurring Outside of the Study Community

Eligible deaths outside of the study area, but within the State, will be included in the above review and confirmation procedure. For eligible out-of-state deaths, attempts will be made to obtain an abstract or summary from the hospitals where they died and, if these cannot be obtained, to interview an informant. Their local medical charts will also be reviewed.

2.2 DEFINITIONS OF CVD DEATHS

The following will be the primary events of interest:

(1) Definite fatal myocardial infarction (MI)
(2) Definite sudden death due to coronary heart disease (CHD)
(3) Definite fatal CHD
(4) Possible fatal CHD
(5) Definite fatal stroke
(6) Possible fatal stroke
(7) Definite fatal congestive heart failure (CHF)
(8) Possible fatal CHF
(9) Other fatal CVD

Criteria used for ascertaining the primary CVD deaths are the International Diagnostic criteria for acute myocardial infarction and acute stroke and criteria for fatal CHF of the Framingham study:

2.2.1 Definite fatal myocardial infarction (MI)

(la) Definite MI within 4 weeks of death by criteria:

1. Evolving diagnostic ECG

AND/OR

2. Diagnostic ECG and abnormal enzymes

AND/OR

3. Prolonged cardiac pain and abnormal enzymes.

OR

(lb) Acute MI diagnosed by autopsy

AND

(2) No known non-atherosclerotic or non-cardiac-atherosclerotic process that was probably lethal according to death certificate, autopsy report, hospital records, or physician records.

2.2.2 Definite sudden death due to coronary heart disease (CHD)

(1) Death witnessed as occurring within 1 hour after the onset of severe cardiac symptoms (cardiac pain - see below, shortness of breath, fainting) or within 1 hour after the subject was last seen without symptoms

AND

(2) No documentation of definite acute MI within, 4 weeks prior to death by criteria (see (l)a. in Section 2.2.1 for criteria for definite MI)

AND

(3) No known non-atherosclerotic or non-cardiac-atherosclerotic process that was probably lethal according to death certificate, autopsy report, hospital records, or physician report.

2.2.3 Definite fatal CHD

(1) Death certificate with consistent underlying or immediate cause(s) (ICD-9 codes 410-414)

AND

(2) No documentation by criteria of definite acute MI within 4 weeks prior to death

AND

(3) Criteria for sudden death not met

AND

(4) No known non-atherosclerotic or non-cardiac-atherosclerotic process or event that was probably lethal according to death certificate, autopsy report, hospital records, or physician records

AND

(5a) Previous history of MI according to relative, physician, or hospital records, or definite MI (see criteria above) or possible MI by criteria below:
(One or more of the following categories: *)

1) Equivocal enzymes and equivocal ECG (with or without pain)
2) Equivocal enzymes and diagnostic ECG (no pain)
3) Abnormal enzymes and other ECG (no pain)

4) Abnormal enzymes and equivocal ECG (no pain)
5) Abnormal enzymes alone (no pain, ECG absent or uncodeable)
6) Prolonged cardiac pain and equivocal enzymes (ECG absent or uncodeable)
7) Prolonged cardiac pain and equivocal ECG (enzymes incomplete)
8) Prolonged cardiac pain and diagnostic ECG (equivocal or incomplete enzymes)
9) Prolonged cardiac pain alone (ECG and enzymes incomplete)
10) Prolonged cardiac pain, "other" ECG, equivocal enzymes
11) Prolonged cardiac pain, "other" ECG, incomplete enzymes

OR

(5b) Autopsy reporting severe atherosclerotic-coronary artery disease or old MI without acute MI (50% proximal narrowing of two major vessels or 75% proximal narrowing of one more vessel if anatomic details given)

OR

(5c) Rapid death:

Death occurring greater than 1 and less than or equal to 24 hours after the onset of severe cardiac symptoms or after subject was last seen without symptoms.

* Definitions are given in Section 2.3.

2.2.4 Possible fatal CHD

(1) No documentation by criteria of definite acute MI within 4 weeks prior to death

AND

(2) No documentation by criteria of definite sudden death

AND

(3) No documentation by criteria of definite fatal CHD

AND

(4) Death certificate with consistent underlying or immediate cause (ICD-9 codes 410-414)

AND

(5) No known non-atherosclerotic or non-cardiac-atherosclerotic process that was probably lethal according to death certificate, autopsy report, hospital records, or physician records.

2.2.5 Definite Fatal Stroke (for definitions of stroke sub-types, see pp. II-25-II-26)

(1a) Cerebral infarction or hemorrhage diagnosed at autopsy

AND

(1b) No other disease process or event such as brain tumor, subdural hematoma, metabolic disorder, or peripheral lesion that could cause focal neurologic deficit with or without coma - according to death certificate, autopsy, hospital records, or physician records

OR

(2a) History of rapid onset (approximately minutes to hours from onset to time of maximum acute neurologic deficit) of focal neurologic deficit with or without change in state of consciousness

AND

(2b) Documentation of focal neurologic deficit by unequivocal physician or laboratory finding within 6 weeks of death with >24 hours duration of objective physician findings

AND

(2c) See list under (1b) above.

2.2.6 Possible "Undocumented" Fatal Stroke (for definitions of stroke sub-types, see pp. II-25-II-26)

(1) Death certificate with consistent underlying or immediate cause (ICD-9 codes 431-437) but neither autopsy evidence nor adequate pre-terminal documentation of the event

AND

(2) No evidence at autopsy examination of the brain, if performed, of any disease process other than cerebral infarction or hemorrhage that could cause focal neurologic signs (see (1b) above).

2.2.7 Definite Fatal CHF

Two major or one major and 2 minor criteria must be present concurrently.

Major criteria

Paroxysmal nocturnal dyspnea or orthopnea
Neck vein distention
Rales
Cardiomegaly
Acute pulmonary edema
S_3 gallop
Increased venous pressure > 16 cm water
Circulation time $\geq$ 25 seconds
Hepatojugular reflux

Minor criteria

Ankle edema
Night cough
Dyspnea on exertion
Hepatomegaly
Pleural effusion
Vital capacity reduced by one-third from predicted
Tachycardia (rate of heart $\geq$ 120/min)
Elevated B-type Natriuretic Peptide (BNP)

Major or Minor criterion

Weight loss $\geq$ 4.5 kg in 5 days in response to treatment. No known non-cardiac process, such as renal failure, leading to massive fluid overload.

2.2.8 Possible Fatal CHF

Death certificate with consistent underlying or immediate cause, but neither autopsy evidence nor adequate pre-terminal documentation of the event.

2.2.9 Other Fatal CVD

1. Definite other fatal CVD

   (1a) Autopsy evidence consistent with other CVD as cause of death

   OR

   (1b) Death certificate with consistent underlying or immediate cause

AND

(2) Adequate documentation in medical records

2. Possible other fatal CVD

Death certificate with consistent underlying or immediate cause, but does not satisfy any of the above criteria.

2.3 DEFINITION OF ABNORMAL ECG, ABNORMAL ENZYMES, PROLONGED CHEST PAIN, AND STROKE TYPES

2.3.1 Abnormal ECG

1. Evolving Diagnostic ECG

An evolving pattern on serial ECGs of a diagnostic ECG. (An evolving pattern of changes [appearance or disappearance within lead groups: anterior (V_1 -V_5); lateral (I, aV_L , V_6); or inferior (II, III, aV_F)] establishes the infarct as acute. Two or more ECG recordings during the hospitalization are needed for this classification.)

To qualify as a Q wave, deflection should be at least 0.1 mV (1 mm.) in amplitude.

Possibilities:

a. No Q wave in one ECG record followed by a record with a diagnostic Q wave.

OR

b. An equivocal Q wave and no major ST segment depression in one ECG followed by a record with a diagnostic Q wave PLUS a major ST segment depression.

OR

c. An equivocal Q wave and no ST segment elevation in one ECG record followed by a record with a diagnostic Q wave PLUS ST segment elevation > 1 mm.

OR

d. An equivocal Q wave and no major T wave inversion in one ECG record followed by a record with a diagnostic Q wave PLUS a major T wave inversion.

OR

e. No Q wave and no ST Junction depression $\geq$ 0.5 mm. and flat or down-sloping ST segment depression followed by a record with an equivocal Q wave PLUS ST Junction and flat or down-sloping ST depression of 0.5 mm.

OR

f. No Q wave and no ST elevation > 1 mm. followed by a record with an equivocal Q wave PLUS ST elevation > 1 mm.

OR

g. No Q wave and no T wave findings diagnostic of infarction followed by a record with an equivocal Q wave PLUS T wave findings diagnostic of infarction.

2. DIAGNOSTIC ECG WITH Q WAVE

   a. Diagnostic Q and QS patterns.

3. DIAGNOSTIC ECG WITHOUT Q WAVE

   a. ST segment elevation PLUS T wave depression indicative of infarction. (T wave depression cannot be used in the presence of ventricular conduction defects.)

4. EQUIVOCAL ECG WITH Q WAVE

   a. ECG with Q and QS pattern possibly representing infarction.

5. EQUIVOCAL ECG WITHOUT Q WAVE

   a. ST junction (J) and segment depression or T wave inversions or ST segment elevations possibly representing infarction.

6. OTHER

   a. All other findings, including normal.

7. UNCODEABLE ECG

   a. Missing Leads
   b. Baseline drift (1 in 20) if it obscures ST-T segment.
   c. Muscle tremor giving 2 mm peak-to-peak oscillation.
   d. Other technical errors making Q wave measurements impossible.
   e. Major abnormal QRS conduction patterns (BBB, pacer, etc.)

2.3.2 Abnormal Enzymes

To be able to be used to evaluate an MI, enzymes must have been measured within 1-4 days of admission or onset of acute event, whichever is later.

1. Abnormal Cardiac Enzymes

Enzymes are classed as "abnormal" if any appropriately-timed enzyme values meet any of the following criteria:

1) Troponin is ≥ 2 times the upper limit of the normal range used by the lab at which the test was done or it is reported as “abnormal”.

OR

2a) CK-MB is "present" (if laboratory uses the criterion of "present" or "absent" without reporting a more specific value) or the CK-MB (heart fraction) is at least twice the upper limits of normal (if hospital uses quantitative criteria) or 10% of the total CK value, and total CK is at least twice the upper limit of normal.

AND

2b) There is no known non-ischemic cause (cardiac surgery, severe muscle trauma, rhabdomyolysis) for the elevated enzyme value.

OR

3a) The ratio $LDH_1 : LDH_2 > 1$

AND

3b) There is no evidence of hemolytic disease.

OR

4a) Total CK and LDH are both at least twice the upper limits of normal. (These increases do not have to occur on the same day.)

AND

4b) There is no known non-ischemic cause (cardiac surgery, severe muscle trauma, rhabdomyolysis) for the elevated enzyme value and no evidence of hemolytic disease.

2. Equivocal Cardiac Enzyme

Enzymes are classed as "equivocal" if the criteria for abnormal are not met and if:

1) Either total CK or total LDH are at least twice the upper limits of normal.

OR

2) Both total CK and total LDH are between the upper limits of normal and twice the upper limits of normal. (These increases do not have to occur on the same day.)

OR

3) CK-MB= 5-9% of total CK or is "weakly present".

A summary of the enzyme diagnostic criteria, as related to total CK and LDH is given in the following algorithm:

	Twice Upper Limit of Normal	*Equivocal*	*Equivocal*	**Abnormal**
TOTAL LDH	Upper Limit of Normal	Normal	*Equivocal*	*Equivocal*
	Normal	Normal	Normal	*Equivocal*
		Normal	Upper Limit of Normal	Twice Upper Limit of Normal
			TOTAL CK	

2.3.3 Prolonged Cardiac Pain

Pain having the following characteristics: Occurring anywhere in the antrior chest, left arm or jaw, which may also involve the back, shoulder, right arm, or abdomen on one or both sides and lasting for more than 20 minutes.

2.3.4 Stroke Types (See Petty GW et al. *Stroke* 2000;31:1062-1068 and Broderick JP et al. *Stroke* 1992;23:1250-1256.)

2.3.4.1 Cerebral Infarction

2.3.4.1.1 Cardioembolic Stroke

Defined by the presence of one or more major cardiac sources of embolism, or of a condition consistent with a cardioembolic etiology: (1) congestive heart failure at stroke onset; (2) myocardial infarction within 2 months prior to stroke onset; (3) hemodynamically significant mitral valve disease; (4) prosthetic mitral or aortic valve; (5) atrial fibrillation or flutter; (6) cardiomyopathy; (7) congenital heart disease; (8) recent systemic arterial emboli; (9) stroke within 48 hours after coronary artery bypass surgery; (10) stroke within 48 hours after left ventricular aneurysm surgery; (11) stroke related to cardiac catheterization or pacemaker implantation; (12) left ventricular aneurysm; (13) intracardiac thrombus; (14) valvular vegetations; (15) sick sinus syndrome; 16) autopsy evidence of recent myocardial infarction that could be dated at the time of or before the stroke; (17) autopsy evidence of rheumatic heart disease; (18) autopsy or imaging (arteriography, magnetic resonance angiography, computed tomography angiography) evidence of recent systemic arterial emboli that could be dated at the time of or before the stroke; and (19) autopsy or imaging (arteriography, magnetic resonance angiography, computed tomography) evidence of embolic occlusion of an intracerebral vessel with little or no evidence of cervical or intracranial atherosclerotic disease.

2.3.4.1.2 Atherothrombotic Stroke

Characterized by the presence of occlusion or a $\geq$ 50% stenosis of a cervicocephalic artery (carotid, vertebral, basilar, middle cerebral, anterior cerebral, or posterior cerebral) supplying the vascular territory of the stroke, as documented by ultrasound, transcranial Doppler, oculopneumoplethysmography, cerebral angiography, magnetic resonance angiography, computed tomography angiography or autopsy.

2.3.4.1.3 Lacunar Stroke

Classified based on the presence of a clinical syndrome consisting of pure motor stroke, pure sensorimotor stroke, pure sensory stroke, ataxic hemiparesis, or clumsy hand-dysarthria. Brain CT or MRI demonstrates either no lesion to explain the syndrome or a deep ischemic stroke, $\leq$ 15 mm in size, in a location consistent with the clinical syndrome.

2.3.4.1.4 Other, Unknown Infarction

Cerebral infarction defying classification into any of the above categories. This includes cryptogenic infarction, i.e., infarction of uncertain cause despite a thorough evaluation or

because the evaluation is incomplete; infarction in the setting of competing potential etiologies (e.g., a 70% ipsilateral carotid stenosis in the presence of left ventricular thrombus); and infarction attributable to uncommon etiologies, such as vasculitis, fibromuscular dysplasia, etc.

2.3.4.2 Intracerebral (Intraparenchymal) Hemorrhage

The acute onset of focal neurological deficit possibly associated with headache, vomiting, altered level of consciousness, signs of meningeal irritation, or blood stained CSF. If performed, CT, MRI, or autopsy will demonstrate a parenchymal hemorrhage. Rupture of a lesion resulting in parenchymal hemorrhage, which is not associated with hemorrhage into the subarachnoid space, is classified as an intracerebral hemorrhage. Intraparenchymal hemorrhage extending into the subarachnoid space is also classified as an intracerebral hemorrhage.

2.3.4.3 Subarachnoid Hemorrhage

The abrupt onset of headache, with or without altered consciousness, and with associated signs of meningeal irritation. A focal neurologic deficit may develop acutely or with a delay of hours or days after the other criteria have been present. CT, MRI, CSF examination, or autopsy will show blood in the subarachnoid space. A subarachnoid hemorrhage is one that is confined to the subarachnoid space. Imaging studies or autopsy may show an intraparenchymal hemorrhage that occurred either at or after the onset of primary subarachnoid hemorrhage. Intraparenchymal hemorrhage extending into the subarachnoid space is classified as an intracerebral hemorrhage.

2.3.4.4 Transient Ischemic Attack

A transient ischemic attack (TIA) is an episode of focal neurological symptoms with abrupt onset and rapid resolution lasting less than 24 hours and due to altered circulation to a limited region of the brain. Transient visual disturbances associated with retinal ischemia will be excluded. Transient symptoms such as syncope, unexplained unconsciousness, dizziness, or wooziness will be excluded unless associated with other symptoms of brainstem ischemia. Symptoms such as vertigo, dysarthria, or diplopia, which occur in isolation without other symptoms of brainstem ischemia are excluded. The diagnosis of TIA is a clinical one; results of neuroimaging studies are recorded but do not affect the diagnosis of TIA.

2.4 MORTALITY SURVEY FORMS (see Appendix C)

1. **Mortality Survey Death Certificate Form**: This form codes relevant information directly from the death certificate.

2. **Final Decision Form I - Autopsy Report Form:** This form is designed to capture the underlying cause of death as designated by the pathologist, medical examiner or coroner when an autopsy has been performed. The form is completed by Dr. Sievers when an autopsy report accompanies the mortality packet. The form is completed by transcribing the relevant information from the autopsy report, and does not involve decision-making.

3. **Photocopy Checklist for Medical Records Review - Mortality Surveillance - CVD and Non-CVD:** This check list is intended to assist the field staff in collecting the appropriate medical records information for review of the cause of death in SHS participants. It also serves as a computerized record of the materials collected to support the mortality review for each event. The form is completed by the field staff collecting information on a SHS death.

4. **Mortality Survey - Final Decision Form:** This form records the judgment of the SHS Mortality Review Committee member as to the underlying and contributory causes of death. The form is completed independently by two reviewers for each SHS participant death. Completed forms are forwarded to the Coordinating Center for data entry and review to identify discrepancies in assigned causes.

   SPECIAL COMMENTS:

   Assigning Codes for Causes of Death - Section A of the Final Decision Form includes codes for the underlying cause of death (only 1 is allowed) and for up to 2 contributing causes. Codes 01 through 09 are used for CVD and codes 21 through 33 are used for major, non-CVD causes. Code 88 should be used to designate a cause other than those listed, and the exact "other" cause should be printed in the space provided. Code 99 is used to designate death due to indeterminate causes. When a vascular disease was a contributory cause of death, the code associated with a "definite" occurrence should be used, i.e., codes 01, 03, 05 or 07.

   The remainder of the form is used to indicate the types of evidence on which the designation of CVD was based. For non-CVD deaths, up to 3 evidence codes are provided to record the type of information on which the decision regarding cause of death was based.

5. **Mortality Survey Packet Checklist:** This form is used by the field staff to organize materials for the mortality packets prior to forwarding the packet to Dr. Sievers for review.

5. **Master List of Hospitalizations and Outpatient Visits:** This form (see Appendix D) is used by the field staff to record both in-patient and out-patient visits for which the medical records need to be reviewed. This would include any event of interest to the SHS or may be used by the centers to keep a log of all hospitalizations or outpatient visits. The intent of the form is to be useful to the field staff for organizing the events that require review for any given participant.

CHAPTER THREE

MORBIDITY SURVEILLANCE

3.1 ELIGIBLE POPULATION

Cardiovascular morbidity will be identified among surviving SHS cohort members in the three study areas through annual contacts or review of medical records, and through interviews of the participants at their Phase V examination of cohort members of the family study. Events of interest are those occurring since the SHS-III examination (or the most recent chart review if that was the last contact). Some prior events that were inadvertently missed may also be picked up in Phase IV.

The occurrence of non-fatal events in the SHFS non-cohort participants since their Phase IV examinations (or Phase III pilot exam if a pilot family participant did not return for the Phase IV exam) will also be ascertained at the time of the Phase V re-examination by means of a physical examination, ECG, and history and through review of the participants' medical records covering the time period between the Phase IV (or Phase III pilot exam) and Phase V examinations.

3.2 SURVEILLANCE EVENTS

Tables 1.1 and 1.2 (above) summarize the primary and secondary CVD endpoints of interest in the SHS. All potentially eligible events will be reviewed whether they were treated on an in-patient or out-patient basis. Outcomes include selected positive tests for atherosclerosis.

Criteria used for defining acute myocardial infarction and stroke have been derived primarily from the International Diagnostic Criteria. The criteria for "diagnostic" cardiac enzymes are those of ARIC and the International Diagnostic Criteria.

3.3 DIAGNOSTIC CRITERIA: NON-FATAL MYOCARDIAL INFARCTION

3.3.1 Definite Non-Fatal MI

Must meet one or more of the following criteria:

1. Evolving diagnostic ECG (defined in Section 2.3.1);

   OR

2. Diagnostic ECG and abnormal enzymes (defined in Sections 2.3.1 and 2.3.2);

   OR

3. Prolonged cardiac pain (defined in Section 2.3.3) and abnormal enzymes.

3.3.2 Possible Non-Fatal MI

Must meet one or more of the following criteria in the absence of findings that meet the criteria for Definite Non-Fatal MI:

1. Equivocal enzymes and equivocal ECG (with or without pain)
2. Equivocal enzyme and diagnostic ECG (no pain)
3. Abnormal enzymes and other ECG (no pain)
4. Abnormal enzymes and equivocal ECG (no pain)
5. Abnormal enzymes alone (no pain, ECG absent or uncodeable)
6. Prolonged cardiac pain and equivocal enzymes (ECG absent or uncodeable)
7. Prolonged cardiac pain and equivocal ECG (enzymes incomplete)
8. Prolonged cardiac pain and diagnostic ECG (equivocal or incomplete enzymes)
9. Prolonged cardiac pain alone (ECG and enzymes incomplete)
10. Prolonged cardiac pain, "other" ECG, equivocal enzymes
11. Prolonged cardiac pain, "other" ECG, incomplete enzymes

3.3.3 Definite Coronary Heart Disease (CHD)

1. Cardiac cath proven coronary artery disease, ***or***
2. PTCA, ***or***
3. Coronary artery bypass grafting, ***or***
4. Abnormal stress ECG, **and** Abnormal imaging, ***or***
5. Positive functional test of ischemia (such as treadmill)

3.3.4 Possible Coronary Heart Disease

Meets some, but not met all, criteria for definite CHD or test results are equivocal.

3.3.5 Other Non-fatal CVD

1. Congestive Heart Failure (CHF)
2. CHF secondary to ESRD (ESRD diagnosis=10)
3. Cardiomyopathy
4. Valvular Heart Disease
5. Left ventricular Hypertrophy
6. Atrial Fibrillation
7. Non-coronary heart surgery or carotid or other vascular surgery (includes procedures for Peripheral Vascular Disease (PVD))
8. Pacemaker implantation
9. Positive non-coronary angiography (includes procedures for PVD)
10. Arrhythmia

11. Angina pectoris (Class 2 chest pain, or relieved by nitroglycerides; otherwise, diagnosis=07)

3.3.6 End Stage Renal Disease

1. Kidney dialysis
2. Kidney transplantation

3.3.7 ECG Tracings to be Photocopied

The following ECG tracings are to be photocopied:

1. The last ECG obtained prior to this admission.

2. The first ECG recorded after admission or the occurrence of an in-hospital event.

3. The first ECG done each day thereafter, and

4. The last ECG recorded before discharge.

The photocopies of ECGs should be dated according to the date and time the ECG was done, and they should be arranged in chronological order from earliest to latest.

A summary of the diagnostic criteria for hospitalized, non-fatal myocardial infarction used in the Strong Heart Study is given in Table 3.1 below.

Table 3.1 Summary of Diagnostic Criteria for Hospitalized, Non-Fatal Myocardial Infarction (MI)

Cardiac Pain	ECG Findings	Enzymes	Diagnosis
Present	Evolving Diagnostic ECG	Abnormal	Definite MI
		Equivocal	Definite MI
		Incomplete	Definite MI
		Normal	Definite MI
	Diagnostic ECG	Abnormal	Definite MI
		Equivocal	Possible MI
		Incomplete	Possible MI
		Normal	No MI
	Equivocal ECG	Abnormal	Definite MI
		Equivocal	Possible MI
		Incomplete	No MI
		Normal	No MI
	Absent, Uncodeable, or other	Abnormal	Definite MI
		Equivocal	Possible MI
		Incomplete	No MI
		Normal	No MI
Not present	Evolving Diagnostic ECG	Abnormal	Definite MI
		Equivocal	Definite MI
		Incomplete	Definite MI
		Normal	Definite MI
	Diagnostic ECG	Abnormal	Definite MI
		Equivocal	Possible MI
		Incomplete	No MI
		Normal	No MI
	Equivocal ECG	Abnormal	Possible MI
		Equivocal	Possible MI
		Incomplete	No MI
		Normal	No MI
	Absent, Uncodeable, or other	Abnormal	Possible MI
		Equivocal	No MI
		Incomplete	No MI
		Normal	No MI

3.4 DIAGNOSTIC CRITERIA: NON-FATAL STROKE

3.4.1 Definite Non-Fatal Stroke (for definitions of stroke sub-types, see pp. II-42-II-43)

1. History of rapid onset (approximately minutes to hours from onset to time of maximum acute neurologic deficit) of focal neurologic deficit with or without a change in state of consciousness

AND

2. Documentation of focal neurologic deficit by unequivocal physician or laboratory finding within 6 weeks of onset with 24 hours duration of objective physician findings

AND

3. No other disease process or event such as brain tumor, sub-dural hematoma, metabolic disorder, or peripheral lesion that could cause focal neurologic deficit with or without coma according to hospital records.

3.4.2 Possible Non-Fatal Stroke (for definitions of stroke sub-types, see pp. II-42-II-43)

1a. History of rapid onset (approximately minutes to hours from onset to time of maximum acute neurologic deficit) of focal neurologic deficit with or without change in state of consciousness,

AND

1b. Documentation of focal neurologic deficit by unequivocal physician or laboratory finding within 6 weeks of onset with 24 hours duration of objective physician findings,

OR

1c. Discharge diagnoses with consistent primary or secondary codes (ICD-9-CM codes 431, 432, 434, 436, 437),

AND

2. No evidence by unequivocal physician or laboratory findings of any other disease process or event causing focal brain deficit or coma other than cerebral infarction or hemorrhage according to hospital records.

3.4.3 Unequivocal Laboratory Findings (for definitions of stroke sub-types, see pp. II-42-II-43)

1. A computerized axial tomography (CAT) scan showing no definite findings of any disease process or event causing focal brain deficit or coma other than cerebral infarction or hemorrhage,

AND

2a. Showing a focal area of decreased or normal attenuation consistent with cerebral infarct,

OR

2b. Showing focal increased attenuation consistent with intra-cerebral hemorrhage.

A summary of the diagnostic criteria for hospitalized, non-fatal stroke used in the Strong Heart Study is given in Table 3.2 below (for definitions of stroke sub-types, see pp. II-42-II-43).

Table 3.2 Summary of Diagnostic Criteria for Hospitalized, Non-Fatal Stroke

Diagnostic Evidence	Onset/Duration Neuro. Deficit	Other Causes	Diagnosis
Unequivocal physician or laboratory	Rapid/ > 24 hr.	Absent	Definite Stroke
Discharge Diagnoses of Stroke (431, 432, 434, 436, 437)	Rapid/ > 24 hr.	Absent	Possible Stroke
All other combinations			No Stroke

3.5 DEFINITE CHF

Two major or one major and 2 minor criteria must be present concurrently.

Major criteria

Paroxysmal nocturnal dyspnea or orthopnea
Neck vein distention
Rales
Cardiomegaly
Acute pulmonary edema
S_3 gallop
Increased venous pressure > 16 cm water
Circulation time $\geq$ 25 seconds
Hepatojugular reflux

Minor criteria

Ankle edema
Night cough
Dyspnea on exertion
Hepatomegaly
Pleural effusion
Vital capacity reduced by one-third from predicted
Tachycardia (rate of $\geq$ 120/min)
Elevated B-type Natriuretic Peptide (BNP)

Major or Minor criterion

Weight loss $\geq$ 4.5 kg in 5 days in response to treatment. No known non-cardiac process leading to massive fluid overload such as renal failure.

Congestive heart failure that occurs secondary to ESRD should be entered as such in item 4.b. but coded as “non-CVD, specify:”, code “10" in part A.

3.6 ABNORMAL ECG

1. Evolving Diagnostic ECG

An evolving pattern on serial ECGs of a diagnostic ECG. (An evolving pattern of changes [appearance or disappearance within lead groups: anterior (V_1 -V_5); lateral (I, aV_L, V_6); or inferior (II, III, aV_F)] establishes the infarct as acute. Two or more ECG recordings during the hospitalization are needed for this classification.)

To qualify as a Q wave, deflection should be at least 0.1 mV (1 mm.) in amplitude.

Possibilities:

a. No Q wave in one ECG record followed by a record with a diagnostic Q wave.

OR

b. An equivocal Q wave and no major ST segment depression in one ECG followed by a record with a diagnostic Q wave PLUS a major ST segment depression.

OR

c. An equivocal Q wave and no ST segment elevation in one ECG record followed by a record with a diagnostic Q wave PLUS ST segment elevation > 1 mm.

OR

d. An equivocal Q wave and no major T wave inversion in one ECG record followed by a record with a diagnostic Q wave PLUS a major T wave inversion.

OR

e. No Q wave and no ST Junction depression $\geq$ 0.5 mm. and flat or down-sloping ST segment depression followed by a record with an equivocal Q wave PLUS ST Junction and flat or down-sloping ST depression of 0.5 mm.

OR

f. No Q wave and no ST elevation > 1 mm. followed by a record with an equivocal Q wave PLUS ST elevation > 1 mm.

OR

g. No Q wave and no T wave findings diagnostic of infarction followed by a record with an equivocal Q wave PLUS T wave findings diagnostic of infarction.

2. DIAGNOSTIC ECG WITH Q WAVE

a. Diagnostic Q and QS patterns.

3. DIAGNOSTIC ECG WITHOUT Q WAVE

a. ST segment elevation PLUS T wave depression indicative of infarction. (T wave depression cannot be used in the presence of ventricular conduction defects.)

4. EQUIVOCAL ECG WITH Q WAVE

a. ECG with Q and QS pattern possibly representing infarction.

5. EQUIVOCAL ECG WITHOUT Q WAVE

a. ST junction (J) and segment depression or T wave inversions or ST segment elevations possibly representing infarction.

6. OTHER

a. All other findings, including normal.

7. UNCODEABLE ECG

a. Missing Leads
b. Baseline drift (1 in 20) if it obscures ST-T segment.
c. Muscle tremor giving 2 mm peak-to-peak oscillation.
d. Other technical errors making Q wave measurements impossible.
e. Major abnormal QRS conduction patterns (BBB, pacer, etc.)

3.7 ABNORMAL ENZYMES

To be able to be used to evaluate an MI, enzymes must have been measured within 1-4 days of admission or onset of acute event, whichever is later.

1) Troponin is ≥ 2 times the upper limit of the normal range used by the lab at which the test was done or it is reported as “abnormal”.

OR

2a) CK-MB is "present" (if laboratory uses the criterion of "present" or "absent" without reporting a more specific value) or the CK-MB (heart fraction) is at least twice the upper limits of normal (if hospital uses quantitative criteria) or 10% of the total CK value, and total CK is at least twice the upper limit of normal.

AND

2b) There is no known non-ischemic cause (cardiac surgery, severe muscle trauma, rhabdomyolysis) for the elevated enzyme value.

OR

3a) The ratio $LDH_1 : LDH_2 > 1$

AND

3b) There is no evidence of hemolytic disease.

OR

4a) Total CK and LDH are both at least twice the upper limits of normal. (These increases do not have to occur on the same day.)

AND

4b) There is no known non-ischemic cause (cardiac surgery, severe muscle trauma, rhabdomyolysis) for the elevated enzyme value and no evidence of hemolytic disease.

2. Equivocal Cardiac Enzyme

Enzymes are classed as "equivocal" if the criteria for abnormal are not met and if:

1) Either total CK or total LDH are at least twice the upper limits of normal.

OR

2) Both total CK and total LDH are between the upper limits of normal and twice the upper limits of normal. (These increases do not have to occur on the same day.)

OR

3) CK-MB= 5-9% of total CK or is "weakly present".

A summary of the enzyme diagnostic criteria, as related to total CK and LDH is given in the following algorithm:

	Twice Upper Limit of Normal	*Equivocal*	*Equivocal*	**Abnormal**
TOTAL LDH	Upper Limit of Normal	Normal	*Equivocal*	*Equivocal*
	Normal	Normal	Normal	*Equivocal*

Normal	Upper Limit of Normal	Twice Upper Limit of Normal

TOTAL CK

3.8 PROLONGED CARDIAC PAIN

Pain having the following characteristics: Occurring anywhere in the anterior chest, left arm or jaw, which may also involve the back, shoulder, right arm, or abdomen on one or both sides and lasting for more than 20 minutes.

3.9 STROKE TYPES (See Petty GW et al. *Stroke* 2000;31:1062-1068 and Broderick JP et al. *Stroke* 1992;23:1250-1256.)

3.9.1 Cerebral Infarction

3.9.1.1. Cardioembolic Stroke

Defined by the presence of one or more major cardiac sources of embolism, or of a condition consistent with a cardioembolic etiology: (1) congestive heart failure at stroke onset; (2) myocardial infarction within 2 months prior to stroke onset; (3) hemodynamically significant mitral valve disease; (4) prosthetic mitral or aortic valve; (5) atrial fibrillation or flutter; (6) cardiomyopathy; (7) congenital heart disease; (8) recent systemic arterial emboli; (9) stroke within 48 hours after coronary artery bypass surgery; (10) stroke within 48 hours after left ventricular aneurysm surgery; (11) stroke related to cardiac catheterization or pacemaker implantation; (12) left ventricular aneurysm; (13) intracardiac thrombus; (14) valvular vegetations; (15) sick sinus syndrome; 16) autopsy evidence of recent myocardial infarction that could be dated at the time of or before the stroke; (17) autopsy evidence of rheumatic heart disease; (18) autopsy or imaging (arteriography, magnetic resonance angiography, computed tomography angiography) evidence of recent systemic arterial emboli that could be dated at the time of or before the stroke; and (19) autopsy or imaging (arteriography, magnetic resonance angiography, computed tomography) evidence of embolic occlusion of an intracerebral vessel with little or no evidence of cervical or intracranial atherosclerotic disease.

3.9.1.2. Atherothrombotic Stroke

Characterized by the presence of occlusion or a $\geq$ 50% stenosis of a cervicocephalic artery (carotid, vertebral, basilar, middle cerebral, anterior cerebral, or posterior cerebral) supplying the vascular territory of the stroke, as documented by ultrasound, transcranial Doppler, oculopneumoplethysmography, cerebral angiography, magnetic resonance angiography, computed tomography angiography or autopsy.

3.9.1.3. Lacunar Stroke

Classified based on the presence of a clinical syndrome consisting of pure motor stroke, pure sensorimotor stroke, pure sensory stroke, ataxic hemiparesis, or clumsy hand-dysarthria. Brain CT or MRI demonstrates either no lesion to explain the syndrome or a

deep ischemic stroke, ≤ 15 mm in size, in a location consistent with the clinical syndrome.

3.9.1.4. Other, Unknown Infarction

Cerebral infarction defying classification into any of the above categories. This includes cryptogenic infarction, i.e., infarction of uncertain cause despite a thorough evaluation or because the evaluation is incomplete; infarction in the setting of competing potential etiologies (e.g., a 70% ipsilateral carotid stenosis in the presence of left ventricular thrombus); and infarction attributable to uncommon etiologies, such as vasculitis, fibromuscular dysplasia, etc.

3.9.2 Intracerebral (Intraparenchymal) Hemorrhage

The acute onset of focal neurological deficit possibly associated with headache, vomiting, altered level of consciousness, signs of meningeal irritation, or blood stained CSF. If performed, CT, MRI, or autopsy will demonstrate a parenchymal hemorrhage. Rupture of a lesion resulting in parenchymal hemorrhage, which is not associated with hemorrhage into the subarachnoid space, is classified as an intracerebral hemorrhage. Intraparenchymal hemorrhage extending into the subarachnoid space is also classified as an intracerebral hemorrhage.

3.9.3 Subarachnoid Hemorrhage

The abrupt onset of headache, with or without altered consciousness, and with associated signs of meningeal irritation. A focal neurologic deficit may develop acutely or with a delay of hours or days after the other criteria have been present. CT, MRI, CSF examination, or autopsy will show blood in the subarachnoid space. A subarachnoid hemorrhage is one that is confined to the subarachnoid space. Imaging studies or autopsy may show an intraparenchymal hemorrhage that occurred either at or after the onset of primary subarachnoid hemorrhage. Intraparenchymal hemorrhage extending into the subarachnoid space is classified as an intracerebral hemorrhage.

3.9.4 Transient Ischemic Attack

A transient ischemic attack (TIA) is an episode of focal neurological symptoms with abrupt onset and rapid resolution lasting less than 24 hours and due to altered circulation to a limited region of the brain. Transient visual disturbances associated with retinal ischemia will be excluded. Transient symptoms such as syncope, unexplained unconsciousness, dizziness, or wooziness will be excluded unless associated with other symptoms of brainstem ischemia. Symptoms such as vertigo, dysarthria, or diplopia which occur in isolation without other symptoms of brainstem ischemia are excluded. The diagnosis of TIA is a clinical one; results of neuroimaging studies are recorded but do not affect the diagnosis of TIA.

3.10 PROCEDURE FOR IDENTIFICATION OF INCIDENT AND RECURRENT CASES

Identification of non-fatal CVD events in the SHS cohort will continue in Phase V. Participants will be contacted annually or their IHS records will be reviewed. These events include non-fatal MI or stroke and new diagnoses of congestive heart failure. Persons will also be asked whether certain treatments or diagnostic procedures were done, including cardiac bypass surgery or angioplasty, cardiac catheterization, treadmill testing, and renal dialysis or renal transplant.

Ascertainment of any non-fatal events in the SHFS non-cohort participants since their Phase IV examinations (or Phase III pilot exam if a pilot family participant did not return for the Phase IV exam) occurs at the time of the Phase V examinations.

Criteria used to define acute MI, stroke, and congestive heart failure in Phase V are the same as those previously used by the SHS. These criteria were derived primarily from the International Diagnostic Criteria, ARIC, and the Framingham Study and are described in detail previously. The criteria for 'diagnostic' cardiac enzymes used in the SHS are those of ARIC and the International Diagnostic Criteria. All available information concerning the event is reviewed by a member of the SHS Morbidity Review Committee to determine whether the study criteria have been met. Reports of cardiac surgery, angioplasty, cardiac catheterization, and treadmill testing are also validated by review of information obtained from medical records.

The morbidity survey will involve the following steps:

STEP 1: Identification of potentially eligible cases.

In order to identify persons with events that may qualify as incident cases, IHS hospital computerized medical records (PCC, patient care component) or their IHS medical records are reviewed. All screening discharge diagnoses should be reviewed (see below); in addition to tests and procedures of interest to the SHS. Other local hospitals will also be surveyed to obtain discharges for MI or stroke that may be SHS participants. Participants in the Phase V examinations will be asked if they had a CVD event of interest since their last SHS examination (Phase III pilot exam or Phase IV exam). Positive answers will be confirmed by chart review. Potential cases will be identified using the following ICD-9 codes. The list of screening codes to be used in reviewing discharge diagnoses is broader than the study event codes in order that cases not be missed.

1. MYOCARDIAL lNFARCTION (ICD-9 codes 402, 410-414, 427-428, 518.4)

402 Hypertensive heart disease
410 Acute myocardial infarction
411 Other acute and subacute forms of ischemic heart disease
411.0 Post-myocardial infarction syndrome

411.1 Intermediate coronary syndrome
411.8 Other - includes coronary insufficiency (acute), microinfarct of heart, subendocardial ischemia

412 Old myocardial infarction
413 Angina pectoris
414 Other chronic ischemic heart disease
427 Cardiac dysrhythmia

(Participants for whom *three separate admissions* that included atrial fibrillation have already been abstracted and morbidity packets forwarded for review *need NOT have additional, subsequent admissions for atrial fibrillation abstracted.* If they are admitted for <u>other</u> SHS events or procedures, these other events SHOULD be abstracted.)

428 Heart failure
428.0 Congestive heart failure
428.1 Left heart failure
428.9 Heart failure, unspecified

(Participants for whom *three separate admissions* that included congestive heart failure have already been abstracted and morbidity packets forwarded for review *need NOT have additional, subsequent admissions for congestive heart failure abstracted.* If they are admitted for <u>other</u> SHS events or procedures, these other events SHOULD be abstracted.)

518.4 Acute edema of lung, unspecified

2. CEREBROVASCULAR DISEASE (ICD-9 430-438)

430 Subarachnoid hemorrhage
431 Intracerebral hemorrhage
432 Other and unspecified intracranial hemorrhage
433 Occlusion and stenosis of precerebral arteries - includes embolism, narrowing, obstruction or thrombosis of basilar, carotid, and vertebral arteries
434 Occlusion of cerebral arteries
435 Transient cerebral ischemia
436 Acute, but ill-defined, cerebrovascular disease - includes CVA NOS, Stroke
437 Other and ill-defined cerebrovascular disease - includes cerebral atherosclerosis, chronic cerebral ischemia, hypertensive encephalopathy, cerebrovascular disease or lesion not otherwise specified.
438 Late effects of cerebrovascular disease

3. *END STAGE RENAL DISEASE (ICD-9 39.95, 54.98, 55.6, 585, 586)
(It is only necessary to identify and collect chart information for the <u>FIRST</u> time one of these diagnoses was made.)

39.95 Hemodialysis
54.98 Peritoneal dialysis

55.6 Kidney transplant
585 Chronic renal failure
586 Renal failure, unspecified

4. *CHRONIC VALVULAR HEART DISEASE (ICD-9 394-396, 424.0, 424.1)

394 Diseases of mitral valve
395 Diseases of aortic valve
396 Diseases of mitral and aortic valves
424.0 Mitral valve disorder
424.1 Aortic valve disorder

5. *AORTIC ANEURYSM (ICD-9 441.0-441.9)

6. *PROCEDURES FOR TREATMENT OF PERIPHERAL VASCULAR DISEASE

ICD-9 procedure code **88.48**	Peripheral Angiograms
ICD-9 procedure code **39.50**	Peripheral Angioplasty
ICD-9 procedure codes **39.25 & 39.29**	Peripheral Surgical Revascularization
ICD-9 procedure codes **84.10-84.19**	Amputation

* These events were added to the annual surveillance of cohort members in 2003. Retrospective surveillance for incident events only (those occurring since January 1, 2000) was done for these newly added events beginning in summer, 2003.

STEP 2: Confirmation of event occurrence

Because discharge diagnoses may be improperly recorded and a variety of associated codes will be screened, it is important to confirm that one of the events of interest has, in fact, occurred. Information in the record pertaining to the admission by which the potential case was identified (the index admission) should be reviewed. Check the discharge diagnoses listed on the face sheet of the admission and read the discharge summary. If one of the survey events has occurred during the study interval, information about the event will be photocopied from the record. If it is determined that the event is not an eligible SHS event, no information need be collected. Data should be obtained for all events of interest occurring during the study interval.

STEP 3: Medical record data collection

If the index admission is for one of the study events (whether or not it is the first occurrence), an appropriate photocopy checklist for that admission should be completed (Appendix D). If evidence is present suggesting that one or more myocardial infarctions or strokes occurred, a separate medical records abstract and checklist form will be completed for each event. Separate events must have a 28-day period when the patient is discharged from an acute care facility after a previous event. ***If the participant is a study death, the abstract of medical records for decedents should also be completed***. If the medical record is not eligible

for abstraction, the reason for exclusion (i.e., event occurred outside of the calendar years of the study, not a study event) should be entered on the master list of hospitalization and outpatient visits.

High resolution photocopies of ECGs taken as evidence of a myocardial infarction during the morbidity survey (see Section 3.3.7) should be arranged in chronological order from earliest to latest.

3.11 MORBIDITY SURVEY FORMS (see Appendix D)

1. **Morbidity Survey Medical Records Abstract and Photocopy Checklist for Non-fatal CVD Events or Procedures:** This form is to be completed for each eligible non-fatal CVD event or procedure, regardless of whether it was treated on an in-patient or out-patient basis. The checklist is used to record all of the relevant types of information that were collected from the medical record. Morbidity packets for each admission are assembled according to this listing.

2. **Morbidity Survey - Decision Form:** This form is completed by members of the Morbidity Review Committee based on information provided from medical records. Part A is used to code the type of event, and Part B is used to indicate on what evidence the decision in Part A was based. In section C the reviewer has the opportunity to indicate his/her clinical impression, even if it does not conform to the SHS criteria for an event. If more than one event occurred during a hospitalization, they can both be recorded on a single form, but the reviewer may have to add his own extra boxes in Section A and be sure to complete the "evidence" Section for each event.

3. **Morbidity Survey - Cardiovascular Test Procedures and Peripheral Vascular Procedures Abstract:** These forms are used to capture information on the results of selected tests of cardiac function and for atherosclerosis (including peripheral vascular disease) that may have been done on a SHS participant. The appropriate form is completed based on the type of test report that is photocopied from the medical record. The form is completed by the Morbidity Review physician.

3.12 ACUTE MYOCARDIAL INFARCTION (AMI) QUALITY OF CARE TOOL AND INSTRUCTIONS (see Appendix E)

1. **AMI Tool. (see Appendix E, pp. E-1 to E-8)** This is an abstraction tool for assessing quality of care for hospitalized acute myocardial infarctions that was developed by the Health Care Financing Administration (HCFA). The SHS Observational Study Monitoring Board has asked SHS to assess quality of care, and HCFA uses this AMI Quality of Care assessment tool on a nationwide basis. Thus, during Phases IV & V of SHS, the Steering Committee hopes to be able to collect sufficient data on the quality of care provided for acute MIs in SHS communities to make comparisons with national data. The SHS investigators found it necessary to modify the tool somewhat to fit the particular circumstances typical of Indian healthcare facilities.

2. **AMI Tool Instructions. (see Appendix E, pp. E-9 to E-57)** This is the instruction manual, which was also developed by HCFA and modified by the SHS investigators to reflect the changes made in the tool in adapting it for use in Indian community healthcare facilities.

CHAPTER FOUR

TRAINING & QUALITY CONTROL OF MORTALITY & MORBIDITY SURVEILLANCE

4.1 TRAINING

Interviewers and data abstractors were centrally trained at the March 2006 training meeting in Oklahoma. Training included instructions in reviewing and abstracting of charts and instructions in transcribing of information on death certificates and medical examiner reports. Training included:

1. Adherence to the standardized protocol
2. Techniques for locating information in the charts
3. Dealing with problems encountered in the charts
4. Post-abstraction responsibility for the data

The training sessions consisted of:

1. Explanation of the procedure for abstracting
2. Demonstration by the instructor of abstraction procedures
3. Performance of abstraction by the trainee with instructor observing
4. Abstraction of records by both the trainee and the instructor with verification for completeness, consistency and accuracy

4.2 QUALITY CONTROL

4.2.1 Ascertainment of Cause of Death

In the mortality study, mortality packets for all deaths are sent to a second member of the Mortality Review Committee by the Arizona Center after being reviewed by Dr. Sievers. Each reviewer will independently make a judgment as to the cause of death and fill out a Mortality Survey Final Decision. The Coordinating Center will then compare the results from both reviewers. Discrepancies for CVD deaths will be adjudicated by Dr. James Howard and the Mortality Committee. Disagreement as to non-CVD causes of death will be resolved by using Dr. Sievers' decision.

4.2.2 Review of non-fatal CVD

In order to monitor the reliability of the morbidity review process, 10 random samples of morbidity packets will be sent to all members of the Morbidity Review Committee for independent review. The distribution of diagnoses assigned by individual reviewers will be monitored quarterly by the Coordinating Center to determine whether there is any unusual clustering by reviewer that would suggest the need for re-training.

RELATED READING

1. Sievers ML. Myocardial infarction among Southwestern American Indians. Ann Int Med 1967;67:800-807.

2. The National Heart, Lung and Blood Institute, ARIC (Atherosclerosis Risk in Communities Study) Manual, 1987.

3. Brown RD, Whisnant JP, Sicks JD, O'Fallon WM, Wiebers DO. Stroke incidence, prevalence, and survival: secular trends in Rochester, Minnesota, through 1989. Stroke 1996;27:373-380.

4. Petty GW, Brown RD Jr, Whisnant JP, Sicks JD, O'Fallon WM, Wiebers DO. Ischemic stroke subtypes: a population-based study of functional outcome, survival, and recurrence. Stroke 2000 May;31(5):1062-8.

5. Broderick JP, Phillips SJ, O'Fallon WM, Frye RL, Whisnant JP. Relationship of cardiac disease to stroke occurrence, recurrence, and mortality. Stroke 1992 Sep;23(9):1250-6.

APPENDIX A

Codes

APPENDIX A -- 1

THE STRONG HEART – FAMILY STUDY
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS, PHASE V

Study Communities and Codes

Arizona Community Codes

County	Community Name	Community Code
Maricopa	Co-Op Colony	116
	Gila Crossing	119
	Komatke	124
	Laveen	125
	Lone Butte	127
	Komatke Hts.	799
	Maricope Colony	128
	Lehi	126
	Salt River	132
Pinal	Santa Cruz	231
	Blackwater	213
	Sacaton Flats	230
	Sacaton	229
	San Tan, Lower	232
	San Tan, Upper	233
	Stotonic	237
	Goodyear (South)	235
	Bapchule	212
	Casa Blanca	214
	Casa Blanca S	215
	Casa Blanca W	216
	Sacate	228
	Sweetwater	240

Dakotas Community Codes

County	Community Name	Community Code
Bennett (Pine Ridge)	Allen	526
	Harrington	527
	Martin	528
	Patricia	529
	Swett	530
	Tuthill	531
	Vetal	532
Benson (Fort Totten)	Leeds	001
	Maddock	002
	Minnewaukan	003
	Brinsmade	100
	Esmond	101
	Crow Hill	356
	Flora	357
	Fort Totten	358
	Knox	359
	Mission	360
	Oberon	361
	St. Michael D	362
	Tokio	363
	Warwick	364
	Woodlake Dis	365
Custer (Pine Ridge)	Buffalo Gap	586
	Custer	587
	Hermosa	588
	Pringle	590
Dawes (Pine Ridge)	Chadron	306
	Crawford	307
Dewey (Eagle Butte)	Agency Dist	605
	Bear Creek/Eagle Butte	606
	Eagle Butte	607
	Firesteel	608
	Four Bear/Swiftbird	609
	Glencross	610
	Green Grass/Eagle Butte	611
	Isabel	612
	Lantry	613
	Laplant/Swiftbird	614
	Marksville/Swiftbird	615
	Moreau River/Whitehorse	616
	Promise/Whitehorse	617
	Ridgeview	618

Dakotas Community Codes (cont.)

County	Community Name	Community Code
Dewey (Eagle Butte) (cont.)	Swiftbird	619
	Swiftbird JC	620
	Timber Lake	621
	Trail City	622
	White Horse	623
	Blackfoot	624
	Parade	625
Eddy (Fort Totten)	New Rockford	102
	Hamar	396
	Sheyenne	397
Fall River (Pine Ridge)	Edgemont	631
	Hot Springs	632
	Igloo	633
	Oelrichs	634
	Oral	635
	Provo	636
Haakon (Eagle Butte)	Midland	600
	Milesville	601
	Philip	602
Hughes	Big Bend	656
	Pierre	657
	Harrold	658
Jackson (Pine Ridge)	Belvidere	661
	Interior/Wanblee	662
	Kadoka/Wanblee	663
	Stamford	664
Jackson (Pine Ridge)	Hisle/Wanblee	846
	Longvalley	847
	Potato Creek	848
	Wanblee	849
Meade (Eagle Butte)	Faith	706
	Howes	707
	Sturgis	708
	Blackhawk	709
	Ft. Meade	710
	Mud Butte	711
	Piedmont	712
Nelson (Fort Totten)	Aneta	103

Dakotas Community Codes (cont.)

County	Community Name	Community Code
Nelson (Fort Totten) (cont.)	Pekin	104
	Dahlen	105
	Lakota	456
	Michigan	457
	Tolna	458
Pennington	Keystone	220
	Yellow Thunder Camp	630
	Ellsworth Air Force Base	631
	Scenic	632
	Wall	633
	Caputa	700
	Box Elder	736
	Hill City	737
	New Underwood	738
	Quinn	739
	Rapid City	740
	Sioux Addition (Lakota Homes)	741
Potter (Eagle Butte)	Gettysburg	751
	Lebanon	771
Ramsey (Fort Totten)	Starkweather	106
	Webster	107
	Churches Ferry	108
	Crary	476
	Devils Lake	477
	Doyon	478
	Lake Wood	479
Shannon (Pine Ridge)	Am Horse Cr/Kyle	771
	Batesland/Allen	772
	Calico	773
	Crazy Horse	774
	Cuny Table	775
	Denby	776
	Grass Creek/Manderson	777
	Kyle	778
	Lake	779
	Lakeside	780
	Manderson	781
	Oglala	782
	Pine Ridge	783
	Porcupine	784
	Red Shirt TA	785
	Rockyford/Porcupine	786

Dakotas Community Codes (cont.)

County	Community Name	Community Code
Shannon (Pine Ridge) (cont.)	Slim Butte	787
	White River	788
	Wolf Creek	789
	Wounded Knee/Manderson	790
	Wakfamni Lk	791
Sheridan (Pine Ridge)	Gordon	336
	Hay Springs	337
	Lakeside	338
	Rushville	339
	Whiteclay	340
Sully (Eagle Butte)	Onida	801
Walworth	Mobridge	841
Ziebach (Eagle Butte)	Bridger	866
	Cherry Creek	867
	Dupree	868
	Glad Valley	869
	Iron Lightin	870
	Red Elm	871
	Red Scaffold	872
	Thunder Butte	873

Oklahoma Community Codes

County	Community Name	Community Code
Beckham	Carter	095
	Delhi	096
	Elk City	097
	Erick	098
	Mayfield	099
	Sayre	100
	Texola	101
Blaine	Canton	104
	Eagle City	105
	Geary	106
	Greenfield	107
	Hitchcock	108
	Homestead	109
	Longdale	110
	Okeene	111
	Southard	112
	Watonga	113
Caddo	Albert	138
	Alfalfa	139
	Anadarko	140
	Apache	141
	Binger	142
	Bridgeport	143
	Carnegie	144
	Cement	145
	Cyril	146
	Eakly	147
	Fort Cobb	148
	Gracemont	149
	Hinton	150
	Hydro	151
	Lookeba	152
	Riverside Bi	153
	Washita	154
Canadian	Concho	158
	Concho Bia S	159
	Calumet	160
	El Reno	161
	Mustang	162
	Piedmont	163
	Union	164
	Yukon	165

Oklahoma Community Codes (cont.)

County	Community Name	Community Code
Carter	Ardmore	169
	Carter Semin	170
	Clemscot	171
	Fox	172
	Gene Autry	173
	Graham	174
	Healdton	175
	Lone Grove	176
	Mcman	177
	Milo	178
	Newport	179
	Pooleville	180
	Ratliff City	181
	Springer	182
	Tatums	183
	Tussy	184
	Wilson	185
	Wirt	186
	Woodford	187
Cleveland	Lexington	232
	Moore	233
	Noble	234
	Norman	235
Comanche	Cache	245
	Chattanooga	246
	Elgin	247
	Faxon	248
	Fletcher	249
	Ft. Sill BIA	250
	Geronimo	251
	Indiahoma	252
	Lawton	253
	Medicine Prk	254
	Meers	255
	Sterling	256
Cotton	Devol	260
	Randlett	261
	Temple	262
	Walters	263
Custer	Arapaho	291
	Butler	292
	Clinton	293
	Custer	294

Oklahoma Community Codes (cont.)

County	Community Name	Community Code
Custer (cont.)	Moorewood	295
	Thomas	296
	Weatherford	297
Garvin	Foster	350
	Elmore City	351
	Hennepin	352
	Lindsay	353
	Maysville	354
	Paoli	355
	Pauls Valley	356
	Pernell	357
	Stratford	358
	Wynnewood	359
Grady	Alex	363
	Amber	364
	Bradley	365
	Chickasha	366
	Cox City	367
	Minco	368
	Ninnekah	369
	Pocassett	370
	Rush Springs	371
	Tuttle	372
	Verden	373
Greer	Brinkman	390
	Granite	391
	Mangum	392
	Reed	393
	Willow	394
Harmon	Vinson	395
	Gould	397
	Hollis	398
Jackson	Altus	435
	Blair	436
	Duke	437
	Eldorado	438
	Elmer	439
	Headrick	440
	Martha	441
	Olustee	442

Oklahoma Community Codes (cont.)

County	Community Name	Community Code
Jefferson	Addington	446
	Fleetwood	447
	Grady	448
	Hastings	449
	Oscar	450
	Ringling	451
	Ryan	452
	Terral	453
	Waurika	454
Kiowa	Cooperton	495
	Gotebo	496
	Hobart	497
	Lone Wolf	498
	Mountain Prk	499
	Mountain View	500
	Roosevelt	501
	Snyder	502
Love	Burneyville	565
	Leon	566
	Marietta	567
	Orr	568
	Overbrook	569
	Rubottom	570
	Thackerville	571
McClain	Blanchard	574
	Byars	575
	Dibble	576
	Newcastle	577
	Purcell	578
	Rosedale	579
	Washington	580
	Wayne	581
Murray	Big Canyon	664
	Davis	665
	Dougherty	666
	Hickory	667
	Sulphur	668
Oklahoma	Okla City, Rur	717
	Arcardia	718
	Bethany	719
	Choctaw	720
	Edmond	721

Oklahoma Community Codes (cont.)

County	Community Name	Community Code
Oklahoma (cont.)	Harrah	722
	Jones	723
	Luther	724
	Newalla	725
	Nicoma Park	726
	Okla City, Urb	727
	Spencer	728
	Wheatland	729
	Del City	730
	Midwest City	731
Stephens	Alma	905
	Bray	906
	Comanche	907
	County Line	908
	Duncan	909
	Loco	910
	Marlow	911
	Velma	912
Tillman	Davidson	927
	Frederick	928
	Grandville	929
	Hollister	930
	Loveland	931
	Manitou	932
	Tipton	933
Washita	Bessie	965
	Burns Flat	966
	Canute	967
	Cloud Chief	968
	Colony	969
	Cordell	970
	Corn	971
	Dill City	972
	Foss	973
	Rocky	974
	Sentinel	975

APPENDIX A -- 2

THE STRONG HEART – FAMILY STUDY
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS, PHASE V

Codes for IHS Facilities by Area and Service Unit

Service Area Code	Service Unit Code	Location Code	Facility Name
		Area: Aberdeen	
Service	Unit:	Non SVC Unit	
10	00	00	Aberdeen
Service	Unit:	Rapid City	
10	09	01	Rapid Ct Gms
10	09	88	R Shirt T Hs
Service	Unit:	Cheyenne Riv	
10	10	01	Eagle Butte
10	10	31	Cherry Cr Hs
10	10	33	Red Scaff Hs
10	10	34	Swiftbird Hs
10	10	35	Whitehhors Hs
10	10	51	Cherry Cr Hs
10	10	82	Faith
10	10	88	Isabel
Service	Unit:	Ft.	Berthold
10	12	00	Newtown Fo
10	12	10	Minni – Tohe
10	12	30	Mandaree Hs
10	12	31	Twin Bute Hs
10	12	32	Wh Shield Hs
Service	Unit:	Ft. Totten	
10	13	10	Ft. Totten Hc
10	13	51	St. Michaels
Service	Unit:	Pierre	
10	14	00	Chamberln Fo
10	14	21	Pierre S – Hc
10	14	30	Ft. Thomps Hs
10	14	31	Low Brule Hs
Service	Unit:	Pine Ridge	
10	15	01	Pine R'g Ho
10	15	10	Wanblee Hc
10	15	30	Allen Hs
10	15	31	Kyle Hs
10	15	32	Manderson Hs
10	15	62	Porcupine Sc
10	15	63	Porcupine Ch

Service Area Code	Service Unit Code	Location Code	Facility Name
		Area: Aberdeen (cont.)	
Service	Unit:	Rosebud	
10	16	01	Rosebud Hosp
10	16	55	Norris Sc
10	16	59	St. Francis
10	16	61	White River
10	16	90	Parmelee
Service	Unit:	Sisset – Wahpt	
10	17	01	Sisseton Hos
10	17	22	Wahpeton Hc
Service	Unit:	Standing Rock	
10	18	01	Ft. Yates Hos
10	18	10	Mclaughln Hc
10	18	30	Bullhead Hs
10	18	31	Cannonbal Hs
10	18	33	Wakpala Hs
Service	Unit:	Turtle Mount	
10	19	01	Belcourt Hos
Service	Unit:	Omaha – Winneb	
10	20	01	Winnebago Ho
Service	Unit:	Yankton	
10	21	01	Wagner Hosp

Service Area Code	Service Unit Code	Location Code	Facility Name
		Area: Oklahoma	
Service	Unit:	Claremore	
50	52	01	Claremore Ho
50	52	14	Miami Hl Cen
Service	Unit:	Clinton	
50	53	01	Clinton Hosp
50	53	10	Watonga H. Ct
50	53	11	Concho Hc
Service	Unit:	Kansas	
50	54	10	Holton Hc
50	54	20	Haskell Hc
50	54	30	White Cloud
Service	Unit:	Lawton	
50	55	01	Lawton Hosp
50	55	10	Anadarko Hc
50	55	30	Carnegie Hc
50	55	31	Riverside Hs
Service	Unit:	Pawnee	
50	56	10	Pawhuska Hc
50	56	11	White Eag Hc
50	56	12	Pawnee Hc
50	56	13	Pawnee Benefit Package
Service	Unit:	Shawnee	
50	58	10	Shawnee H Ct
Service	Unit:	Tahlequah	
50	59	01	W.W. Hastings
Service	Unit:	Ada	
50	62	01	Carl Albrt H
50	62	11	Wewoka Hl Ct
		Area: Oklahoma Tribe/638	
Service	Unit:	Claremore	
55	52	02	Creek Nation
55	52	11	Delaware Dhc
55	52	12	Okemah H Ct
55	52	15	Indian Hlth. Res. (Tulsa)
55	52	16	Salina Hlth. Center
55	52	31	Sapulpa Hc
Service	Unit:	Shawnee	
55	58	11	Oklahoma City Clinic
55	58	12	Black Hawk Clinic
Service	Unit:	Tahlequah	
55	59	10	Eufaula Hc

Service Area Code	Service Unit Code	Location Code	Facility Name
	Area: Oklahoma Tribe/638 (cont.)		
55	59	11	Sallisaw HC
55	59	12	Dkmartin Hc
Service	Unit:	Talihina	
55	60	01	Talihina Hos
55	60	11	J. Andrsn Hc
55	60	12	Hugo Hl Ct
55	60	13	McAlester Hc
Service	Unit:	Ada	
55	62	10	Tishomingo
55	62	12	Ardmore Hc
Service	Unit:	Eagle Pass	
55	63	00	Eagle Pass

Service Area Code	Service Unit Code	Location Code	Facility Name
		Area: Phoenix	
Service	Unit:	Keams Canyon	
60	62	01	Keams Canyon
Service	Unit:	Owyhee	
60	63	01	Owyhee Hosp
Service	Unit:	Colorado Riv	
60	64	01	Parker Hosp
Service	Unit:	Phoenix	
60	66	01	Phoenix Ho
60	66	20	Phoenix H S
60	66	30	West End H C
60	66	31	Salt River
60	66	63	Ft. McDowell Hs
60	66	99	Undesig Locs
Service	Unit:	Sacaton	
60	67	01	Asacaton Hos
Service	Unit:	San Carlos	
60	68	01	San Carlos
Service	Unit:	Schurz	
60	69	01	Schurz Hosp
Service	Unit:	Whiteriver	
60	71	01	Whiteriver H
Service	Unit:	Ft. Yuma	
60	72	01	Ft. Yuma

APPENDIX A -- 3

THE STRONG HEART – FAMILY STUDY
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS, PHASE V

Non-IHS Hospitals and Codes

1. Dakota

Pine Ridge	
Martin Hospital	10-15-55
Kadoka Hospital	10-15-56
Philip Hospital	10-15-57
Hot Spring VA Hospital	10-15-58
Ft. Meade VA Hospital	10-15-59
Rapid City Regional Hospital	10-15-60
Gordon, Nebraska Hospital	10-15-61
Porcupine Community Clinic	10-15-62
University of Minnesota Hospital	10-15-63
Hot Spring Community Hospital	10-15-64
Fitzsimons Hospital, Denver	10-15-65
Sioux Valley Hospital, Sioux Falls	10-15-66
McKennan Hospital	10-15-67
Ellsworth AFB	10-15-68
Wall Clinic	10-15-69
Rapid City Eye Institute	10-15-70
Minneapolis VA Medical Center	10-15-71
St. Anthony Hospital, Denver	10-15-72
Porter Memorial Hospital	10-15-73
Eagle Butte	
Faith Clinic	10-10-82
Isabel Clinic	10-10-83
St. Mary's Hospital, Pierre	10-10-84
Sacred Heart, Yankton	10-10-85
Mid Dakota, Chamberlain	10-10-86
Med Center One, Bismarck, ND	10-10-87
St. Alexius, Bismarck, ND	10-10-88
Mobridge Hospital	10-10-89
Gettysburg Hospital	10-10-90
Ft. Totten	
Mercy Hospital, Devil's Lake	10-10-60
New Rockford Hospital	10-10-61
United Hospital, Grand Forks	10-10-62
St. Lukes Hospital, Fargo	10-10-63
Fargo VA Hospital	10-10-64

2. Phoenix

Desert Samaritan Hospital	60-66-70
Good Samaritan Hospital	60-66-71
Humana Hospital	60-66-72
Jesse Owens Med. Ctr.	60-66-73
John C. Lincoln Hospital	60-66-74
Maricopa Med. Ctr.	60-66-75
Maryvale Samaritan Hospital	60-66-76
Mesa Lutheran Hospital	60-66-77
Phoenix Baptist Hospital	60-66-78
Phoenix Memorial Hospital	60-66-79
St. Luke's Medical Center	60-66-80
Scottsdale Memorial Hospital	60-66-81
St. Joseph's Hospital	60-66-82
Valley Lutheran Hospital	60-66-83
Chandler Community Hospital	60-66-84
NIH	60-66-85
Family Care Clinic in Chandler	60-66-86

3. Oklahoma

Anadarko Municipal Hospital	08-01-14
Carnegie Tri-County Municipal Hospital	08-02-14
Comanche County Memorial Hospital	16-01-05
Southwestern Medical Center	16-03-05
Reynolds Army Hospital	16-05-05
Grady Memorial Hospital	26-01-14
Veterans Administration Hospital	55-18-01
State of Oklahoma Teaching Hospitals	55-20-01
Oklahoma Memorial Hospital	55-20-01
Oklahoma Childrens Memorial	55-20-01
Duncan Regional Hospital	69-28-76
Mercy Hospital	55-63-76
South Community	55-63-87
Norman Regional Hospital	14-60-24
St. Anthony Hospital	55-63-78
Baptist Medical Center	55-63-89
Deaconess Hospital	55-63-24
Presbyterian Hospital	55-63-84
Midwest City Memorial Hospital	55-53-29

APPENDIX A--4

STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PERSONNEL CODES

Arizona Center

301	Barbara Howard
303	Jim Howard
304	Betty Jarvis
305	Paula Harper
307	Linda Phillips
309	Michael Paidi
312	Joy Jones
313	Matilda Johns
314	Helen Johns
315	Rowena Juan
316	Oreen Johns
317	Angelina Barley
320	Sonja Antone
322	Maurice Sievers
323	Rosinna Briones
333	Andrea Kriska
340	Robert Hanson
342	Joanne Carter
347	Judy Bergman
352	Bert Lewis
354	Melissa Bergman
355	Jean MacCluer
356	David Robbins
357	Roseanne Lewis
358	Rachel Peters
359	Tony Dasaro
360	Sean McKnight
361	Lenita Fragua
362	Bernadita (Ditas) Fallis
363	Brad McCormick
364	Roberta Seepie
365	Debbie Hockless
366	Lemark Davis
367	Tamara Brewer
368	Shannon Begay
369	Michael Davidson
370	Nanette Taho
372	Virgena Claw-Begay
373	Caroleen Miles
374	Erica Boyd
375	Mary Jackson
376	Judy King
377	Sharon Taho
378	Libby Schwartz
379	Tonah Kaylor
380	Mary Rybka
381	Kristen Gonzales
382	Tanya Molina
383	Agnes Walsh
384	Sylvia Torres
385	Trisca Mitchell
386	Judith Wieser
387	Yvette Millard
388	Bernadette Cooper
389	Damon Davis
390	Sunshine Jackson
391	Kristina Thomas
392	Callen Hull
393	Marchell Jose
394	Jason Umans
395	Marie Russell

Dakotas Center

101	Thomas K. Welty
102	Beverly Blake Price
109	Arliss Keckler
119	Corbin LeBeau
134	Kurt Schweigman
160	Marcia O'Leary
177	Patsy Foote
182	Lillian Brown
190	Alan Crawford
197	Neil Sikes
198	Theresa Sikes
402	Arlene Iron Crow (Richard R. Rodeheffer)
403	Dorothy Rhoades
405	Theresa Wounded Face
406	Sue Marion
407	Misty Tyon
408	Jim Galloway
410	Brenda Veit
411	Joyce Marshall
412	Marie Kougl Gross
413	LaVonne Looking Elk
414	Chris Zahn
415	Jay Bad Heart Bull
416	Wendy Lawrence
417	Francine Red Willow
418	Janna Morris
419	Jeanette Ofstad
420	Joe Ferber
421	Sarah Lantis
422	Tiffany Dailey
423	Jeffrey A. Henderson
424	Freda Poor Bear
425	Earline Shiroma
426	Arlette Hager
427	Myra Lohnes
428	Maxine Paul
429	Mabel Rosales
430	Bonnie High Bull
431	Cherie Kessler
432	Marlene Poor Bear
433	Lyle G. Best
434	Jennifer Richards
435	Sandra Shot with Arrow
436	Mae Keller
437	DeeAnn Hollenbeck
438	Lois Bettelyoun
439	Fedelia Brown
440	Leola Quiver
441	Helene Gaddie
442	Danial Kougl
443	Sue Sherwood
444	Laurie Bickel
445	Jesse Clifton
446	Jordan Lawrence

Oklahoma Center

201	Elisa Lee
202	Linda Cowan
203	Kathe Samuelson
204	Jeunliang Yeh
205	Martha Stoddart
206	Carl Schaefer
207	Debra Gates
208	Linda Poolaw
209	Wenyu Wang
210	Fawn Yeh
211	Jill Miller
212	Lee Keesee
213	Tristian Ferguson
214	Ying Zhang
215	Yiming Wang
216	Momotaz Begum
220	Susan Xu
227	Tauqeer Ali
229	Karen Kimbley
231	Stephanie Gomez
233	Donna Smith
242	Amir Butt
250	Richard Devereux
252	Verna Cable
254	Jonathan Bella
255	Everett Rhoades
256	Jorge Kizer
290	Wiebers
291	“
292	“
402	Richard Rodeheffer

APPENDIX B

Instructions for Death Certificate Form

and

Informant Interview Form

APPENDIX B -- 1

Instructions for Death Certificate Form

The Death Certificate Form is completed for each eligible death. The purpose of this form is to obtain information on the decedent and information on the informant, coroner/medical examiner, or certifying physician. The ID number has 6 digits; it is the participant's SHS ID. The community code has 3 digits, it is the standard IHS community code.

Item	Instructions
1.	Decedent's name. Enter the first, middle, and last name of the decedent. Begin each name in the left-most box using CAPITAL letters.
2.	Death certificate number. This number will be found stamped or typed on the death certificate. If a computer printout is used, it must include this information. Record the number starting in the right-most box. DO NOT add zero to the right of the number.
3.	Sex. Record the decedent's sex.
4.	Race. Record as is stated.
5.	Marital status. Record as listed. If the death certificate just says "not married" or "S", record as "Single".
6.	Date of birth. Record as listed on the death certificate.
7.	Date of death. Record as listed on the death certificate.
8.	Time of death. Convert all time to 24 hour clock and record. Enter unknown as "=" in each field.
9.	Location of death. Choose an appropriate answer. Other includes nursing home, another residence, or a non-hospital institution.
10.	Autopsy. Record as indicated on the death certificate.
11.	Record whether this is a coroner's or medical examiner's case.
12.	Interval of onset of symptoms and death. Record the shortest possible category for the immediate cause of death as indicated on the death certificate. If this is missing, DO NOT substitute the interval for another cause. Instantaneous should be recorded as "5 minutes or less".
13.	Date abstract completed. Record the date the Death Certificate Form is completed.
14.	Code number of abstractor. The field center staff member who has completed this form must enter his/her valid Strong Heart Study code number in this question.

APPENDIX B -- 2

Informant Interview Form Instructions

I. General Instructions

The purpose of the informant interview is to obtain information about possible cardiovascular events in order to classify the cause of death. Informant interviews are very helpful in deaths that occur outside the hospital, especially if no autopsy, coroner, or medical examiner reports are available. *It is important to note that the most useful portion of the interview is that which describes what happened to the person during the last few hours (day) of his or her life. Often these descriptions of the person's symptoms or behaviors are the best indicators of the likely cause of death. Thus, this portion of the interview should be a major focus, as well as questions regarding timing of any symptoms in relation to death.*

The interview with next-of-kin is potentially difficult because of the sensitive nature of a relative's death and the difficulty recalling or understanding the events related to the death. Even if the informant initially claims no knowledge, begin the form to see if the questions can be answered. The person interviewed should be the one with the most information about the circumstances of death. This may not always be the person listed as the informant on the death certificate.

The interviewer should enter the information required on the first page before the contact is made with the informant, though some of the informant data may need to be completed after contact, such as relationship to the decedent. In some cases the informant may change, as in the case where a spouse is to be contacted but the actual informant is a son or daughter. A record of calls should be maintained regarding attempts to contact the informant. The interviewer should record the date and time of each call, any explanatory notes, a result code for each call, and the interviewer's assigned code number. Eight attempts to contact an informant should be made over a two-week period. If no contact is made, attempts can be stopped.

The questionnaire is divided into sections. The first is concerned with the decedent's medical history, including previous hospitalizations, followed by his/her health in the year prior to death. Then the questions address the events immediately surrounding the fatal event, and the symptoms the deceased experienced prior to the event. Then emergency medical care is ascertained, and the information about other potential informants is requested. A detailed, verbatim, description of the circumstances surrounding death is sought. Finally the interviewer answers questions about the reliability of the information obtained during the interview.

Almost all questions have multiple choices for answers; however, if necessary the interviewer can write any additional information or comments that may be important to understanding the response in the margins next to the question. A few questions require the interviewer to write out descriptions of the death or the decedent's state of health as related by the informant. For these questions, the interviewer should write word-for-word (in short phrases,

abbreviating) the response of the informant. For questions asking the informant to specify names, if more than one answer is given, write all responses.

The interviewer needs to know thoroughly the SHS definition of death to complete the interview accurately. "Death" is defined as the point at which the decedent stops breathing on his/her own and never recovers. Thus, the onset of death for someone who is resuscitated or ventilated is the point at which he/she last breathes spontaneously. He/she may recover several times after resuscitation, but the last cessation of breathing is considered "death". Death is not the time "pronounced dead". If someone is "found dead", timing of death may be estimable if the time since last seen alive was short. However, if long, timing of death may be unknown.

The interviewer should be familiar with skip patterns and the nature of each question. Several questions are similar, with only subtle differences. The interviewer must make the distinction clear to the informant. Such questions may sound repetitive and are easier if clarified.

If the informant contradicts a previous answer, probe to clarify and correct the answers.

If the informant says at the start of the interview that he/she does not know anything about the death, coax the informant to start the interview and try to complete it. If the informant is obviously not helpful, gracefully end the interview.

Finally, the interviewer is responsible for reviewing and editing the Informant Interview Form thoroughly following the interview. Review every question and the skip patterns carefully. Every question must be answered unless skip patterns indicate otherwise. The description of the events preceding the death is extremely important for diagnostic purposes. Make sure that the description includes the timing of events and the symptoms experienced.

II. Detailed Instructions for Various Questions

ITEM DESCRIPTIONS

1-4 Information on the decedent's name, date of death, and informant should be filled out prior to the informant interview.

5 This question asks for the relationship of the informant to the decedent. Make sure not to reverse this: for example, "She was my mother" should be answered "daughter/son". "Other relative" includes aunt, uncle, cousin, in-law, and grandparent.

6-8 These questions relate to the decedent's medical history and thus are ***"ever"*** questions.

6 This question refers to chest pain from heart disease at any time before death. Angina or angina pectoris or a heart attack would be considered "yes" responses. Pain in the left arm or shoulder, jaw, or upper abdomen is considered equivalent to chest pain.

7 Refer to the list of names for nitroglycerin if informant hesitates. Nitroglycerin is usually administered as a small tablet placed under the tongue but may be taken as a pill, an ointment, or as "skin patch".

8 These questions simply ask whether the decedent had ever had any of these cardiac events previously. Mark the appropriate response for each one.

Synonyms for heart attack are "myocardial infarction", "Ml", coronary occlusion.

Coronary bypass involves surgery bypassing the blocked coronary arteries with vessels removed from the arm or leg. "Balloon dilation" or "PCTA" are other terms for angioplasty. A cardiac catheterization, coronary angiography, or angiogram for diagnostic purposes without angioplasty should be answered "no".

A stroke is a brain hemorrhage or ischemia (blockage of blood flow) also known as a cerebrovascular attack, cerebral hemorrhage, or blood clot on brain.

These events include the final, fatal event under consideration.

9-12 These questions relate to hospitalization and doctor's visits in the year prior to death.

13 If decedent was hospitalized more than once or stayed in more than 1 hospital, record the most recent on the form, then list all dates, names, cities and states of other hospitalizations on a separate piece of paper. If exact dates are unknown, fill in month and year. Missing values are indicated by "=" (equal sign) in the appropriate field.

14 Refer to any encounter with a physician for any reason in the year preceding death, including final symptoms.

15 This should be the most recent visit. If more than one physician was seen, obtain the names and addresses of the two who the respondent thinks would be the most knowledgeable about the decedent.

16 Record the name and address of decedent's "usual" physician. If the same as most recently seen, record "same".

17 This question refers to any restriction from the decedent's usual day-to-day activities. It excludes the events at death.

18 "Being cared for" refers to attendant medical care because of disability or sickness.

19 Fill in as much information as is known by informant. If the informant asks why this is needed, explain that it may be important to get additional information from the nursing home, with permission, to understand the cause of death.

20 "Present" is defined as being within sight or sound of the deceased at the time of death; for example, present: lying next to in bed, in next room and could be heard, left decedent alone momentarily. Not present: in another room out of sight and sound, outside out of sight and sound, left decedent alive and returned after 5 minutes, talked to on phone sometime right before.

21 This question asks whether anyone was present at the time of the decedent's death (defined above). If the decedent died in his/her sleep with someone nearby, Question 21 should be answered "yes".

22 Mark the shortest interval known to be reliable. If the informant hesitates, read the intervals in order starting with the shortest.

We are primarily interested in acute symptoms, not chronic. Thus, if a person had been generally fatigued for a month and then had chest pain one hour before death, it is the chest pain that was the last episode. Similarly, if someone had a long history of angina but, not having acute pain, suddenly collapsed and stopped breathing, the onset of the final episode was the time of collapse. If the death occurred while sleeping or while someone was within hearing range of decedent, the interval between onset and death is considered to be instantaneous. If the decedent was found dead (no one close enough to see or hear him/her), the onset may be unknown.

Onset of last episode is defined as being at that point in time when new symptoms cause a change in activity. If the symptom is chronic (e.g. , longstanding exertional chest pain), there must be a change in severity or frequency. Symptoms might be step-wise (e.g., one chest pain, then a more severe one an hour later). In this case it is the first pain, if it was new and caused a change, that is the onset of the final episode. The final episode for someone who collapses, is revived, and collapses again began at the first collapse. Interviewers will have to probe and define onset specifically for each informant.

23-24 The location of the pain or discomfort referred to in Q23 and Q24 is specific. If the pain was experienced at sites other than the chest, left arm or shoulder or jaw, the answer should be "no". If the informant is unsure, but is leaning toward a "yes", then proceed as with a "yes". If the decedent was found dead, most of the answers to the next few questions will be "unknown". In this case, skip quickly through, verifying that the answers are unknown.

25 A list of names of "nitroglycerin" preparations is provided in the medication list and should be consulted if informant isn't sure or offers a brand name.

26 This is a crucial question for the timing of death. Use the definition provided above for death and onset of the final episode in order to clarify timing. Read the question, wait for response, and mark the shortest interval known to be true. If the informant gave a time interval when answering Question 23, the interviewer may want to preface Q26 stating

the time interval and asking for confirmation (e.g., "You mentioned that _____ had chest pains two days before he died. Is that when the chest pain began?").

27 This question asks about any symptoms other than pain or discomfort in the chest that started within 3 days of death. Make sure the onset was within 3 days, and that the condition was not longstanding or "usual". Read the list slowly and fill in the appropriate answers.

28 Fill in the appropriate response.

29 Fill in as much of the information as is known.

30 This question asks if there is any person who may be able to provide additional information about the events leading up to the death or the death itself. For example, a spouse may know most about the three days prior to death while a co-worker actually witnessed the death. (Note: If the answer is "yes", an interview will need to be carried out with this individual.)

This section is **very important,** and as much detailed information as possible should be sought.

31 Narrative: Write out as close to word-for-word as possible, using short phrases. Probe neutrally for symptoms, order and timing of events, medical care, etc. Record these important items verbatim; try to limit the narrative to the space provided. When describing the events surrounding the death itself, be sure to differentiate between the onset of the last symptoms, the death (recalling definition of death), and being "pronounced dead".

32 Close the interview by thanking the informant and repeating how much the quality of our research depends on the cooperation of people like him/herself. After closing the interview, fill in the questions about reliability and administrative information.

If informant is decedent's next of kin and agrees to provide consent for further information, ask him/her to sign the consent form.

33 Interviewer evaluates the quality of information provided by the informant.

APPENDIX C

Mortality Surveillance Data Forms

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MORTALITY SURVEY
DEATH CERTIFICATE

ID number: |___|___|___|___|___|___| Community Code: |___|___|___|

Social Security Number: |___|___|___|--|___|___|--|___|___|___|___|

1. Decedent:
   a. Last name: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
   b. Middle name: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
   c. First name:|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
2. Death certificate number: (*State File Number*) |___|___|___|___|___|___|___|___|
3. Sex: Male |___|1 Female |___|2
4. Race/Ethnicity:
   - American Indian |___|1
   - Hispanic |___|2
   - White |___|3
   - Black |___|4
   - Oriental |___|5
   - Other |___|8
   - Unknown |___|9
5. Marital status
   - Married |___|1
   - Single |___|2
   - Separated |___|3
   - Divorced |___|4
   - Widowed |___|5
   - Unknown |___|9
6. Date of birth: |___|___|/|___|___|/|___|___|___|___| (month / day / year)
7. Date of death: |___|___|/|___|___|/|___|___|___|___| (month / day / year)
8. Time of death (*24 hour clock*): |___|___|:|___|___| (hours : minutes)
   (*If "Death Occurred" is missing use "Death Pronounced"*)
9. Where did the decedent die?
   - IHS hospital/clinic in study area |___|1
   - Non-IHS hospital in study area |___|2
   - Hospital out of area |___|3
   - Home |___|4
   - Other |___|5
   - Location unknown |___|9
10. Was an autopsy performed? Yes |___|1 No |___|2 Unknown |___|9
11. Was this a coroner's or medical examiner's case? Yes |___|1 No |___|2 Unknown |___|9
12. Interval between onset and death (*for immediate cause of death*):
    - 5 min. or less |___|1
    - 1 hour or less |___|2
    - 1 day or less |___|3
    - Unknown or not recorded |___|9
    - 1 week or less |___|4
    - 1 month or less |___|5
    - more than 1 month |___|6

ADMINISTRATIVE INFORMATION:

13. Abstractor code: |___|___|___|
14. Abstraction date: |___|___|/|___|___|/|___|___|___|___| (month / day / year)

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MORTALITY SURVEY
INFORMANT INTERVIEW

ID number: |___|___|___|___|___|___|

Social Security Number: |___|___|___|--|___|___|--|___|___|___|___|

A. DECEDENT (*Completed by study center staff prior to interview.)*

1. Name: _____
Last *First* *Middle*

2. Date of death: |___|___|/|___|___|/|___|___|___|___|
month day year

B. INFORMANT (*Completed by study center staff prior to interview.)*

3. a. Name: _____
Last *First* *Middle*

b. Address: _____

c. Telephone: (_____) _____

C. RECORD OF CALLS or HOME VISIT TO COMPLETE INTERVIEW

	DATE (mo/day/yr)	TIME (24 hr clock)	Method of contact 1=Phone 2=Home Visit 3=Other	Contact successful 1=Yes 2=No 9=Refused	Interview Completed 1=Yes 2=No
1)	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____

D. Person Providing Information (*Completed by study center staff prior to interview.)*

4. a. Name: _____
Last *First* *Middle*

b. Address: _____

c. Telephone: (_____) _____

5. Before we get started, could you please tell me what was your relationship to the deceased?

You are the _____ of the deceased.

These first questions are about his/her medical history.

6. Before his/her final illness, had he/she ever had pains in the chest from heart disease, for example, angina pectoris?

   Yes |___|1 No |___|2 ***(If no, go to Q8)*** Unknown |___|9

7. Did he/she ever take nitroglycerin for this pain?

   Yes |___|1 No |___|2 Unknown |___|9

8. Did he/she ever have any of the following medical condition or procedures before his/her final illness?

		Yes	No	Unknown
a.	heart attack?	|___|1	|___|2	|___|9
b.	stroke?	|___|1	|___|2	|___|9
c.	heart failure?	|___|1	|___|2	|___|9
d.	rheumatic heart disease?	|___|1	|___|2	|___|9
e.	any other heart disease or heart condition If yes, specify: _____	|___|1	|___|2	|___|9
f.	coronary bypass surgery (CABBAGE)	|___|1	|___|2	|___|9
g.	coronary angioplasty (balloon angioplasty)	|___|1	|___|2	|___|9
h.	insertion of pace maker (defibrillator)	|___|1	|___|2	|___|9
i.	any other heart surgery?	|___|1	|___|2	|___|9

The next few questions are about his/her health in the year prior to death.

		Yes	No	Unknown
9.	Was he/she hospitalized…			
	In the year prior to death?	|___|1	|___|2	|___|9
	In the month prior to death?	|___|1	|___|2	|___|9
	In the 7 days prior to death?	|___|1	|___|2	|___|9
10.	Were any hospitalizations for heart attack or chest pain?	|___|1	|___|2	|___|9
11.	Was a hospitalization for heart surgery?	|___|1	|___|2	|___|9

12. What was the date of the ***last*** hospital admission? |___|___|/|___|___|/|___|___|___|___|
    (If unknown, draw two lines across the boxes) month day year

If the information in questions 13 – 16 is already known to you, skip to Q17.

13. Can you tell me the name and location of the hospital? ***(If unknown, check the box.)*** |___|

    a. Name: _____

    b. Address: _____

    City/town: _____

    State-Zip: _____

14. Was he/she seen by a physician anytime in the year prior to death?

    Yes |___|1 No |___|2 Unknown|___|9

15. Can you tell me the name and address of this physician or healthcare facility? |___|
    IHS only

    a. Name: _____

    b. Address: _____

    City/town: _____

    State-Zip: _____

16. Can you tell me the name and address of his/her usual physician?

If same as Q17, check here. |___|

a. Name: _____

b. Address: _____

City/town: _____

State-Zip: _____

17. Now, think back to about one month before he/she died. At that time, was he/she sick or ill; were his/her activities limited, or was he/she normally active for the most part?

Sick/ill/limited activities |___|1 Normally active |___|2 Unknown |___|9

18. Was he/she being cared for at a nursing home, or at another place at the time of death?

Yes, nursing home	|___|1	No	|___|4
Yes, at home	|___|2	Unknown	|___|9
Yes, other, specify: _____	|___|3		

19. If the decedent was cared by nursing home prior to the death, please tell me the name and location of the nursing home:

a. Name: _____

b. Address: _____

c. Telephone: (_____) _____

20. Were you present when he/she died?

Yes |___|1 (***Go to Q23)*** No |___|2 Unknown |___|9

21. If no, how long before he/she died did you last see him/her?

1 hour or less	|___|1	More than 24 hours	|___|2
24 hours or less	|___|2	Unknown	|___|9

Did anyone see or hear him/her when he/she died?

Yes |___|1 No |___|2 Unknown |___|9

22. How long after he/she was last known to be alive was he/she found dead?

(*Enter the shortest interval known to be true*)

5 minutes or less	|___|1	More than 24 hours	|___|4
1 hour or less	|___|2	Unknown	|___|9
24 hours or less	|___|3		

23. Did he/she experience pain or discomfort in his/her chest, left arm or shoulder or jaw either just before death or within 3 days (72 hours) of death?

Yes |___|1 No |___|2 Unknown |___|9

(If NO or Unknown go to Q27)

The next set of questions deal specifically with the last episode (that led to the death) of his/her pain or discomfort. The last episode is defined as starting at the time he/she noticed discomfort that caused him/her to stop or change what he/she was doing.

24. Did his/her last episode of pain or discomfort specifically involve the chest?
Yes |___|1 No |___|2 Unknown |___|9

25. Did he/she take nitroglycerine because of this last episode of pain or discomfort?
Yes |___|1 No |___|2 Unknown |___|9

26. How long was it from the beginning of his/her last episode of pain or discomfort to the time he/she stopped breathing on his/her own? ***(use the shortest interval known to be true)***

5 minutes or less	|___|1	24 hours or less	|___|4
10 minutes or less	|___|2	More than 24 hours	|___|5
1 hour or less	|___|3	Unknown	|___|9

27. Within 3 days of death, or just before he/she died, did any of the following symptoms begin for the first time:

		Yes	No	Unknown
a.	Shortness of breath?	|___|1	|___|2	|___|9
b.	Dizziness?	|___|1	|___|2	|___|9
c.	Palpitations (pounding in the chest)?	|___|1	|___|2	|___|9
d.	Marked or increased fatigue, tiredness, or weakness?	|___|1	|___|2	|___|9
e.	Headache?	|___|1	|___|2	|___|9
f.	Sweating?	|___|1	|___|2	|___|9
g.	Paralysis?	|___|1	|___|2	|___|9
h.	Loss of speech?	|___|1	|___|2	|___|9
i.	Attack of indigestion or nausea or vomiting?	|___|1	|___|2	|___|9
j.	Other? specify: _____	|___|1	|___|2	|___|9

The next few questions are concerned with emergency medical care he/she may have received just prior to or at the time of death. You may have already given this information in an answer to an earlier question. Since it is important to obtain information specifically on emergency medical care, I hope you don't mind if these questions seem repetitive.

28. Was he/she taken to a hospital? Yes |___|1 No |___|2

29. If Yes, could you tell me the name and location of this hospital:

a. Name: _____

b. Address: _____

City/town: _____

State-Zip: _____

30. Is there someone else whom we could contact, who might know more about the circumstances surrounding his/her death or his/her usual state of health?

Yes |___|1 No |___|2 Unknown |___|9

(If Yes, complete the front of the second Informant Interview)

31. Finally, I want to ask you to tell me everything about the circumstances surrounding his/her death. Specifically, please tell me what you know of his/her general health, health on the day he/she died, and of the death itself. ***(Record summary verbatim)***

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

32. Did informant agree to provide consent to gather further information?

Yes |___|1 No |___|2 Not applicable |___|3

(If Yes, ask the informant to sign the consent form for us to review the decedent's medical records)

33. How reliable was the participant in completing the questionnaire?

Very reliable |___|1 Reliable |___|2 Unreliable |___|3 Very unreliable |___|4 Uncertain |___|5

ADMINISTRATIVE INFORMATION:

34. Interviewer code: |___|___|___|

35. Interview date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MORTALITY SURVEY
FINAL DECISION - AUTOPSY REPORT

ID number: |___|___|___|___|___|___|

Social Security Number: |___|___|___|--|___|___|--|___|___|___|___|

1. Decedent's name:

   a. Last name: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

   b. Middle name: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

   c. First name: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

2. Cause of death, choose appropriate one: |___|___|

   01=Definite fatal myocardial infarction
   02=Definite sudden death due to coronary heart disease
   03=Definite fatal coronary heart disease
   04=Possible fatal coronary heart disease
   05=Definite fatal stroke
   06=Possible fatal stroke
   07=Definite fatal congestive heart failure
   08=Possible fatal congestive heart failure
   09=Other fatal cardiovascular diseases; specify: _____

   21=Malignant neoplasm; specify primary site:_____ |___|___|___|___|
   22=Unintentional injury and adverse effects/motor vehicle accident ICD code
   23=Unintentional injury and adverse effect/all other
   24=Pneumonia and influenza
   25=Chronic obstructive pulmonary disease and allied conditions
   26=Diabetes mellitus
   27=Chronic liver disease and cirrhosis
   28=Suicide
   29=Homicide and legal intervention
   30=Nephritis, nephrotic syndrome and nephrosis
   31=ESRD
   32=Septicemia
   33=HIV/AIDS
   88=Other, specify: _____ |___|___|___|___|
   99=Can not be determined. ICD code

ADMINISTRATIVE INFORMATION:
Abstractor code: |___|___|___|

Abstract date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PHOTOCOPY CHECKLIST FOR MEDICAL RECORDS REVIEW
MORTALITY SURVEILLANCE - CVD and NON-CVD

Admission date: |___|___|/|___|___|/|___|___|___|___| ID Number: |___|___|___|___|___|___|
month day year

For each hospital admission WITHIN the YEAR prior to death, obtain photocopies of each of the following sections of the medical history (when available) and assemble them for each admission. Be sure that photocopies are legible.

	YES	NO	DONE, No Report
Admission Sheets (Face Sheets)	|___|1	|___|2	|___|9
Admitting History and Physical Exam	|___|1	|___|2	|___|9
Discharge Summary	|___|1	|___|2	|___|9
ECGs (SHS-I, II, III, IV and V)	|___|1	|___|2	|___|9
Cardiac Enzyme (including Troponin)	|___|1	|___|2	|___|9
Reports of results of:			
Chest X-ray	|___|1	|___|2	|___|9
Echocardiogram	|___|1	|___|2	|___|9
Angiogram	|___|1	|___|2	|___|9
Exercise tolerance test (Treadmill)	|___|1	|___|2	|___|9
Cardiac catheterization	|___|1	|___|2	|___|9
CT (CAT) scan	|___|1	|___|2	|___|9
MRI	|___|1	|___|2	|___|9
Carotid ultrasound	|___|1	|___|2	|___|9
Lumbar puncture	|___|1	|___|2	|___|9
Creatinine	|___|1	|___|2	|___|9
Liver Function test	|___|1	|___|2	|___|9
Pathology	|___|1	|___|2	|___|9
Cultures	|___|1	|___|2	|___|9

ID Number: |___|___|___|___|___|___|

	YES	NO	DONE, No Report
Other Laboratory results, SPECIFY:			
_____	|___|1	|___|2	|___|9
_____	|___|1	|___|2	|___|9
_____	|___|1	|___|2	|___|9
Operative reports:			
Coronary bypass	|___|1	|___|2	|___|9
Angioplasty	|___|1	|___|2	|___|9
Swan-Ganz catheterization	|___|1	|___|2	|___|9
Non-CVD operation	|___|1	|___|2	|___|9
For terminal Event Only:			
Ambulance report	|___|1	|___|2	|___|9
ER Admission and Discharge Summary	|___|1	|___|2	|___|9
Any clinical notes regarding DOA	|___|1	|___|2	|___|9
Autopsy Report/ Coroner's Report	|___|1	|___|2	|___|9
From IHS clinic chart (if available), photocopy notes and test results from the most recent visit prior to death	|___|1	|___|2	|___|9

ADMINISTRATIVE INFORMATION:

Abstractor code: |___|___|___|

Abstract date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MORTALITY SURVEY – FINAL DECISION

ID number: |___|___|___|___|___|___|

Date of death: |___|___|/|___|___|/|___|___|___|___| Age at death: |___|___|
month day year

		Underlying cause of death	**Contributory cause of death** 1	2
A.	Cause of death, choose appropriate one.	|___|___|	|___|___|	|___|___|

01 = Definite fatal myocardial infarction
02 = Definite sudden death due to coronary heart disease
03 = Definite fatal coronary heart disease
04 = Possible fatal coronary heart disease
05 = Definite fatal stroke
06 = Possible fatal stroke
07 = Definite fatal congestive heart failure
08 = Possible fatal congestive heart failure
09 = Other fatal cardiovascular diseases

If is Non-CVD death, choose one from the following list and complete the evidence code:

Evidence Code: (up to 3 Codes) |___|___|
|___|___|

21 = Malignant neoplasm;
primary site: _____
22 = Unintentional injury and adverse effects/MVA
23 = Unintentional injury and adverse effects/all other
24 = Chronic obstructive pulmonary disease and allied conditions
25 = Pneumonia and influenza
26 = Diabetes mellitus
27 = Chronic liver disease and cirrhosis
28 = Suicide
29 = Homicide and legal intervention
30 = Nephritis, nephrotic syndrome and nephrosis
31 = ESRD
32 = Septicemia
33 = HIV/AIDS

01 = Pathology Report |___|___|
02 = Clinical Diagnosis only
03 = Pulmonary function test
04 = Blood glucose test
05 = Abnormal liver function tests
06 = Abnormal kidney function test
07 = Positive culture (blood or sputum)
08 = Positive antibody test
09 = Positive blood test (any type)
10 = Autopsy
11 = Police/Coroner's investigation
12 = Other medical records evidence
Specify: _____

88 = Other, specify: _____
99 = Can not be determined.

Was the death alcohol related? Yes |___|1 No |___|2 Unknown |___|9

B. Criteria used: (Please check the appropriate boxes.)

1. Definite fatal myocardial infarction

[ ] 1)a. Definite MI within 4 weeks of death by criteria: Yes No

1. Evolving diagnostic ECG, ***and/or*** |___|1 |___|2

2. Diagnostic ECG and abnormal cardiac enzymes, ***and/or*** |___|1 |___|2

3. Prolonged cardiac pain and abnormal cardiac enzymes |___|1 |___|2

OR

[ ] 1)b. Acute MI diagnosed by autopsy

AND

[ ] 2) No known non-atherosclerotic or noncardiac-atherosclerotic condition that was probably lethal according to death certificate, autopsy report, hospital records, or physician records.

2. Definite sudden death due to CHD

[ ] 1. Death witnessed as occurring within 1 hour after the onset of severe cardiac symptoms (prolonged cardiac pain, shortness of breath, fainting) or within 1 hour after the subject was last seen without symptoms.

AND

[ ] 2. No documentation of acute MI within 4 weeks prior to death.

AND

[ ] 3. No known non-atherosclerotic or noncardiac-atherosclerotic process that was probably lethal according to death certificate, autopsy report, hospital records or physician report.

3. Definite fatal CHD

[ ] 1. Death certificate with consistent underlying or immediate causes, **AND**
[ ] 2. No documentation of definite acute MI within 4 weeks prior to death, **AND**
[ ] 3. Criteria for sudden death not met (above), **AND**
[ ] 4. No known non-atherosclerotic or noncardiac-atherosclerotic process or event that was probably lethal according to death certificate, autopsy report, hospital records, or physician records,

AND

[ ] 5(a) Previous history of MI according to relative, physician, or hospital records, or definite or possible MI by criteria,
OR
[ ] 5(b) Autopsy reporting severe atherosclerotic-coronary artery disease or old MI without acute MI (50% proximal narrowing of two major vessels or 75% proximal narrowing of one more vessel, if anatomic details given.),
OR
[ ] 5(c) Death occurring greater than 1 and less than or equal to 24 hours after the onset of severe cardiac symptoms or after subject was last seen without symptoms,
OR
[ ] 5(d) Angiogram reporting severe (≥ 50% narrowing) atherosclerotic coronary artery disease,
OR
[ ] 5(e) Other positive physical signs or lab findings.

4. Possible fatal CHD

[ ] 1. No documentation by criteria of definite acute MI within 4 weeks prior to death,
AND

[ ] 2. No documentation by criteria of definite sudden death,
AND

[ ] 3. No documentation by criteria of definite fatal CHD,
AND

[ ] 4. Death certificate with consistent underlying or immediate cause,
AND

[ ] 5. No known non-atherosclerotic or noncardiac-atherosclerotic process that was probably lethal according to death certificate, autopsy report, hospital records, or physician records.

5. Definite fatal stroke (also complete 6.1, 6.2 and Supplemental Form)

[ ] 1a. Cerebral infarction or hemorrhage diagnosed at autopsy,
AND

[ ] 1b. No other known disease process or event such as brain tumor, subdural hematoma, metabolic disorder or peripheral lesion that could cause focal neurologic deficit, with or without coma, according to death certificate, autopsy, hospital records, or physician records,

OR

[ ] 2a. History of rapid onset (approximately minutes to hours from onset to time of maximum acute neurologic deficit) of focal neurologic deficit with or without change in state of consciousness,
AND

[ ] 2b. Focal neurologic deficit within 6 weeks of death documented by unequivocal physician or laboratory findings with 24 hours duration of objective physician findings,
AND

[ ] 2c. No other known disease process or event such as brain tumor, subdural hematoma, metabolic disorder, or peripheral lesion that could cause focal neurologic deficit, with or without coma, according to death certificate, autopsy, hospital records, or physician records,

6. Possible (Undocumented) fatal stroke (also complete 6.1, 6.2 and Supplemental Form)

[ ] 1. Death certificate consistent with underlying or immediate cause (ICD-9, code 431 – 437), but neither autopsy evidence nor adequate pre-terminal documentation of the event,
AND

[ ] 2. No evidence at autopsy examination of the brain, if performed, of any disease process that could cause focal neurologic signs that would not be connected with cerebral infarction or hemorrhage.

6.1 DOCUMENTED CAUSES CONTRIBUTING TO STROKE (Check all that apply.)

[ ] 1. Underlying coagulopathy (e.g., Factor V Leiden; cirrhosis)
[ ] 2. Iatrogenic coagulopathy (e.g., anticoagulants)
[ ] 3. Antecedent procedure (e.g., surgery) in past 2 months
[ ] 4. Antecedent injury (e.g., fracture) in past 2 months
[ ] 5. Underlying neoplasia
[ ] 6. Other: (specify) _____
[ ] 9. None identified

6.2 TYPE OF CEREBRAL EVENT:

⌊__⌋

1. Cardioembolic infarction
2. Subarachnoid hemorrhage
3. Intraparenchymal hemorrhage
4. Lacunar
5. Other, unknown infarction
6. TIA
7. Unknown type stroke
8. Atherothrombotic infarction

7. Definite fatal congestive heart failure.

Two major criteria or one major and two minor criteria:

a. Major criteria

[ ] i. Paroxysmal nocturnal dyspnea or Orthopnea
[ ] ii. Neck vein distention
[ ] iii. Rales
[ ] iv. Cardiomegaly
[ ] v. Acute pulmonary edema
[ ] vi. S3 gallop
[ ] vii. Increased venous pressure >16cm water
[ ] viii. Circulation time ≥ 25 seconds
[ ] ix. Hepatojugular reflux

b. Minor criteria

[ ] i. Ankle edema
[ ] ii. Night cough
[ ] iii. Dyspnea on exertion
[ ] iv. Hepatomegaly
[ ] v. Vital capacity reduced by one-third from maximum
[ ] vi. Tachycardia (rate of ≥ 120/min.)
[ ] vii. Elevated BNP (see manual for levels)

c. Major or minor criteria

[ ] i. Weight loss > 4.5kg in 5 days in response to treatment

AND

d. [ ] No known non-cardiac process leading to fluid overload such as renal failure

8. Possible fatal congestive heart failure

[ ] Death certificate or medical records with consistent underlying or immediate cause, but neither autopsy evidence nor adequate pre-terminal documentation of the event.

9. Other fatal cardiovascular diseases

[ ] i. Death certificate or medical records with consistent underlying or immediate cause.

Comment: _____

C. Does the diagnosis in Section A (Cause of death) agree with your clinical impression?

Yes |___|1 No |___|2

If “No”, what is your diagnosis? _____ |___|___|

Why? _____

_____

ADMINISTRATIVE INFORMATION:

Reviewer code: |___|___|___|

Review date: |___|___|/|___|___|/|___|___|___|___|
month day year

Coordinating Center Use Only

Reviewer:

First review |___|1 Second review |___|2 Stroke review |___|3 Adjudication |___|9

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

Mortality and Morbidity Surveys – SUPPLEMENTAL STROKE FORM
(Complete for mortality codes 5 or 6 and morbidity codes 3, 4 or 8)

ID number: |___|___|___|___|___|___|___|

Date of this event: |___|___|/|___|___|/|___|___|___|___|
month day year

A. ISCHEMIC STROKE LOCATION

	YES	NO
Right hemisphere	|___|1	|___|2
Left hemisphere	|___|1	|___|2
Basilar	|___|1	|___|2
Hemispheric and Basilar	|___|1	|___|2
Unknown	|___|1	|___|2

B. BRAIN IMAGING

1. HEAD CT

	Yes	|___|1
	No (go to Q 2)	|___|2
	Yes, but no report	|___|3
1.1 If yes, timing of Head CT	<48 h since symptom onset	|___|1
	≥48 h since symptom onset	|___|2
	Unknown	|___|9

2. BRAIN MRI

Yes	|___|1
No (go to Q 3)	|___|2
Yes, but no report	|___|3

C. NEUROVASCULAR IMAGING

3. CAROTID DUPLEX

Yes	|___|1
No (go to Q 4)	|___|2
Yes, but no report	|___|3

4. *TRANSCRANIAL DOPPLER (TCD)* Yes |___|1

No, (go to Q 5) |___|2

Yes, but no report |___|3

5. *MAGNETIC RESONANCE ANGIOGRAPHY* (*MRA)* Yes |___|1

No (go to Q 6) |___|2

Yes, but no report |___|3

6. *CT ANGIOGRAPHY* Yes |___|1

No (go to Q 7) |___|2

Yes, but no report |___|3

7. *ANGIOGRAPHY* Yes |___|1

No, (go to Q 8) |___|2

Yes, but no report |___|3

D. STROKE DEFICIT

8. MODIFIED RANKIN SCALE (0-5) |___|
(Code Maximal Severity Within 7 Days of Stroke)

0 = no symptoms at all
1 = no significant disability despite symptoms: able to carry out all usual duties and activities
2 = slight disability: unable to carry out all previous activities but able to look after own affairs without assistance
3 = moderate disability: requiring some help, but able to walk without assistance
4 = moderately severe disability: unable to walk without assistance, and unable to attend to own bodily needs without assistance
5 = severe disability: bedridden, incontinent, and requiring constant nursing care and attention
9 = information insufficient for coding

E. STROKE TREATMENT

Intravenous thrombolysis Yes |___|1

No |___|2

Presentation within 3 hours from symptom onset Yes |___|1

No |___|2

F. BRAIN EXAMINATION AT AUTOPSY Yes |___|1

No |___|2

Yes, but no report |___|3

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

Mortality Survey Packet Checklist

ID number: |___|___|___|___|___|___|

1. Death Certificate _____
2. ICD coded cause of death by nosologist _____
3. Autopsy performed Yes |___|
   No |___|
4. Autopsy report Available |___|
   Unavailable |___|
5. If autopsy report is available, Autopsy Form (by receiver) _____
6. Medical Records Photocopy Checklist _____
7. Copy reports as specified _____
8. Check if the decedent is eligible for the morbidity survey and proceed as required by the morbidity survey protocol. _____
9. Check if tracking form was sent. _____
10. Informant Interview Form? _____
11. Medical Records Abstract Form, Informant Interview Form, Autopsy Report Form, and Final Decision Form to Dr. Sievers _____ Date
12. Was he/she in a nursing home at the time of death? Yes |___| No |___| Unknown |___|
13. Was he/she receiving care from a home hospice care program at the time of death?
    Yes |___| No |___| Unknown |___|

ADMINISTRATIVE INFORMATION:

SHS staff code: |___|___|___|

Completion date: |___|___|/|___|___|/|___|___|___|___|
month day year

APPENDIX D

Morbidity Surveillance Data Forms

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

Master List of Hospitalization and Outpatient Visits

ID number: |___|___|___|___|___|___|

List all facilities where patient was hospitalized or was an outpatient since date of last SHS contact.

Reason: 1=Heart attack 2=Stroke 3=CHF
4=Other CVD, please specify (includes PVD and valvular heart disease).
5=Other non-CVD, please specify.
6=End Stage Renal Disease (includes kidney dialysis or kidney transplant).

If it is a FATAL event, mark X in the inpatient or outpatient space.

In patient	Out-patient	Hospital/Clinic	Town/State	Date (mm/dd/yy)	Reason	Abstracted (Y/N)
				__/__/__		

Diagnosis: ____________________

				__/__/__		

Diagnosis: ____________________

				__/__/__		

Diagnosis: ____________________

				__/__/__		

Diagnosis: ____________________

				__/__/__		

Diagnosis: ____________________

				__/__/__		

Diagnosis: ____________________

				__/__/__		

Diagnosis: ____________________

				__/__/__		

Diagnosis: ____________________

:

MORBIDITY SURVEY
Medical Records Abstract and Photocopy Checklist for Non-Fatal CVD Events or Procedures

ID number: |___|___|___|___|___|___|

1. a. Hospital code number |___|___|___|___|___|___|

   b. Hospital name _____

   c. Hospital location _____

   d. Medical record number |___|___|___|___|___|___|___|___|___|___|

2. Date of ADMISSION to this hospital or date of this OUTPATIENT visit:

   |___|___|/|___|___|/|___|___|___|___|
   month day year

3. Date of discharge: |___|___|/|___|___|/|___|___|___|___|
   month day year

4. Was the patient transferred to or from another acute care hospital?

   Yes |___|1 ***(be sure information is listed on M&M master list form)*** No |___|2

5. Enter the ICD-9 code numbers for the hospital discharge diagnoses and procedure codes recorded in the medical record exactly as they appear on the front sheet of the medical record and/or on the discharge summary. Be sure they are ICD-9 codes. Record diagnoses if no codes are available.

   1. |___|___|___| • |___|___|
   2. |___|___|___| • |___|___|
   3. |___|___|___| • |___|___|
   4. |___|___|___| • |___|___|
   5. |___|___|___| • |___|___|
   6. |___|___|___| • |___|___|
   7. |___|___|___| • |___|___|
   8. |___|___|___| • |___|___|
   9. |___|___|___| • |___|___|
   10. |___|___|___| • |___|___|
   11. |___|___|___| • |___|___|
   12. |___|___|___| • |___|___|

6. Has the participant received a kidney transplant? Yes |___| 1 No|___|2

   If yes, date of first transplant: |___|___|/|___|___|/|___|___|___|___|
   month day year

7. Was the participant receiving kidney dialysis during this hospital or outpatient visit?

   Yes |___| 1 No|___|2

   If yes, date dialysis FIRST STARTED: |___|___|/|___|___|/|___|___|___|___|
   month day year

For each hospital admission or outpatient visit, obtain photocopies of each of the following sections of the medical records (when available) and *assemble them for each admission*. Be sure that photocopies are legible.

	YES	NO	DONE, No Report
Admission Sheets (Face Sheets), including Diagnoses	_____	_____	_____
Admitting History and Physical Exam	_____	_____	_____
Discharge Summary	_____	_____	_____
ECGs (see instruction)	_____	_____	_____
Cardiac enzyme report (days 1 to 4)	_____	_____	_____
Neurology Consult Report	_____	_____	_____
Reports of Procedures:			
1. Echocardiogram	_____	_____	_____
2. Coronary angiogram	_____	_____	_____
3. Exercise tolerance test (Treadmill)	_____	_____	_____
4. Cardiac catheterization	_____	_____	_____
5. Coronary bypass	_____	_____	_____
6. Coronary angioplasty	_____	_____	_____
7. Swan-Ganz catheterization	_____	_____	_____
8. Intracoronary or I.V. streptokinase, or TPA reperfusion	_____	_____	_____
9. Aortic balloon pump	_____	_____	_____
10. Radionuclide scan	_____	_____	_____
11. CAT or CT of the head	_____	_____	_____
12. Magnetic Resonance Image (MRI) of the head	_____	_____	_____
13. Carotid ultrasound/Doppler	_____	_____	_____
14. Lumbar puncture	_____	_____	_____
15. Angiography (including vessels in the lower extremities)	_____	_____	_____
16. Peripheral Angioplasty (lower extremity vessel(s))	_____	_____	_____
17. Surgical revascularization of peripheral vessel(s))	_____	_____	_____
18. Amputation	_____	_____	_____
19. Chest X-ray	_____	_____	_____
20. Carotid endarterectomy	_____	_____	_____
21. Other, specify: _____	_____	_____	_____

Be sure to include Tracking Sheet in the packet

ADMINISTRATIVE INFORMATION:

SHS staff code: |___|___|___|

Completion date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MORBIDITY SURVEY – DECISION

ID number: |___|___|___|___|___|___|

Date of this event: |___|___|/|___|___|/|___|___|___|___|
month day year

A. DIAGNOSIS (enter appropriate code number): |___|___|

01. Definite non-fatal myocardial infarction
02. Possible non-fatal myocardial infarction |___|___|
03. Definite non-fatal stroke
04. Possible non-fatal stroke
06. Definite CHD |___|___|
07. Possible CHD (those with some, but not all, criteria or with equivocal criteria for definite CHD)
08. TIA
09. Other CVD, specify: _____ |___|___|
10. Non–CVD, specify:_____ |___|___|
11. ESRD (dialysis or transplant)

B. Criteria used: (Please check one box in each field)

1. MYOCARDIAL INFARCTION

a.	PROLONGED CARDIAC PAIN	Present	|___|1
		Absent	|___|2
b.	ECG FINDINGS	Evolving diagnostic ECG	|___|1
		Diagnostic ECG	|___|2
		Equivocal ECG	|___|3
		Absent, uncodable, or other	|___|9
c.	CARDIAC ENZYMES	Abnormal	|___|1
		Equivocal	|___|2
		Incomplete	|___|3
		Normal	|___|4

i) Troponin-I ≥2xULN or "abnormal" Yes |___|1 No |___|2 Not done |___|9

COMMENTS: _____

_____

_____

_____

_____

_____

2. STROKE

a. DIAGNOSTIC EVIDENCE

Unequivocal physician or laboratory |___|1

Discharge diagnoses of stroke (431, 432, 434, 436, 437) |___|2

Neither of above |___|9

b. ONSET/DURATION OF NEUROLOGICAL DEFICIT

Rapid/ > 24 hours |___|1

Rapid/ < 24 hours |___|2

Protracted/ > 24 hours |___|3

Protracted/ < 24 hours |___|4

c.1. OTHER CAUSES Present (go to c.2) |___|1

Absent |___|2

c.2. DOCUMENTED CAUSES CONTRIBUTING TO STROKE (Check all that apply.)

1. Underlying coagulopathy (e.g., Factor V Leiden; cirrhosis) |___|
2. Iatrogenic coagulopathy (e.g., anticoagulants) |___|
3. Antecedent procedure (e.g. surgery) in past 2 months |___|
4. Antecedent injury (e.g. fracture) in past 2 months |___|
5. Underlying neoplasia |___|
6. Other: (specify) _____ |___|
9. None identified |___|

d. TYPE OF STROKE: |___|

1. Cardioembolic infarction
2. Subarachnoid hemorrhage
3. Intraparenchymal hemorrhage
4. Lacunar
5. TIA
6. Other, unknown infarction
7. Unknown type of stroke
8. Atherothrombotic infarction

COMMENTS:_____

_____

_____

_____

_____

3. Definite Coronary Heart Disease (CHD) |___|

a. Cardiac cath proven coronary artery disease (1 or more vessels ≥ 50% stenosis), ***or*** |___|1

b. PCTA, ***or*** |___|2

c. Coronary artery bypass grafting, ***or*** |___|3

d1. Abnormal stress ECG, **and** |___|4

d.2. Abnormal imaging, ***or*** |___|5

e. Positive functional test of ischemia (such as treadmill) |___|6

COMMENTS:_____

_____

_____

_____

_____

4. Other Non-fatal Cardiovascular Disease

a. Congestive Heart Failure |___|
b. CHF secondary to ESRD (diagnosis = 10) |___|
c. Cardiomyopathy |___|
d. Valvular Heart Disease |___|
e. Left Ventricular Hypertrophy |___|
f. Atrial Fibrillation |___|
g. Non-coronary heart surgery or carotid or other vascular surgery (does not include procedures for PVD) |___|
h. Pacemaker implantation |___|
i. Positive non-coronary angiography (does not include procedures for PVD) |___|
j. Arrhythmia |___|
k. Angina pectoris (Class 2 chest pain, or relieved by nitroglycerides) (diagnosis = 07) |___|
l. PVD (either peripheral arterial surgical procedures, angiogram or amputation) |___|

COMMENTS: _____

_____

_____

_____

C. Does the diagnosis in Section A (DIAGNOSIS) agree with your clinical impression?
Yes |___|1 No |___|2

If "No," what is your diagnosis? (Diagnosis in A) |___|___|

Why? _____

_____

_____

_____

ADMINISTRATIVE INFORMATION:

Reviewer code: |___|___|___|

Review date: |___|___|/|___|___|/|___|___|___|___|
month day year

Coordinating Center Use Only

Deposition: Regular |___|1 QC |___|2 Stroke |___|7 Adjudication |___|9

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

Mortality and Morbidity Surveys – SUPPLEMENTAL STROKE FORM
(Complete for mortality codes 5 or 6 and morbidity codes 3, 4 or 8)

ID number: |___|___|___|___|___|___|

Date of this event: |___|___|/|___|___|/|___|___|___|___|
month day year

A. ISCHEMIC STROKE LOCATION

	YES	NO
Right hemisphere	|___|1	|___|2
Left hemisphere	|___|1	|___|2
Basilar	|___|1	|___|2
Hemispheric and Basilar	|___|1	|___|2
Unknown	|___|1	|___|2

B. BRAIN IMAGING

1. HEAD CT

	Yes	|___|1
	No (go to Q 2)	|___|2
	Yes, but no report	|___|3
1.1 If yes, timing of Head CT	<48 h since symptom onset	|___|1
	≥48 h since symptom onset	|___|2
	Unknown	|___|9

2. BRAIN MRI

Yes	|___|1
No (go to Q 3)	|___|2
Yes, but no report	|___|3

C. NEUROVASCULAR IMAGING

3. CAROTID DUPLEX

Yes	|___|1
No (go to Q 4)	|___|2
Yes, but no report	|___|3

4.	*TRANSCRANIAL DOPPLER (TCD)*	Yes	|___|1
		No, (go to Q 5)	|___|2
		Yes, but no report	|___|3
5.	*MAGNETIC RESONANCE ANGIOGRAPHY* (*MRA)*	Yes	|___|1
		No (go to Q 6)	|___|2
		Yes, but no report	___|3
6.	*CT ANGIOGRAPHY*	Yes	|___|1
		No (go to Q 7)	|___|2
		Yes, but no report	|___|3
7.	*ANGIOGRAPHY*	Yes	|___|1
		No, (go to Q 8)	|___|2
		Yes, but no report	|___|3

D. STROKE DEFICIT

8. MODIFIED RANKIN SCALE (0-5) |___|
(Code Maximal Severity Within 7 Days of Stroke)

0 = no symptoms at all
1 = no significant disability despite symptoms: able to carry out all usual duties and activities
2 = slight disability: unable to carry out all previous activities but able to look after own affairs without assistance
3 = moderate disability: requiring some help, but able to walk without assistance
4 = moderately severe disability: unable to walk without assistance, and unable to attend to own bodily needs without assistance
5 = severe disability: bedridden, incontinent, and requiring constant nursing care and attention
9 = information insufficient for coding

E. STROKE TREATMENT

Intravenous thrombolysis	Yes	|___|1
	No	|___|2
Presentation within 3 hours from symptom onset	Yes	|___|1
	No	|___|2

F.	**BRAIN EXAMINATION AT AUTOPSY**	Yes	|___|1
		No	|___|2
		Yes, but no report	|___|3

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

Morbidity Survey
Cardiovascular Test Procedures Abstract

ID number: |___|___|___|___|___|___|___|

1. **WAS CATHETERIZATION/ANGIOGRAM DONE?**
   Yes |___|1 No **(*Go to Q18*)** |___|2 Yes, but no report |___|3

2. If YES, When? |___|___|/|___|___|/|___|___|___|___|
   month day year

3. Where: _____ |___|___|___|___|___|___|
   Hospital/Clinic City/State Hospital Code

Was Any Vessel ≥ 50% Stenotic in ...

		Yes	No	Uncertain	Unknown
4.	Left Main:	|___|1	|___|2	|___|8	|___|9
5.	Left anterior descending:	|___|1	|___|2	|___|8	|___|9
6.	Right coronary:	|___|1	|___|2	|___|8	|___|9
7.	Circumflex artery:	|___|1	|___|2	|___|8	|___|9

8. Ejection Fraction (%): |___|___|___|

777= normal, % not specified 888=abnormal, % not specified
999=unknown/no response

9. Left Ventricular Function: Normal |___|1 Assessed, results not specified |___|3
Depressed |___|2 Not assessed **(*Go to Q18*)** |___|9

10. Was Akinetic Wall Observed?

Yes |___|1 No (***Go to Q15***) |___|2 Uncertain |___|8 Unknown|___|9

		Yes	No	Uncertain	Unknown
11.	Anterior:	|___|1	|___|2	|___|8	|___|9
12.	Inferior:	|___|1	|___|2	|___|8	|___|9
13.	Apex:	|___|1	|___|2	|___|8	|___|9
14.	Diffuse:	|___|1	|___|2	|___|8	|___|9

Finding of Valvular Function:

		Yes	No	Uncertain	Unknown
15.	Mitral regurgitation:	|___|1	|___|2	|___|8	|___|9
16.	Aortic regurgitation:	|___|1	|___|2	|___|8	|___|9
17.	***Was Angioplasty performed?***	|___|1	|___|2	|___|8	|___|9

18. WAS TREADMILL EXERCISE TEST DONE?

Yes |___|1 No **(*Go to Q25*)** |___|2 Yes, but no report |___|3

19. If YES, When? |___|___|/|___|___|/|___|___|___|___|
month day year

3. Where:_____ |___|___|___|___|___|___|
Hospital/Clinic City/State Hospital Code

21. Treadmill ECG:

Normal |___|1 Borderline |___|2 Abnormal |___|3 Inconclusive |___|8 No report |___|9

22. Maximum heart rate (beats/minute): 999=no report |___|___|___|

23. Maximum systolic blood pressure (mmHg): 999=no report |___|___|___|

24. Treadmill time (round to nearest whole number minute): 99=no report |___|___|

25. WAS THALLIUM TEST, OR OTHER NUCLEAR IMAGE TEST DONE?

Yes |___|1 No **(*Go to Q29*)** |___|2 Yes, but no report |___|3

19. If YES, When? |___|___|/|___|___|/|___|___|___|___|
month day year

3. Where:_____ |___|___|___|___|___|___|
Hospital/Clinic City/State Hospital Code

28. Test results: Positive |___|1 Negative |___|2 Equivocal |___|3 No report |___|9

ADMINISTRATIVE INFORMATION:

29. Reviewer code |___|___|___|

30. Review date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MORBIDITY SURVEY
PERIPHERAL VASCULAR PROCEDURES/REVASCULARIZATION ABSTRACT

ID number: |___|___|___|___|___|___|___|

1. **Was peripheral angiogram (ICD-9 procedure code 88.48) done?**

Yes |___|1 No |___|2 **(Go to Q2)** Yes, but no report |___|9

a. If yes: Contrast angiogram |___| MR angiogram |___| CT angiogram |___|

b. If yes, when? |___|___|/|___|___|/|___|___|___|___|
month day year

c. Where: _____

d. Was any vessel ≥ 50% stenotic?

i. Aorta: Yes |___|1 No |___|2 Uncertain|___|8 Unknown |___|9
If yes, which side? Right |___| Left |___| Both |___|

ii. Iliac: Yes |___|1 No |___|2 Uncertain |___|8 Unknown |___|9
If yes, which side? Right |___| Left |___| Both |___|

iii. Femoral: Yes |___|1 No |___|2 Uncertain |___|8 Unknown |___|9
If yes, which side? Right |___| Left |___| Both |___|

iv. Popliteal or lower: Yes |___|1 No |___|2 Uncertain |___|8 Unknown |___|9
If yes, which side? Right |___| Left |___| Both |___|

v. Carotid stenosis Yes |___|1 No |___|2 Uncertain |___|8 Unknown |___|9
If yes, which side? Right |___| Left |___| Both |___|

e. Was there evidence of previous revascularization? Yes |___|1 No |___|2

2. **Was peripheral angioplasty or surgical revascularization done?**

Yes, angioplasty |___|1
(ICD-9 procedure code 39.50)

Yes, revascularization |___|3
ICD-9 procedure code 39.25 and 39.29)

No |___|2 **(Go to Q3)**

Yes, but no report |___|9

a. If yes, when? |___|___|/|___|___|/|___|___|___|___|
month day year

b. Where: _____

3. **Was amputation (ICD-9 procedure codes 84.10 – 84.19) performed?**

Yes |___|1 No |___|2 **(Go to Q4.)** Yes, but no report |___|9

a. If yes, which side? Right |___| Left |___| Both |___|

b. When: |___|___|/|___|___|/|___|___|___|___|
month day year

c. Where: _____

4. **Was carotid angioplasty/stenting done?**

Yes, surgery |___|1 No |___|2 **(Go to end.)** Yes, but no report |___|9
(ICD-9 procedure code 38.12)

a. If yes, which side? Right |___| Left |___| Both |___|

b. If yes, when? |___|___|/|___|___|/|___|___|___|___|
month day year

c. Where: _____

5. **Was carotid endarterectomy done?**

Yes |___|1 No |___|2 **(Go to end.)** Yes, but no report |___|9

a. If yes, which side? Right |___| Left |___| Both |___|

b. When: |___|___|/|___|___|/|___|___|___|___|
month day year

c. Where: _____

ADMINISTRATIVE INFORMATION:

5. Reviewer code: |___|___|___|

6. Review date: |___|___|/|___|___|/|___|___|___|___|
month day year

Instructions: The same procedures used for the ongoing surveillance in each center should be used, including evaluation of clinic charts and/or use of the IHS computerized records as well as direct contact with participants when necessary.

The purpose of this study is to derive an estimate of the proportion of participants who have undergone diagnostic or therapeutic procedures documenting definite lower extremity peripheral arterial disease since the Phase III SHS examination, and the proportion thereof for whom the necessary records are still available. Therefore, medical records for hospitalizations or outpatient encounters dealing with the

diagnostic or procedural codes listed below and occurring since 1 January 1998 should be requested and reports of the procedures of interest should be obtained. Earlier events that correspond to the same procedures should be noted but charts need not be abstracted.

The following diagnostic codes should be identified:

For Peripheral Angiograms: ICD-9 procedure code **88.48**
For Peripheral Angioplasty: ICD-9 procedure code **39.50**
For Peripheral Surgical Revascularization: ICD-9 procedure codes **39.25 and 39.29**
For Amputation: ICD-9 procedure codes **84.10-84.19**
For Carotid Endarterectomy: ICD-9 procedure code **38.12**
For Angioplasty: ICD-9 procedure code **00.61**
For Stenting: ICD-9 procedure code **00.45**

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

HEART FAILURE PROCEDURES

SHS ID: |___|___|___|___|___|___|___| Date of Event: |___|___|/|___|___|/|___|___|___|___|
month day year

A. ATRIAL FIBRILLATION AT TIME OF CHF? Yes |___| 1 No |___| 2 Unknown |___| 9

B. WHICH IMAGING STUDY WAS PERFORMED DURING THIS ADMISSION? Please check ALL that were done. If more than one imaging study was done in the same admission, please use one of these forms for EACH IMAGING STUDY to record the results of that study.

|___|1 Echocardiogram

|___|2 Nuclear Imaging

|___|3 Invasive Angiogram

|___|4 CT Angiogram

|___|5 MRI Angiogram

|___|6 Other, Specify: _____

|___|7 Not sure, no results found in chart

|___|8 None

If not sure or none, skip to Q8.

1. Name of test: _____

2. Date of test: |___|___|/|___|___|/|___|___|___|___|
month day year

3. Facility name: _____

City/State: _____

4. Ejection fraction: Measured: | ____ |% Estimated: | ____ |%

If % not stated, 777 = normal, or range ≥ 50% 888 = abnormal, or range < 50% 999 = unknown/no response

5. Ejection fraction interpretation: Normal |___| 1 Depressed |___| 2 NR |___| 9

6. Segmental wall motion abnormalities? Yes |___| 1 No |___| 2 NR |___| 9

If yes, degree of abnormality: Mild |___| 1 Moderate |___| 2 Severe |___| 3 Unknown |___| 9

7. Transmitral time: E Velocity: ___ cm/sec A Velocity: _____ cm/sec Peak E/A Ratio: _____

Decel. Time:_____ msec IVRT: ____Septal E':_____ Peak S':_____ Septal A':____

SHS ID: |___|___|___|___|___|___|___|

8. **Valvular disease?** Yes |___| 1 No |___| 2 Unknown |___| 9

If No or Unknown, go to Q9.

If Yes,

a. Mitral regurgitation/insufficiency:

1+ |___| 1 2+ |___| 2 3+ |___| 3 4+ |___| 4 Unknown |___| 9

b. Mitral stenosis: Mild |___| 1 Moderate |___| 2 Severe |___| 3 Unknown |___| 9

c. Aortic regurgitation/insufficiency:

1+ |___| 1 2+ |___| 2 3+ |___| 3 4+ |___| 4 Unknown |___| 9

d. Aortic stenosis: Mild |___| 1 Moderate |___| 2 Severe |___| 3 Unknown |___| 9

e. Tricuspid regurgitation:

1+ |___| 1 2+ |___| 2 3+ |___| 3 4+ |___| 4 Unknown |___| 9

9. **Right ventricular systolic pressure/PA systolic pressure (mmHg):** **|___|___|___|**

If not stated, 777 = normal 888 = abnormal 999 = unknown/no response

C. B-TYPE NATRIURETIC PEPTIDE (BT-BNP):_____pg/ml. Upper Limit of Normal:_____pg/ml

N-TYPE NATRIURETIC PEPTIDE (NT-BNP): _____ pg/ml. Upper Limit of Normal:_____pg/ml

D. CARDIOMYOPATHY DIAGNOSIS: Ischemic: ___ Non-Ischemic: _____ Hypertrophic: ____

Valvular disease: ____ Acute MI:_____ NR |___| 9

No cardiomyopathy _____

Reviewer Code: |___|___|___| Review Date:|___|___|/|___|___|/|___|___|___|___|
month day year

Instructions for completing SHS CHF form

The CHF Procedure Form is for both non-fatal and fatal CHF events. We will collect the same information, when it's available, to characterize the features associated with heart failure events, whether they are non-fatal or fatal. Obviously some heart failure deaths will be so diagnosed based on fulminant pulmonary edema without further medical evaluation, but in other cases death may occur because of progressive cardiac pump failure in hospital, where there may be extensive characterization of the status of heart muscle and valve function, etc.

Because episodes of severe heart failure from which individuals die and those from which they are rescued by contemporary treatment do not represent fundamentally different biological entities, but rather differ in the severity of underlying derangements and in the efficacy and promptness of therapeutic interventions, it is soundest both to include fatal and non-fatal heart failure events as a single end-point (unless one is focusing solely on mortality) and to gather the same information to classify the subtypes of heart failure (systolic vs. diastolic ventricular dysfunction, roles of coronary artery or valvular disease, etc.) for both fatal and non-fatal CHF events.

A. ATRIAL FIBRILLATION AT TIME OF CHF?

This question is answered in the affirmative if there is clear evidence of atrial fibrillation on the ECG. There will be a presumption that atrial fibrillation may have contributed to precipitating heart failure. If that is the case the arrhythmia should be persistent enough to be recorded on the ECG.

B. IMAGING STUDY

Please check ALL that were done. If more than one imaging study was done in the same admission, please fill in a copy of this form for EACH IMAGING STUDY to record the results of that study.

If a test was not done or no information is available, skip to Section C, otherwise, fill in the following.

B1 & B2. Record the name and date of the test.
B3. Record the place where the test was done.

Use the test study and date soonest after the admission (when CHF was first diagnosed). If there is a cursory initial study followed by a detailed study with **no intervention or status change** in between, use the more detailed study results.

B4. Ejection Fraction: Record the results in the appropriate box. If a range is given, one should put in the average value, rounded to the nearest whole number. For example, an ejection fraction such as 20-25% would average 22.5% and round to 23%. If there is an indication of a measured value, it should be taken as “measured;” if it is said to be estimated or if the reports says “about 50%”, for example, the EF would be estimated. If a specific EF percent is given without further modification, code as measured. If the actual result was not given, use the following:

777 = normal, or range $\geq$ 50%
888 = abnormal, or range < 50%
999 = unknown

B5. Ejection Fraction Interpretation: Normal, Depressed, NR.

If no interpretation is noted on the reading, please check “NR” for no response. The categorical variable is included to allow entry of the qualitative conclusion reached in the primary report of the study being reviewed and not our conclusion about whether or not a given ejection fraction is normal.

Note to CC: This will make this variable of restricted utility, being useful for a two-step identification of reduced function based on objective measurement if available or on the qualitative interpretation in the primary report, but will create a variable that should not be used for other purposes.

B6. Segmental Wall Motion Abnormalities: Yes, No, NR.

If yes, degree of abnormality: Mild, Moderate, Severe, Unknown

The adjudicator can make this interpretation from alternative descriptions (e.g., regional or by specification of individual segments), if possible, from the information in the report. If there is not enough information in the record to make this determination, please check "NR" for no response.

B7. Transmitral time. Please record the following:

E Velocity in cm/sec
A Velocity in cm/sec
Peak E/A ratio
Decel. Time in msec
IVRT
Septal E'
Peak S'
Septal A'

These measurements may be found in the echo report typically under Doppler measurements. E', A' and peak S' refer to tissue Doppler measurements.

B8. Valvular Disease: Yes, No, Unknown

If NO or Unknown, skip to B9 (Right ventricular systolic pressure). Check whether there is evidence of valvular disease on the echocardiogram report (if there is an echo report), and note the abnormality severity. If there is no mention of severity, check the most mild form of disease. For instances where a range is reported, such as "mild to moderate "or "1 to 2+", check the less severe category. If there is no mention of severity, the coder should mark "mild", but not "trace". Do not note "trace" as evidence of disease. If regurgitation is reported as trace-mild-moderate-severe the coder should equate 1+ to trace, 2+ to mild, 3+ to moderate and 4+ to severe.

a. Mitral Regurgitation: 1+, 2+, 3+, 4+, unknown

b. Mitral Stenosis: Mild, Moderate, Severe, Unknown

c. Aortic Regurgitation: 1+, 2+, 3+, 4+, unknown

d. Aortic Stenosis: Mild, Moderate, Severe, Unknown

e. Tricuspid Regurgitation: 1+, 2+, 3+, 4+, unknown

B9. Right Ventricular Systolic Pressure (pulmonary artery (PA) systolic pressure). If results were given, record the actual number in mmHg. Otherwise use the following:

777 = Normal
888 = Abnormal

999 = Unknown

C. B-TYPE NATRIURETIC PEPTIDE (BT-BNP) and N-TYPE NATRIURETIC PEPTIDE (NT-BNP).

If the results were not in the chart, record 999.

Record the highest BNP level, even if not on the same date as the admission. Upper limit of normal for the BNP and NT-BNP assays used from the lab report

D. CARDIOMYOPATHY DIAGNOSIS: Ischemic, Non-Ischemic, Hypertrophic, Valvular disease, Acute MI, NR, No cardiomyopathy.

The reviewer will make a decision as to the diagnosis of the cardiomyopathy – not the etiology of the heart failure exacerbation. This diagnosis will be based on available medical notes (discharge summary/cardiology notes, especially) and appropriate imaging tests (echo and catheterization mostly). Because diagnostic tests will not be reviewed, precise diagnostic criteria may not be possible.

SHS will use a practical definition that is used in many studies from large databases or large clinical trials without precise central review of the evidence, which is to diagnose dilated cardiomyopathy in patients with heart failure whose LV ejection fraction is depressed (below whatever limit the evaluating center used for "preserved EF") and then sub-classify as ischemic on the basis of documented extensive coronary artery disease and/or historic and/or ECG evidence of myocardial infarction (often more than one event). While this is imprecise, it will be no more so than use of ejection fractions from several different modalities (echo, cath or nuclear angiogram) derived by many interpreting physicians using a variety of methods of measurement or estimated by the interpreting physician without making any specific measurements.

There may be cases that defy classification, for example in the case of EF reduction out of proportion to the extent of CAD. However because of the desirability of including all individuals in population-based analyses, generally a conclusion should be made. **We will use the following definition for ischemic cardiomyopathy:**

1.) Patients with a history of MI or revascularization (CABG, PCI) or
2.) Patients with $\geq$ 75% stenosis of left main or proximal LAD or
3.) Patients with $\geq$ 75% stenosis of two or more epicardial vessels.

Code the diagnosis of hypertrophic cardiomyopathy only if there is specific echo data suggesting hypertrophic obstructive cardiomyopathy (HOCM) or marked septal hypertrophy without obstruction (in a published paper from SHS, only 1 of 8 participants with HCM by echo had obstruction (Maron BJ, Spirito P, Roman MJ, Paranicas M, Okin PM, Best LG, Lee ET, Devereux RB: Prevalence of hypertrophic cardiomyopathy in a population-based sample of American Indians aged 51 to 77 years (the Strong Heart Study). Am J Cardiol. 2004 Jun 15:93(12);1510-1514.)

Code the diagnosis of valvular disease in patients with severe valvular disease with evidence suggesting it is the cause of the cardiomyopathy, rather than coding as “non-ischemic”. If there are criteria to code as ischemic as listed above, code as ischemic. In these cases it will be presumed that severe MR is a consequence of the ischemia. In the infrequent case that it is debatable, it may be possible to review previous SHS echocardiograms to make this assessment. In this case, contact the CC for the echo data.

If there is not enough evidence in the medical record to make a diagnosis, check “NR”. If there is no evidence of cardiomyopathy, check the “No cardiomyopathy” response.

Fill in your SHS Reviewer Code and the date you review this case.

APPENDIX E

Acute Myocardial Infarction (AMI) Tool

and

Instructions

THE STRONG HEART V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

ACUTE MYOCARDIAL INFARCTION
(STRONG HEART STUDY PROVIDER TOOL)
revised 6/22/2006

SHS I.D.: |___|___|___|___|___|___|

Inclusion:

1) Is Acute Myocardial Infarction confirmed by discharge diagnosis at ANY of the hospitalizations in this series? **The diagnosis may be either principal or secondary; and listed on either the discharge summary or discharge face sheet.**

|___|1 Yes = Continue **|___|2 No = STOP**

Which facility(s)?

|___| Initial facility

|___|1 Principal diagnosis |___|2 Secondary diagnosis |___|3 not categorized

|___| First referral facility

|___|1 Principal diagnosis |___|2 Secondary diagnosis |___|3 not categorized

|___| Second referral facility

|___|1 Principal diagnosis |___|2 Secondary diagnosis |___|3 not categorized

2) Is Acute Myocardial Infarction confirmed by enzymes and/or EKG's obtained at ANY of the hospitalizations in this series?

|___|1 Yes = Continue **|___|2 No = STOP**

Which facility(s)?

|___|1 Initial facility

|___|2 First referral facility

|___|3 Second referral facility

PLEASE COPY THE FIRST EKG OBTAINED AT EACH ADMISSION IN THIS SERIES.

Complete this form if the above criteria apply to ANY of a continuous series of admissions and transfers. Use information from as many as the FIRST THREE facilities where the patient received care. (If more than 3 facilities…..STOP).

A. Demographics:

A1. SHS #: _____

A2. Name: _____

A3. Date of Birth: |___|___|/|___|___|/|___|___|___|___|
month day year

A4. Pay Source, IF KNOWN:(select all that apply):

|___|1 Medicare

|___|2 Medicaid

|___|3 IHS/Tribal facility

|___|4 Private Insurance

|___|5 Self Pay

A5. Initial Facility Name (or number) _____:

Admission Date: |___|___|/|___|___|/|___|___|___|___|
month day year

Arrival Time: _____ (Military time, or closest approximation)

Discharge (or Transfer) Date: |___|___|/|___|___|/|___|___|___|___|
month day year

Discharge (or Transfer) Time: _____ (Military time, or closest approximation)

Was chest pain or clinical suspicion of cardiac disease present at the time of admission to this facility?
|___|1 Yes

|___|2 No

Was there any indication of unusual delay from the time the patient presented to the facility and when they were first evaluated by a provider?
|___|1 Yes

|___|2 No **If "NO", go to A6.**

Approximately how long was this delay?_____ hours

A6. First Referral Facility Name (or number) _____:

Admission Date: |___|___|/|___|___|/|___|___|___|___|
month day year

Arrival Time: _____ (Military time, or closest approximation)

Discharge (or Transfer) Date: |___|___|/|___|___|/|___|___|___|___|
month day year

Discharge (or Transfer) Time: _____ (Military time, or closest approximation)

Was chest pain or clinical suspicion of cardiac disease present at the time of admission to this facility?
|___|1 Yes

|___|2 No

A7. Second Referral Facility Name (or number) _____:

Admission Date: |___|___|/|___|___|/|___|___|___|___|
month day year

Arrival Time: _____ (Military time, or closest approximation)

Discharge (or Transfer) Date: |___|___|/|___|___|/|___|___|___|___|
month day year

Discharge (or Transfer) Time: _____ (Military time, or closest approximation)

Was chest pain or clinical suspicion of cardiac disease present at the time of admission to this facility?

|___|1 Yes

|___|2 No

B. Early Administration of Aspirin:

B1. Did the patient receive aspirin, **FROM ANY FACILITY**, within 24 hours of arrival (either 24 hours before arrival or 24 hours after arrival) to the **FIRST** hospital/health care facility?

|___|1 Yes

B1A. Date first aspirin received: |___|___|/|___|___|/|___|___|___|___|
month day year

B1B. Time first aspirin received? (military time) _____ |___| Not Available

B1C. Facility that administered aspirin: _____

B1D. Dosage of aspirin administered: ____ mg.

B1E. Type of aspirin: __Non-enteric (or Not Known) __Enteric

|___|2 No

IF "YES" GO TO C1.

Contraindications/Exclusions/Possible Reasons for non-administration

B2. If patient did **NOT** receive aspirin within 24 hours of arrival at the first facility, are any of the following noted in **ANY** medical record during the first 24 hours after the initial admission?

|___|1 Yes, select at least one of the following:

|___|a Allergy/intolerance to aspirin

|___|b Bleeding/hemorrhage on admission

|___|c History of bleeding/bleeding risk

|___|d History of peptic ulcer disease

|___|e Chronic liver disease

|___|f First platelet count <100 x 10^9 /L

|___|g First Hemoglobin <10g/dL or First Hematocrit < 30%

|___|h Warfarin prior to arrival

|___|i Renal insufficiency (Creatinine > 3mg/dL on admission)

|___|j Other, alternative anticoagulants (eg. Plavix, clopidogrel) were prescribed

|___| Other reasons given for not prescribing aspirin? _____

|___|2 No

B3. If patient did **NOT** receive aspirin within 24 hours of arrival at the first facility, did he/she take aspirin 24 hours prior to the initial admission?

|___|1 Yes

|___|2 No or Unknown

C. Early Administration of Beta Blockers:

C1. Did the patient receive a beta blocker, **FROM ANY FACILITY**, within 24 hours of arrival to the **FIRST** hospital/health care facility?

|___|1 Yes

C1A. Date first beta blocker received: |___|___|/|___|___|/|___|___|___|___|
month day year

C1B. Time first beta blocker received:_____
(Military time, or closest approximation)

C1C. Facility that administered a beta blocker: _____

|___|2 No

IF "YES" GO TO D1.

Contraindications/Exclusions/Possible reason beta blockers not administered

C2. If patient did **NOT** receive beta blockers within 24 hours of arrival at the first facility, are any of the following noted in **ANY** medical record during the first 24 hours after the initial admission?

|___|1 Yes, select at least one of the following:

|___|a Allergy/intolerance to beta blockers

|___|b First pulse < 60 bpm on arrival and not taking beta blockers prior to arrival

|___|c Heart Failure/Pulmonary Edema on arrival

|___|d Previous LVEF < 50% or described as severe, moderate or mild dysfunction

|___|e Shock (any type) on arrival

|___|f First systolic BP <100 mmHg

|___|g Arrival EKG with any of the following indicating heart block

|___|g1 1st degree heart block, PR interval > 240 milliseconds.

|___|g2 2nd/3rd degree heart block

|___|g3 RBBB and left fascicular block (bifascicular block)

|___|h History of Chronic Obstructive Pulmonary Disease or asthma

|___|i History of Peripheral Vascular Disease

|___|j Other reasons given for not prescribing beta blockers?_____

|___|2 No

D. Timely Reperfusion:

D1. Is this patient eligible for reperfusion?

|___|1 Yes

Arrival EKG at the FIRST facility with one of the following:

|___|a ST elevation in 2 contiguous leads

|___|b LBBB

|___|c ST segment elevation or injury noted on physician interpretation

and

|___|d Onset of chest pain or other AMI symptoms ≤ 12 hours prior to arrival at the FIRST health care facility.

Date of onset of symptoms: |___|___|/|___|___|/|___|___|___|___|
month day year

Time of onset of symptoms: _____(Military time, or closest approximation)

|___|2 No

D2. Did the patient receive thrombolytic therapy?

|___|1Yes

D2A. Date of first thrombolytic: |___|___|/|___|___|/|___|___|___|___|
month day year

D2B. Time first thrombolytic started: _____(military time or closest approximation)

D2C. Facility that administered first thrombolytic: _____

|___|2 No

D3. Did the patient have a revascularization procedure (angioplasty (PTCA) or CABG) within 24 hours of arrival to the referral hospital?

|___|1 Yes

D3A. Date of first revascularization procedure: |___|___|/|___|___|/|___|___|___|___|
month day year

D3B. Time revascularization procedure started: _____(military time or closest approximation)

D3C. Facility that conducted revascularization procedure:
_____

|___|2 No

If "Yes" to either D2 or D3, then go to E1.

Contraindications/Exclusions:

D4. If patient did **NOT** receive thrombolytic therapy during hospitalization at any facility or revascularization procedure within 24 hours of arrival at the first facility, are any of the following noted in **ANY** medical record during the first 24 hours after the initial admission?

|___|1 Yes, select at least one of the following:

|___|a Bleeding on admission

|___|b History of bleeding/bleeding disorder

|___|c History of peptic ulcer disease

|___|d Chronic liver disease

|___|e Surgery/biopsy within 2 months

|___|f Trauma in past month

|___|g Cardiac arrest within 6 hours prior to arrival

|___|h Bilirubin > 2 mg/dl

|___|i Warfarin prior to arrival

|___|j Stroke (history or current)

|___|k Thrombolysis considered but rejected

|___|l Age > 80 years

|___|m Other reasons for not prescribing thrombolytic therapy?_____

|___|2 No

E: Eligible for Discharge Indicators:

E1. Did the patient expire?
|___|1 Yes **If Yes, STOP**
|___|2 No

E2. Is discharge status unknown?
|___|1 Yes **If Yes, STOP**
|___|2 No

THE FOLLOWING SECTIONS APPLY ONLY TO THE FINAL FACILITY PATIENT WAS DISCHARGED FROM

F. Beta Blockers at Discharge:

F1. Was a beta blocker prescribed at discharge?
|___|1 Yes **If "YES", go to G1.**
|___|2 No

Contraindications/Exclusions/Possible reasons beta blockers not prescribed:
F2. Are any of the following noted in the medical record of the discharge facility?
|___|1 YES, select at least one of the following:
- |___|a Allergy/intolerance to beta blockers
- |___|b Pulse < 50 bpm and not taking a beta blocker
- |___|c Heart Failure or Pulmonary Edema (by physical exam, x-ray, or clinical assessment) **and** LVEF < 50% or described as moderate or mild dysfunction
- |___|d LVEF < 30% or described as severe dysfunction
- |___|e Shock
- |___|f Systolic BP <90 mmHg during hospital stay
- |___|g Last systolic BP < 100 mmHg and not on a beta blocker
- |___|h Heart block
  - |___|h1 First degree
  - |___|h2 2nd/3rd degree
  - |___|h3 Bifacsicular (RBBB and left fascicular block)
- |___|i Chronic Obstructive Pulmonary Disease or asthma
- |___|j Peripheral Vascular Disease
- |___|k Other reasons beta blockers not prescribed: _____

|___|2 No

G. Aspirin at Discharge:

G1. Was aspirin prescribed at discharge?

|___|1 Yes **If "YES", go to H1.**

|___|2 No

Contraindications/Exclusions/Possible reasons aspirin not prescribed:

G2. Are any of the following noted in the medical record of the discharge facility?

|___|1 Yes, select at least one of the following:

|___|a Allergy/intolerance to aspirin

|___|b Bleeding/hemorrhage

|___|c History of bleeding/bleeding risk

|___|d Chronic liver disease

|___|e Peptic ulcer disease

|___|f Platelet count < 100 x 10^9 /L

|___|g Hemoglobin < 10 g/dL or Hematocrit < 30 %

|___|h Treatment with warfarin on discharge

|___|i Renal insufficiency (Creatinine > 3 mg/dL)

|___|j Other reasons given for not prescribing aspirin: _____

|___|2 No

H. ACE Inhibitor at Discharge for Low LVEF (Left Ventricular Ejection Fraction)

H1. Does the patient have an LVEF < 40% or described as severe or moderate dysfunction?

|___|1 Yes

|___|9 Unknown

|___|2 No **If "NO", go to I1.**

H2. Was an ACE Inhibitor prescribed at discharge?

|___|1 Yes **If "YES", go to I1.**

|___|2 No

Contraindications/Exclusions:

H3. Are any of the following noted in the medical record of the discharge facility?

|___|1 Yes, select at least one of the following:

|___|a Allergy/intolerance to ACE Inhibitor

|___|b Aortic stenosis

|___|c Serum Creatinine > 2 mg/dL

|___|d Last systolic BP < 100 mmHg and not on ACE Inhibitor

|___|e Other reasons given for not prescribing ACE Inhibitors: _____

|___|2 No

I. Smoking Cessation Counseling:

I1. Is there a history of cigarette use within the year prior to arrival in the medical record of any facility?

|___|1 Yes

|___|2 No

If "No", go to J1.

I2. Is smoking cessation counseling documented in the medical record of the discharge facility?

|___|1 Yes

|___|2 No

J. Screening and treatment of dyslipidemia:

J1. Was a fasting lipid profile obtained at any facility during this series of admissions?

|___|1 Yes-Results of first test after presenting for care at any facility

LDL cholesterol _____mg/dl

HDL cholesterol _____mg/dl

Triglycerides _____mg/dl

|___|2 No

J2. What treatment plan for dyslipidemia was documented in the chart at the discharge facility during hospitalization or at the time of discharge?

(Check all that apply)

|___|1 A. Dietary counseling

|___|2 B. Lipid lowering medication

|___|3 C. Cardiac rehabilitation program

|___|4 D. None

ADMINISTRATIVE INFORMATION:

Abstractor number: |___|___|___|___|

Abstract date: |___|___|/|___|___|/|___|___|___|___|
month day year

Data entry number: |___|___|___|___|

Entry date: |___|___|/|___|___|/|___|___|___|___|
month day year

Acute Myocardial Infarction (AMI)
Strong Heart Study Instructions - Provider Tool – Revised 12/20/2002

Data Element	AMI Confirmation Criteria
1. MI confirmed? **Question**: Is Myocardial Infarction confirmed by discharge diagnosis? **Instructions**: Select this option if primary discharge diagnosis of any facility in the series indicates the patient was hospitalized with an acute myocardial infarction. **No:** Select this option if the documentation does not indicate acute myocardial infarction.	Review the discharge diagnoses of all admissions in this continuous series of hospitalizations to determine if any of the admissions have a principal discharge diagnosis of "acute myocardial infarction". The principal diagnosis is the primary condition affecting the services provided during the hospitalization, and this should be where the MI is recorded. In some facilities a "principal diagnosis" will be listed and "secondary" diagnoses listed separately. If this is the case, please indicate by check mark in the following line, whether the diagnosis was principal or secondary. If there is no designation of principal or secondary, check " not categorized". Do not consider a particular admission as satisfying this criterion if the diagnosis is listed as: *MI listed as secondary diagnosis *Rule out MI *R/O MI
2. MI confirmed? **Question**: Is Myocardial Infarction confirmed by enzymes and/or EKGs? **Instructions**: **YES:** Select this option if enzymes and EKGs	**Acute MI confirmed by enzymes (any one of the following)** Peak LDH within first 48 hours after arrival > 1.5 times LDH Upper Limits of Normal and LDH-1 on peak LDH > LDH-2 on peak LDH **or** Peak CK-MB % > 5 (CK and CK-MB within the first 48 hours after arrival) $\frac{\text{Peak CPK-MB unit of measurement}}{\text{CK on peak CK-MB}} \times 100$ **or** Peak CK-MB (%, index, fraction) > 5% if peak CPK-MB or CK on peak CK-MB is missing **or** Troponin I within first 48 hours after arrival > Troponin I Upper Limits of Normal or Troponin T within first 48 hours after arrival > Troponin T Upper Limits of Normal ,

Data Element	AMI Confirmation Criteria
indicate an acute myocardial infarction. **No:** Select this option if the documentation does not indicate acute myocardial infarction. **Note: Please obtain a copy of the admission EKG from EACH facility.**	**OR** **At least two of the following:** **1. Two-fold elevation of Peak CPK** (Within the first 48 hours after arrival at the first facility) Peak CPK > 2 times CK-Upper Limits of Normal, **or** **2. Presence of chest pain w/in 48 hrs. prior to arrival at the first facility.** **or** **3. Acute MI on EKG**: **3a. ST elev on any EKG within 6 hrs of arrival at first facility.** indicates ST elevation (≥1 mm) in 2 contiguous leads Contiguous leads: I, AVL I, V_4 I, V_5 I, V_6 AVL, V_5 AVL, V_6 V_1 V_2 V_2 V_3 V_3 V_4 V_4 V_5 V_5 V_6 II, III II, V_6 II, AVF III, AVF **or** **3b. EKG interpretation mentions "myocardial infarction (or injury)" on any EKG during this series of hospitalizations, AND there is no history of a myocardial infarct prior (days/weeks/months before) to admission at the first facility (see History and Physicals of all admissions in this series).** **or** **3c. New Q waves, or left bundle branch block documented on any EKG** within 6 hours of arrival at first facility. New Q-waves on arrival EKG, or left bundle branch block on any EKG within 6 hours of arrival at first facility. **Complete the AMI Provider Tool if the above criteria apply to ANY of a continuous series of admissions and transfers. Use information from as many as the FIRST THREE facilities where the patient received care. (If more than 3 facilities…..STOP)**.

DEMOGRAPHICS					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
A1. SHS ID #	What is the SHS ID No.?	List the SHS ID number.	SHS Record		
A2. Name	What is the pt name?	List the name of the patient	Hospital Record		
A3. Date of Birth	What was the patient's date of birth?	Record the patient's date of birth as it appears in the medical record, in the following format MM/DD/YYYY.	SHS Record		
A4. Pay Source	What is the pay source listed for this patient?	Select all that apply: **Medicare:** Select this option if a payment source is Medicare (T18) **Medicaid:** Select this option if a pay source is Medicaid (T19) **IHS/Tribal**-Select this option if one of the facilities is run by a Tribe or IHS **Private Health Insurance**-Select this option if some of the care was paid for by private health insurance. **Self-Pay**-Select this option if third party coverage was not available to pay for part of the care provided for the AMI	Face sheet		
A5 through A7. Facility Names and Numbers	What is/are the facility names numbers? **(If more than 3 facilities…..STOP).**	List all the facilities that provided care for this AMI in chronological order and include admission and discharge dates and times (military time).	Use SHS codes for health care facilities that are listed in the SHS manual.		

A5 through A7. Admission Date	What is the date the patient was admitted to this hospital?	Enter the date in MM/DD/YYYY format. Use the actual date of inpatient admission to acute care.	ER record, history & physical, nursing assessment, surgery or procedure note.		Arrival Date Admit to observation
A5 through A7. Discharge/Transfer Date	What is the date the patient was discharged/transferred from acute care, left against medical advice, or expired?	Enter the date in MM/DD/YYYY format.	Discharge summary, transfer note, nursing discharge note, progress notes, graphic sheet. Physician orders	AMA	

B. Early Administration of Aspirin					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
B1. Aspirin within 24 hours of arrival at the first health care facility?	Did the patient receive aspirin, **FROM ANY FACILITY**, within 24 hours of arrival (either 24 hours before arrival or 24 hours after arrival) to the **FIRST** hospital/ health care facility?	**Yes:** Select this option if there is documentation that the patient was given aspirin within 24 hours of arrival (either 24 hours before arrival or 24 hours after arrival) at the first health care facility. **If Yes, skip to C1.** **No:** Select this option if the patient did not take aspirin within 24 hours of arrival.	ER record, history & physical, nursing admission assessment, Ambulance record/sheet. Also look for documentation that the patient was advised to self-administer aspirin.	(See attached medication sheet for aspirin-containing drugs)	
B1A. Date first aspirin received?	What was the date the first aspirin was received?	Enter the first date the patient received aspirin after arrival to the hospital using MM/DD/YYYY format.			
B1B. Time first aspirin received?	What time was the first aspirin received?	Enter the time the first aspirin was received after arrival to the first health care facility, enter in military time.	Medication records in medical record or ER record.		

B. Early Administration of Aspirin					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
B1C Facility that administered aspirin?	What was the name and # of the facility that administered the aspirin?	Enter name and # of facility that administered aspirin.	SHS manual for facility code		
B1D. Dose of aspirin?	What was the dose of aspirin administered?	List the mg dose that was administered or that the patient took themselves	ER record, history & physical, nursing admission assessment, Ambulance record/sheet		
B1E Type of aspirin?	What type of aspirin?	List whether the type was enteric, non-enteric or not known			
B2. Contraindications/ Exclusions/Possible reasons for non-administration	Does the patient have any contraindications to early aspirin therapy?	**Yes:** Select yes if any of the following are true and select at least one:			
		Allergy/intolerance to aspirin Was there a history of allergy/ sensitivity/ reaction, or intolerance to aspirin prior to arrival?	History & physical, emergency room notes, nursing admission notes, progress notes.	Record only those associated with a reaction to aspirin: Adverse drug event, adverse drug reaction, allergy, anaphylaxis, intolerance, sensitivity.	Documentation which states aspirin caused upset stomach or didn't agree with patient.
		Bleeding/hemorrhage on admission (48 hours prior to arrival or at the time of arrival)	History & physical, ER record, nursing admission notes, progress notes.	GI bleeding: bleeding diverticulum, bleeding from a peptic, gastric, esophageal, or duodenal ulcer, bleeding from colon, blood in vomitus, emesis, or stool, coffee ground emesis, esophageal bleeding varices, hematemesis, hematochezia, heme/guaiac positive vomitus, emesis, or stool,	Anemia not due to gastrointestinal bleeding, bleeding hemorrhoid, bleeding which occurred as a result of an injury or trauma, chronic anemia, epistaxis, heme positive urine, lab urinalysis report, urine dipstick.

B. Early Administration of Aspirin					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				Hemoccult/occult positive vomitus, emesis or stool, mallory-weiss tear, melena, rectal bleeding (BRB) per rectum, BRBPR. GU bleeding: blood in urine, genitourinary (GU) bleeding, hematuria. Intracranial bleeding: cerebral hemorrhage, hemorrhagic CVA, hemorrhagic infarct of the brain, intracerebral bleeding/hemorrhage, ruptured intracranial aneurysm, subarachnoid hemorrhage (SAH), subdural hematoma. Pulmonary bleeding: coughing up blood, hemoptysis	
		History of bleeding or bleeding risk: Select this option if there is documentation of a history of bleeding from gastrointestinal (GI) tract (esophagus, stanch, intestine, or colon); the genitourinary (GU) tract (kidneys, bladder, or prostate); the brain, the lungs, or any other bleeding documented other than the exclusions listed.	History & physical, ER record, nursing admission notes, progress notes.	GI bleeding: bleeding diverticulum, bleeding from a peptic, gastric, esophageal, or duodenal ulcer, bleeding from colon, blood in vomitus, emesis, or stool, coffee ground emesis, esophageal bleeding varices, hematemesis, hematochezia, heme/guaiac positive vomitus, emesis, or stool, Hemoccult/occult positive vomitus, emesis	Anemia not due to gastrointestinal bleeding, bleeding hemorrhoid, bleeding which occurred as a result of an injury or trauma, chronic anemia, epistaxis, heme positive urine, lab urinalysis report, urine dipstick. Easy bruisability

B. Early Administration of Aspirin					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				or stool, mallory-weiss tear, melena, rectal bleeding (BRB) per rectum, BRBPR. GU bleeding: blood in urine, genitourinary (GU) bleeding, hematuria. Intracranial bleeding: cerebral hemorrhage, hemorrhagic CVA, hemorrhagic infarct of the brain, intracerebral bleeding/hemorrhage, ruptured intracranial aneurysm, subarachnoid hemorrhage (SAH), subdural hematoma. Pulmonary bleeding: coughing up blood, hemoptysis **Bleeding disorder:** Bleeding diathesis, Bleeding tendency, clotting disorder, factor 8 (VIII) deficiency, factor 9 (IX), hemophilia, ITP (idiopathic thrombocytopenia purpura), prolonged bleeding, Von Willebrand's disease	

B. Early Administration of Aspirin					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		History of peptic ulcer disease: Select this option when the documentation indicates a history of ulceration of the stomach, esophagus, or duodenum, whether or not they are currently being treated.	History & physical, ER record, nursing admission notes, progress notes.	Duodenal ulcer, esophageal ulcer, gastric ulcer, gastrointestinal (GI) ulcer, peptic ulcer disease (PUD), stomach ulcer, stress ulcer, ulcers.	Decubitus ulcer (skin), digital ulcer (finger/toes), mouth ulcer (aphthous), pressure ulcer (skin), stasis ulcer, ulcerative colitis, ulcer not associated with the upper GI tract.
		Chronic liver disease (History)	History & physical, ER record, nursing admission notes, progress notes.	Hepatic failure, Fulminant hepatic failure, Hepatic encephalopathy, liver failure, cirrhosis, alcoholic cirrhosis, cirrhosis etiology unknown, Cryogenic cirrhosis, primary or secondary biliary cirrhosis.	
		Platelet count < 100 x 10^9/L Select this option if the patients first platelet count within 24 hours of arrival was < 100 x 10^9/L	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG report, respiratory therapy report, emergency room record, progress notes, history & physical.	Thrombocyte count	
		First hemoglobin < 10 g/dL or First hematocrit < 30%: Select this option when the patients first hemoglobin within 24 hours of arrival is 10	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG	Hemoglobin: Hb, Hgb Hematocrit: HCT, Hematocrit, PCV (packed	

B. Early Administration of Aspirin					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		g/dL or First hematocrit within 24 hours of arrival is < 30%:	report, respiratory therapy report, emergency room record, progress notes, history & physical.	cell volume)	
		Warfarin prior to arrival: select this option if patient was taking warfarin prior to arrival, or recent use of warfarin.	History & physical, nurse's admission assessment, ER record, progress notes.		
		Renal insufficiency (Creatinine > 3 mg/dL): Select this option if the patient's first creatinine within 24 hours of arrival was > 3 mg/dL	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG report, respiratory therapy report, emergency room record, progress notes, history & physical.	Creat, Creatinine (Cr)	BUN/Creatinine ratio
		No: Select no if none of the above are true.			
B3. Aspirin 24 hours prior to arrival?	If the patient did NOT receive aspirin within 24 hrs of arrival at the first facility, did he/she take aspirin within 24 hrs prior to arrival to the first health care facility?	**Yes:** Select this option if the patient took aspirin in the 24 hours prior to arrival. **No:** Select this option if the patient did not take aspirin within the 24 hours prior to arrival at the first health care facility.	ER record, history & physical, nursing admission assessment, Ambulance record/sheet. . Look for documentation that the patient was advised to self-administer aspirin.	This includes self administration at home, or given in ambulance (See attached medication sheet for aspirin synonyms)	

C. Early Administration of Beta Blockers					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
C1. Beta Blockers **from any facility within 24 hours** of arrival at the first health care facility?	Did the patient receive a beta blocker within 24 hours of arrival at the first health care facility?	**Yes:** Select this option if the patient received a beta blocker in the 24 hours after arrival **If Yes, skip to D1.** **No:** Select this option if the patient did not receive a beta blocker in the first 24 hours after arrival.	Medication administration records, emergency room records, IV flow sheets.	(See attached medication sheet for beta blockers)	
C1A. Date first beta blocker received?	What was the date the first beta blocker was received?	Enter the first date the patient received beta blocker after arrival to the health care facility using MM/DD/YYYY format.			
C1B. Time first beta blocker received? C1C Facility that administered a beta blocker?	What time was the first beta blocker received? What was the name and # of the facility that administered the beta blocker?	Enter the time the first beta blocker was received after arrival to the health care facility, enter in military time. Enter the name and # of the facility that administered a beta blocker.	Medication record in medical record or ER record. SHS manual facility code list.		
		No: Select this option if none of the above are true.			
C2. Contraindications/ Exclusions/possible reason that beta blockers not administered	Does this patient have any contraindications to early administration of beta blockers	**Yes:** Select this option if any of the following are true, and select at least one			
		Allergy/intolerance to beta blockers	History & physical, emergency room notes, nursing	Record only those associated with a reaction to beta blocker: Adverse	Documentation which states beta blocker caused upset stomach or didn't agree with

C. Early Administration of Beta Blockers					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
			admission notes, progress notes.	drug event, adverse drug reaction, allergy, anaphylaxis, intolerance, sensitivity. (See attached medication sheet for beta blockers)	patient.
		First pulse < 60 bpm and not taking a beta blocker prior to arrival: Select this option if the patient's first pulse within 48 hours of arrival was < 60 bpm, and patient was not taking beta blocker prior to arrival	Emergency room notes, nursing admission notes, History & physical, progress notes, graphic sheets, ICU flow sheets, flow sheets, nursing notes, ER/triage notes	If a range is recorded enter the mid-point, If two values recorded for the same time, and both are higher than 50 record the higher of the two values, if either pulse is lower than 50, abstract the lower value. (See attached medication sheet for beta blockers)	
		Heart failure/pulmonary edema on arrival: Select this option when there is documentation of heart failure/pulmonary edema on arrival to the hospital.	History & physical, Emergency room notes, nursing admission notes, progress notes.	Heart failure/pulmonary edema: Biventricular failure, cardiac decompensation, cardiac failure, cardiomyopathy, congestive heart failure (CHF), edema of the lungs, heart failure (right or left), pulmonary edema, pump failure, ventricular failure, wet lungs.	Heart failure/pulmonary edema: diffuse infiltrate, diffuse interstitial pulmonary edema, edema of the legs (pedal edema), enlarged vessels, fullness of pulmonary vasculature, interstitial edema, interstitial congestion, JVD (jugular venous distention), perihilar vascular congestion, pulmonary vascular congestion, pulmonary vascular engorgement, rales, vascular congestion, venous congestion, volume or fluid overload, x-ray report finding.

C. Early Administration of Beta Blockers					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		Previous LVEF < 50 or described as severe, moderate or mild dysfunction.	History & physical, Emergency room notes, nursing admission notes, progress notes.	LVEF: Systolic function is a description of the function of the left ventricle based on how much blood is emptied from the left ventricle during each contraction. Include: contractility, EF Ejection fraction, function, left ventricular ejection fraction, LVEF. **Severe dysfunction**: Severe, very severe, very low/poor, akinesis, dyskinesis, global akinesis, marked, markedly, poor, severe, very low, very poor, very severe. **Mild or moderate dysfunction:** Diffuse hypokinesia, global hypokinesia, low, moderate, moderate-severe, moderate to severe, moderately severe, significant, abnormal, compromised, decreased, depressed, diminished, dysfunction, depressed, hypokinesis, impaired, impairment, mild, reduced.	LVEF: Right, atrial or diastolic dysfunction. Local/ localized dysfunction.
		Shock (any type) on arrival. Select this option if the patient	Emergency room notes, procedure note,	The intent is to collect the findings at the time of	Cardiovascular instability, cardioversion/defibrillation,

C. Early Administration of Beta Blockers					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		had shock present at the time of arrival	history & physical, physician admission note. Use physician documentation only.	presentation to the hospital. Anaphylactic shock, cardiogenic shock, hypovolemic shock, cardiovascular collapse, intravascular collapse, septic shock, shock, shocky.	electro-convulsive therapy (ECT), electro-shock therapy (EST), hypotension.
		First systolic BP < 100 mm hg: Select this option when the patients first recorded systolic blood pressure within 48 hours of arrival is < 100 mm hg	Emergency room notes, nursing admission notes, History & physical, progress notes, graphic sheets, ICU flow sheets, flow sheets, nursing notes, ER/triage notes	If two blood pressures are recorded at the same time record the blood pressure with the highest systolic reading, if a range is recorded, record the mid-point.	
		Arrival EKG with any of the following indicating heart block: **1st degree heart block**, **PR interval > 240 milliseconds, 2nd/3rd degree heart block, RBBB and left fascicular block (bifascicular block)**	The only acceptable source is the interpretation from the arrival EKG Arrival EKG is the first EKG done within 6 hours prior to or after arrival to the hospital. **Note: Please obtain a copy of the admission EKG from EACH facility in the continuous series of admissions.**	Arrival EKG is the first EKG done within 6 hours prior to or after arrival to the hospital. **1st degree heart block**, **PR interval >240 milliseconds (.24 seconds)**: PR interval measurement is included in the interpretation on 12-lead EKGs. If interval is not shown do not attempt to measure **2nd/3rd degree heart block**: 2:1 AV block, 2:1 AV conduction, 2:1 heart block, 3:1 AV block, 3:1	RBBB: Incomplete RBBB, incomplete right bundle branch block, interventricular conduction delay (IVCD), intraventricular conduction delay (IVCD) **2nd/3rd degree heart block**: Atrial flutter, first degree heart block (first degree AV block), interventricular conduction delay (IVCD), intraventricular conduction delay (IVCD)

C. Early Administration of Beta Blockers					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				AV conduction, 3:1 heart block, atrioventricular block (AV block), atrioventricular dissociation (AV dissociation), AV conduction block, complete heart block, heart block, intermittent HB, mobitz type 1 or 2, second degree AV block, second degree heart block (2 degrees block), third degree atrioventricular block (3 degrees AV block), third degree heart block (3 degrees block), variable HB, Wenckebach	
		Arrival EKG with any of the following indicating heart block: **1st degree heart block**, **PR interval > 240 milliseconds, 2nd/3rd degree heart block, RBBB and left fascicular block (bifascicular block)** Cont.		**RBBB:** bifascicular block, intermittent RBBB, interventricular conduction delay of RBBB type, intraventricular conduction delay of RBBB type, RBBB, Right Bundle Branch Block, trifascicular block, variable RBBB. **Left fascicular block:** bifascicular block, intermittent LFB, left anterior fascicular block	

C. Early Administration of Beta Blockers					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				(LAFB), left anterior hemiblock (LAHB), left posterior fascicular block (LPFB), left posterior hemiblock (LPHB), trifascicular block, variable LFB.	
		History of COPD or Asthma	History & physical, Emergency room notes, nursing admission notes, progress notes.	asbestosis, asthma, black lung disease, bronchiectasis, childhood asthma, chronic bronchitis, chronic obstructive airway disease (COAD), emphysema, COLD - must be in capital letters - chronic obstructive lung disease, reactive lung disease, restrictive lung disease.	
		History of Peripheral Vascular Disease (PVD)	Progress notes, emergency room notes, history & physical, nursing admission notes.	Angioplasty to lower extremities, aortic-iliac bypass, arterial insufficiency to legs, claudication, femoral bypass surgery (fem-fem bypass), femoral-popliteal bypass (fem-pop bypass), ischemia of lower extremities, peripheral vascular insufficiency, peripheral vascular disease (PVD).	

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
D1. Eligible for reperfusion?	Is this patient eligible for reperfusion?	**Yes:** Select this option if both of the following are true: Arrival EKG shows ST elevation in 2 contiguous leads, LBBB or ST segment elevation or injury noted on physician interpretation **and** Onset of chest pain or other AMI symptoms ≤ 12 hours prior to arrival at FIRST health care facility.	Emergency room notes, History & physical, progress notes, consultants notes, ambulance records, nursing admission assessment, nursing admission notes, nursing progress notes. Arrival EKG: the first EKG completed within 6 hours of arrival.	**ST elevation in 2 contiguous leads:** ST elevation mm in 2 contiguous leads: Contiguous leads are: I, AVL; I, V_4 ; I, V_5 ; I, V_6; AVL, V5; AVL,V_6; V_1 V_2 (2mm) V_2 V_3;(V_2 2mm V_3 1mm) V_3 V_4; V_4 V_5; V_5 V_6; II, III ; II, V_6 ; II, AVF; III, AVF **LBBB:** intermittent LBBB, interventricular conduction delay of LBBB type, Intraventricular conduction delay of LBBB type, LBBB, Left Bundle Branch Block, Variable LBBB. **ST segment elevation:** ST ⊙, ST elevation, ST segment elevation	
		Chest pain/Other AMI symptoms		**Chest pain**: Onset of angina/ chest pain within 12 hours of arrival, angina, chest discomfort, chest fullness, chest heaviness, chest pain	**Chest pain:** Arthritic pain, chest wall pain, muscle pain, pain that is determined to be non-cardiac in origin, pleuritic pain, skeletal pain.

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				(CP), chest/epigastric: aching, burning, crushing pain, pressure, squeezing, tightening. Heart pain, pain/tightness, retrosternal pain, substernal cheat pain **Other AMI symptoms**: Acute onset of fatigue, weakness, tiredness, lethargy, diaphoresis, dizziness, dyspnea, fainting, loss of consciousness, nausea/vomiting, palpitations, racing of heart, shortness of breath (SOB), sweating.	**Other AMI symptoms:** cardiac arrest
Date and time of onset of AMI symptoms?	What date and time did the AMI symptoms start?	Enter the date in MM/DD/YYYY format. Enter time in military format.	ER record, ambulance record, Admission history.		
		No: Select this option if both of the above are not true. **Stop – go to question E.**			
D2. Thrombolytic therapy?	Did the patient receive thrombolytic therapy?	**Yes:** Select this option if there is evidence that the patient received thrombolytic therapy. **If Yes, skip to E1.** **No:** Select this option if there is no documentation that the patient received thrombolytics.	Medication administration record, emergency room records, IV flowsheets	**Thrombolytic agents**: Abbokinase, abbokinase-open cath, activase, altepase, alteplase, alteplase recombinant, anisoylated plasminogen-strept, anistreplase, APSAC, eminase, kabikinase, kabikinase IV, retavase, reteplase,	

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				RPA, strepase, streptase, streptokinase, streptotinase, T-PA, tissue plasminogen activase, tissue plasminogen activator, tissue-type plasminogen activa, TPA, TPA drip, urokinase, win-kinase, winkinase.	
D2A. Date of first thrombolytic?	What was the date of the first administration of thrombolytic?	Record the date the first thrombolytic was administered after arrival to the hospital, record date in MM/DD/YYYY format.	Medication administration record, emergency room records, IV flowsheets		
D2B. Time of first thrombolytic? D2C Facility that administered thrombolytic?	What time was first thrombolytic initiated? What was the name and # of the facility that administered the thrombolytic?	Record the earliest time thrombolytic therapy initiated, record in military time. Record the name and number of the facility that administered the thrombolytic .	Medication administration record, emergency room records, IV flowsheets SHS facility code list		
D3. Angioplasty (PTCA) within 24 hours of arrival?	Did the patient have a PTCA within 24 hours of arrival to this hospital?	**Yes:** Select this option if there is documentation that the patient had a percutaneous transluminal coronary angioplasty (PTCA) within 24 hours of arrival to the referral hospital **If Yes, skip to E1.** **No:** Select this option if there	Test report, operative report, progress notes, discharge summary	Coronary angioplasty with or without stent placement, coronary artery ablation, coronary artery angioplasty, coronary atherectomy, coronary balloon angioplasty, stent placement	balloon angioplasty of femoral or iliac arteries, percutaneous transluminal angioplasty (PTA) of femoral or iliac artery. Cardiac catheterization without angioplasty/stenting.

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		is no documentation of a PTCA within 24 hours of arrival to the referral hospital.			
D3A. Date of PTCA?	What is the date of the first PTCA?	Record the date of the first PTCA performed during this hospital stay. Record the date in MM/DD/YYYY format.	Test report, operative report, progress notes, discharge summary		
D3B. Time of PTCA?	What time did the first PTCA start?	Record the time first PTCA started in military time.	Test report, operative report, progress notes, discharge summary	Record the start time of the first PTCA in the following priority order: 1. Balloon time 2. Wire insertion time 3. Sheath time (Artery time, cannulation time, Vessel access) 4. Lidocaine injection time (infiltration time, local, local anesthesia, xylocaine injection time) 5. Procedure/case start time (begin time, start time) 6. Time patient arrived in cath lab .	
D3C. Facility performing first PTCA?	Name and number of facility performing PTCA	Record name and # of facility performing first PTCA	SHS facility code list		
D4. Contraindications/ Exclusions	Does the patient have any contraindications to reperfusion?	**Yes:** Select this option if any of the following are true:			

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		Bleeding on admission: Select this option if there is documentation that the patient had bleeding on admission	History & physical, ER record, nursing admission notes, progress notes.	**GI bleeding**: bleeding diverticulum; bleeding from a peptic, gastric, esophageal, or duodenal ulcer; bleeding from colon, blood in vomitus, emesis, or stool; coffee ground emesis, esophageal bleeding or varices; hematemesis; hematochezia; heme/guaiac positive vomitus/emesis, or stool; Hemoccult/occult positive vomitus/emesis or stool; mallory-weiss tear, melena, rectal bleeding (BRB) per rectum, BRBPR. **GU bleeding**: blood in urine, genitourinary (GU) bleeding, hematuria. **Intracranial bleeding**: cerebral hemorrhage, hemorrhagic CVA, hemorrhagic infarct of the brain, intracerebral bleeding/hemorrhage, ruptured intracranial aneurysm, subarachnoid hemorrhage (SAH), subdural hematoma. **Pulmonary bleeding**: coughing up blood, hemoptysis	Anemia not due to gastrointestinal bleeding, bleeding hemorrhoid, bleeding which occurred as a result of an injury or trauma, chronic anemia, epistaxis, heme positive urine, lab urinalysis report, urine dipstick.

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		History of bleeding/ bleeding disorder: Select this option if there is documentation that the patient had a history of bleeding or bleeding disorder.	History & physical, ER record, nursing admission notes, progress notes.	**GI bleeding**: bleeding diverticulum; bleeding from a peptic, gastric, esophageal, or duodenal ulcer; bleeding from colon, blood in vomitus, emesis, or stool; coffee ground emesis, esophageal bleeding or varices; hematemesis; hematochezia; heme/guaiac positive vomitus/emesis, or stool; Hemoccult/occult positive vomitus/emesis or stool; mallory-weiss tear, melena, rectal bleeding (BRB) per rectum, BRBPR. **GU bleeding**: blood in urine, genitourinary (GU) bleeding, hematuria. **Intracranial bleeding**: cerebral hemorrhage, hemorrhagic CVA, hemorrhagic infarct of the brain, intracerebral bleeding/hemorrhage, ruptured intracranial aneurysm, subarachnoid hemorrhage (SAH), subdural hematoma. **Pulmonary bleeding**: coughing up blood, hemoptysis **Bleeding disorder:** Bleeding diathesis, Bleeding tendency,	Anemia not due to gastrointestinal bleeding, bleeding hemorrhoid, bleeding which occurred as a result of an injury or trauma, chronic anemia, epistaxis, heme positive urine, lab urinalysis report, urine dipstick.

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		History of bleeding/bleeding disorder Cont.		clotting disorder, factor 8 (VIII) deficiency, factor 9 (IX), hemophilia, ITP (idiopathic thrombocytopenia purpura), prolonged bleeding, Von Willebrand's disease	
		History of peptic ulcer disease: Select this option if there is documentation that the patient has a history of peptic ulcer disease.	History & physical, ER record, nursing admission notes, progress notes.	Duodenal ulcer, esophageal ulcer, gastric ulcer, gastrointestinal (GI) ulcer, peptic ulcer disease (PUD), stomach ulcer, stress ulcer, ulcers.	Decubitus ulcer (skin), digital ulcer (finger/toes), mouth ulcer (aphthous), pressure ulcer (skin), stasis ulcer, ulcerative colitis, ulcer not associated with the upper GI tract.
		Chronic liver disease: Select this option if there is documentation that the patient has chronic liver disease.	History & physical, ER record, nursing admission notes, progress notes.	Hepatic failure, Fulminant hepatic failure, Hepatic encephalopathy, liver failure, cirrhosis, alcoholic cirrhosis, cirrhosis etiology unknown, Cryogenic cirrhosis, primary or secondary biliary cirrhosis.	
		Surgery/biopsy within 2 months: Select this option if there is documentation that the patient had surgery/biopsy in the 2 months prior to arrival to the	Physician admission note, progress notes, history & physical, Emergency room notes, Consult notes, nurses notes,	Select yes only if one of the following procedures were performed in the 2 months prior to arrival to the hospital. Procedures include:	Arthroscopy, Cardiac catheterization (cath), diagnostic procedures without biopsy, laparoscopy without lysis of adhesions, orthopedic surgeries of a limb (total hip or

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		hospital.	diagnostic studies/tests, discharge summary.	Abdominal aortic aneurysm (AAA) repair, Aneurysmectomy of the heart, Appendectomy, biopsy, back surgery, bowel surgery, cholecystectomy, coronary artery bypass graft (CABG), cranial surgery, diagnostic procedure with biopsy, gastrectomy, hysterectomy, laparoscopic surgery, laparoscopy with lysis of adhesions, laparotomy, lobectomy, nephrectomy, open heart surgery, pancreatectomy, pelvic surgery, repair of congenital or acquired hear abnormalities, such as septal defect, ventricular septal defect (VSD), atrial septal defect (ASD), scopes requiring biopsy, splenectomy, thoracotomy, valve surgery.	knee replacement, fracture repair, rotator cuff repair), pacemaker insertion, percutaneous transluminal coronary angioplasty (PTCA), scopes without biopsy.
		Trauma in the past month Select this option if there is documentation of an event, in the past month, which could have caused internal injuries	History & physical, Emergency room notes, nursing admission notes, progress notes	Select yes only when the trauma or injury occurred in the month prior to arrival to the hospital. Include: Falls, fractures,	Very minor injuries, such as a small cut or a stubbed toe.

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		(most injuries serious enough to be documented in the medical record should be included).		head trauma/injury, motor vehicle accidents (MVA).	
		Cardiac arrest within 6 hours prior to arrival: Select this option if the patient suffered a cardiac arrest in the 6 hours prior to arrival to the hospital, requiring CPR, cardioversion, defibrillation, or chemical cardioversion.	CPR sheet, Code sheet, Cardiac arrest sheet.	Asystole/cardiac standstill, cardiac arrest, cardiopulmonary resuscitation (CPR), required cardioversion or defibrillation, shocked (to restore cardiac rhythm), ventricular fibrillation (Vfib), Ventricular tachycardia (Vtach),	Atrial fibrillation, DNR, Elective cardioversion, electro convulsive therapy (ECT), pacemaker, sinus tachycardia, shock therapy (EST).
		First bilirubin > 2 mg/dl: Select this option when the first bilirubin recorded in the first 48 hours of hospitalization is > 2 mg/dl	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG report, respiratory therapy report, emergency room record, progress notes, history & physical.	Bili, Bilirubin, Tbili, Tot Bili, Total bilirubin	
		Warfarin prior to arrival: Select this option if there is documentation that the patient was taking warfarin prior to arrival.	History & physical, nurses admission assessment notes, Emergency record, progress notes.	Taking warfarin (coumadin) prior to hospital, recent use of warfarin.	

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		History or current finding of Stroke: Select this option if there is documentation of a stroke in the past or at the time of arrival	History & physical, emergency room notes, nursing admission notes, progress notes.	Brain infarct, cerebellar infarct, cerebral bleeding/hemorrhage, cerebral infarct, cerebral occlusion, cerebral thrombosis, cerebral vascular accident (CVA), hemorrhagic cerebrovascular accident (CVA), hemorrhagic infarct of the brain, intracerebral bleeding or hemorrhage, intracranial bleeding or hemorrhage, lacunar infarct, multi-infarct dementia, ruptured intracranial aneurysm, stroke, subarachnoid hemorrhage.	Cerebral vascular disease, ministroke, reversible ischemic neurologic deficit (RIND), transient ischemic attack (TIA)
		Thrombolysis considered but rejected: Select this option when there is documentation that a thrombolytic was considered but not used for any reason.	Progress notes, discharge summary, history & physical, emergency room notes. Use physician documentation only.	Any decision documented by a physician not to give thrombolytics. Patient or family refused. **Thrombolytic agents include**: Abbokinase, abbokinase-open cath, activase, altepase, alteplase, alteplase recombinant, anisoylated plasminogen-strept, anistreplase, APSAC, eminase, kabikinase, kabikinase IV, retavase, reteplase, RPA, strepase, streptase,	

D. Timely Reperfusion					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				streptokinase, streptotinase, T-PA, tissue plasminogen activase, tissue plasminogen activator, tissue-type plasminogen activa, TPA, TPA drip, urokinase, win-kinase, winkinase.	
		Age > 80 years: Select this option if the patient is > 80 years of age at the time of admission.	Admission record, ER record, registration form.		
		No: Select no if none of the above are true.			

E. Eligible for Discharge Indicators					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Inclusion**	**Exclusion**
E1. Did the patient expire?	Is the patient eligible for discharge indicator after care in one of the health care facilities where care was received for AMI	**Yes:** Patient expired. **If Yes, STOP.** **No:** Patient did not **e**xpire.	Discharge summary notes, transfer notes, nursing discharge notes, progress notes, test notes, graphic sheet.		
E2. Is discharge status unknown?		**Yes:** Select Yes if discharge status is unknown. **If Yes, STOP.**	Discharge summary notes, transfer notes, nursing discharge		

E. Eligible for Discharge Indicators					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Inclusion**	**Exclusion**
		No: discharge status is known.	notes, progress notes, test notes, graphic sheet.		

F. Beta Blockers at Discharge					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
F1. Beta Blocker at discharge?	Was a beta blocker prescribed at discharge?	**Yes:** Select this option if there is documentation that a beta blocker was prescribed at discharge. **If Yes, skip to G1.** **No:** Select this option if there is no documentation that a beta blocker was prescribed at discharge.	Physician order sheet, discharge summary, nursing discharge note, transfer sheet.	(See attached medication sheet for beta blockers)	
F2. Contraindications/ Exclusions/ Possible reasons beta blockers were not prescribed.	Does the patient have any contraindications to beta blockers at discharge?	**Yes:** Select this option if any of the following are true:			
		Allergy/ intolerance to beta blocker	History & physical, emergency room notes, nursing admission notes, progress notes, discharge summary.	Record only those associated with a reaction to beta blocker: Adverse drug event, adverse drug reaction, allergy, anaphylaxis, intolerance, sensitivity. (See attached medication sheet for beta blockers)	Documentation which states beta blocker caused upset stomach or didn't agree with patient.

		Last pulse < 50 bpm and **not taking a beta blocker**: Select this option if the patients last recorded pulse was < 50 bpm, and not discharged on a beta blocker.	Progress notes, graphic sheet, flow sheets, discharge instructions, nurses notes, transfer/ DC instruction sheet.	Heart rate, pulse, if a range is documented enter the mid-point. (See attached medication sheet for beta blockers)	
		Heart failure or **pulmonary edema <u>and</u> LVEF < 50%** or described as moderate or mild dysfunction. Select <u>only</u> if both are present.	History & physical, Emergency room notes, nursing admission notes, progress notes, MUGA scan, echocardiogram (echo), or cardiac catheterization.	**Heart failure/pulmonary edema:** Biventricular failure, cardiac decompensation, cardiac failure, cardiomyopathy, congestive heart failure (CHF), edema of the lungs, heart failure (right or left), pulmonary edema, pump failure, ventricular failure, wet lungs. **LVEF:** Systolic function is a description of the function of the left ventricle based on how much blood is emptied from the left ventricle during contraction. Include: contractility, EF Ejection fraction, function, left ventricular function, LVEF. Mild or moderate dysfunction: Diffuse hypokinesia, global hypokinesia, low, moderate, moderate-severe, moderate to severe, moderately severe, significant, abnormal, compromised, decreased, depressed,	Heart failure/pulmonary edema: diffuse infiltrate, diffuse interstitial pulmonary edema, edema of the legs (pedal edema), enlarged vessels, fullness of pulmonary vasculature, interstitial edema, interstitial congestion, JVD (jugular venous distention), perihilar vascular congestion, pulmonary vascular congestion, pulmonary vascular engorgement, rales, vascular congestion, venous congestion, volume or fluid overload, x-ray report finding. LVEF: RIGHT, atrial or diastolic function. Local/ localized function.

				diminished, dysfunction, depressed, hypokinesis, impaired, impairment, mild, reduced.	
		LVEF < 30% or described as severe dysfunction.	History & physical, Emergency room notes, nursing admission notes, progress notes, MUGA scan, echocardiogram (echo), or cardiac catheterization.	Systolic function is a description of the function of the left ventricle based on how much blood is emptied from the left ventricle during contraction. Include: contractility, EF Ejection fraction, function, left ventricular function, LVEF. Severe dysfunction: Severe, very severe, very low/poor, akinesis, dyskinesis, global akinesis, marked, markedly, poor, severe, very low, very poor, very severe.	Right, atrial or diastolic dysfunction. Local/ localized dysfunction.
		Shock: Select this option if the patient had shock any time during the hospital stay.	Progress notes, discharge summary, history & physical, emergency room notes. Use physician documentation only.	Anaphylactic shock, cardiogenic shock, hypovolemic shock, cardiovascular collapse, intravascular collapse, septic shock, shock, shocky.	Cardiovascular instability, cardioversion/defibrillation, electro-convulsive therapy (ECT), electro-shock therapy (EST), hypotension.
		Systolic BP < 90 mm hg during hospital stay: Select this option if any systolic BP during the hospital stay was < 90 mm hg.	Emergency room notes, nursing admission notes, history & physical, progress notes, graphic sheet, ICU flow sheet, flow		

			sheets, discharge instructions, nurses notes, ER/Triage notes.		
		Last systolic BP < 100 mm hg <u>and not</u> on a beta blocker: Select this option if the patient's last recorded systolic BP was < 100 mm hg AND the patient was not taking a beta blocker.	Progress notes, graphic sheet, flow sheets, discharge instructions, nurses notes	If two blood pressures are recorded at the same time record the blood pressure with the highest systolic reading, if a range is recorded, record the mid-point.	
		Heart block: 1st degree (From arrival EKG Only**), 2nd/3rd degree, or bifascicular block (RBBB and left fascicular block)** Note: 1st degree block only acceptable if present on arrival EKG (first EKG done within 6 hours of arrival) All other blocks can be recorded from any EKG during the stay.	EKG report, history & physical, emergency room notes, progress notes.	Arrival EKG is the first EKG done within 6 hours prior to or after arrival to the hospital. **1st degree heart block**, **PR interval > 240 milliseconds (.24 seconds)**: PR interval measurement is included in the interpretation on 12-lead EKGs. If interval is not shown do not attempt to measure. **2nd/3rd degree heart block**: 2:1 AV block, 2:1 AV conduction, 2:1 heart block, 3:1 AV block, 3:1 AV conduction, 3:1 heart block, atrioventricular block (AV block), atrioventricular dissociation (AV dissociation), AV conduction block, complete heart block, heart block, intermittent HB, mobitz type 1 or 2, second degree AV block,	RBBB: Incomplete RBBB, incomplete right bundle branch block, interventricular conduction delay (IVCD), intraventricular conduction delay (IVCD) **2nd/3rd degree heart block**: Atrial flutter, first degree heart block (first degree AV block), interventricular conduction delay (IVCD), intraventricular conduction delay (IVCD)

				second degree heart block (2 degrees block), third degree atrioventricular block (3 degrees AV block), third degree heart block (3 degrees block), variable HB, Wenckebach	
		Heart block: 1st degree, 2nd/3rd degree, or bifascicular block (RBBB and left fascicular block) Cont.		**RBBB:** bifascicular block, intermittent RBBB, interventricular conduction delay of RBBB type, intraventricular conduction delay of RBBB type, RBBB, Right Bundle Branch Block, trifascicular block, variable RBBB. **Left fascicular block:** bifascicular block, intermittent LFB, left anterior fascicular block (LAFB), left anterior hemiblock (LAHB), left posterior fascicular block (LPFB), left posterior hemiblock (LPHB), trifascicular block, variable LFB.	
		Chronic obstructive pulmonary disease (COPD) or asthma Select yes if documentation indicates the patient has a history of COPD or asthma.	History & physical, Emergency room notes, nursing admission notes, progress notes.	asbestosis, asthma, black lung disease, bronchiectasis, childhood asthma, chronic bronchitis, chronic obstructive airway disease (COAD), emphysema, COLD -	A cold, acute bronchitis, asbestos exposure, findings of a lung disease on CXR without a clinical history of lung disease, pneumonia, tuberculosis (TB).

				must be in capital letters - chronic obstructive lung disease, reactive lung disease, restrictive lung disease.	
		Peripheral vascular disease (PVD): Select this option if there is documentation of peripheral vascular disease.	Progress notes, emergency room notes, history & physical, nursing admission notes.	Angioplasty to lower extremities, aortic-iliac bypass, arterial insufficiency to legs, claudication, femoral bypass surgery (fem-fem bypass), femoral-popliteal bypass (fem-pop bypass), ischemia of lower extremities, peripheral vascular insufficiency, peripheral vascular disease (PVD).	
		No: Select this option if none of the above are true			

G. Aspirin at Discharge					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
G1. Aspirin at discharge?	Was aspirin prescribed at discharge?	**Yes:** Select this option if there is documentation that aspirin was prescribed at discharge. **If Yes, skip to H1.** **No:** Select this option if there is no documentation that aspirin was prescribed at discharge.	Physician order sheet, discharge summary, nursing discharge note, transfer sheet.	(See attached medication sheet for aspirin-containing drugs)	
G2. Contraindications/ Exclusions/Possible reasons aspirin not prescribed at discharge	Does the patient have any contraindications to aspirin at discharge?	**Yes:** Select this option if any of the following are true:			

G. Aspirin at Discharge					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		Allergy/intolerance to aspirin: Select this option when there is documentation that the patient has a history of intolerance to aspirin or has had a reaction during this hospital stay	History & physical, emergency room notes, nursing admission notes, progress notes, discharge summary.	Record only those associated with a reaction to aspirin: Adverse drug event, adverse drug reaction, allergy, anaphylaxis, intolerance, sensitivity. (See attached medication sheet for aspirin)	Documentation which states aspirin caused upset stomach or didn't agree with patient.
		Bleeding/hemorrhage: Select this option when there is documentation that the patient had bleeding/hemorrhage 48 hours prior to arrival or any time during the hospital stay.	History & physical, emergency room notes, nursing admission notes, progress notes, discharge summary.	**GI bleeding**: bleeding diverticulum; bleeding from a peptic, gastric, esophageal, or duodenal ulcer; bleeding from colon, blood in vomitus, emesis, or stool; coffee ground emesis; esophageal bleeding or varices, hematemesis, hematochezia, heme/guaiac positive vomitus/emesis, or stool; Hemoccult/occult positive vomitus, emesis or stool, mallory-weiss tear, melena, rectal bleeding (BRB) per rectum, BRBPR. **GU bleeding**: blood in urine, genitourinary (GU) bleeding, hematuria.	Anemia not due to gastrointestinal bleeding, bleeding hemorrhoid, bleeding which occurred as a result of an injury or trauma, chronic anemia, epistaxis, heme positive urine, lab urinalysis report, urine dipstick.

G. Aspirin at Discharge					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		Bleeding/hemorrhage Cont.		**Intracranial bleeding:** cerebral hemorrhage, hemorrhagic CVA, hemorrhagic infarct of the brain, intracerebral bleeding/hemorrhage, ruptured intracranial aneurysm, subarachnoid hemorrhage (SAH), subdural hematoma. **Pulmonary bleeding:** coughing up blood, hemoptysis	
		History of bleeding/ bleeding risk: Select this option if there is documentation of a history of bleeding or bleeding risk.	History & physical, emergency room notes, nursing admission notes, progress notes, discharge summary.	**GI bleeding**: bleeding diverticulum; bleeding from a peptic, gastric, esophageal, or duodenal ulcer; bleeding from colon, blood in vomitus, emesis, or stool; coffee ground emesis, esophageal bleeding varices, hematemesis, hematochezia, heme/guaiac positive vomitus/emesis, or stool; Hemoccult/occult positive vomitus, emesis or stool, mallory-weiss tear, melena, rectal bleeding (BRB) per rectum, BRBPR. **GU bleeding**: blood in urine, genitourinary (GU) bleeding, hematuria.	Anemia not due to gastrointestinal bleeding, bleeding hemorrhoid, bleeding which occurred as a result of an injury or trauma, chronic anemia, epistaxis, heme positive urine, lab urinalysis report, urine dipstick.

G. Aspirin at Discharge					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		History of bleeding/ bleeding risk Cont.		**Intracranial bleeding**: cerebral hemorrhage, hemorrhagic CVA, hemorrhagic infarct of the brain, intracerebral bleeding/hemorrhage, ruptured intracranial aneurysm, subarachnoid hemorrhage (SAH), subdural hematoma. Pulmonary bleeding: coughing up blood, hemoptysis **Bleeding disorder:** Bleeding diathesis, Bleeding tendency, clotting disorder, factor 8 (VIII) deficiency, factor 9 (IX), hemophilia, ITP (idiopathic thrombocytopenia purpura), prolonged bleeding, Von Willebrand's disease	
		Chronic liver disease (History)	History & physical, ER record, nursing admission notes, progress notes.	Hepatic failure, Fulminant hepatic failure, Hepatic encephalopathy, liver failure, cirrhosis, alcoholic cirrhosis, cirrhosis etiology unknown, Cryogenic cirrhosis, primary or secondary biliary cirrhosis.	

G. Aspirin at Discharge					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		Peptic ulcer disease (History)	History & physical, ER record, nursing admission notes, progress notes.	Duodenal ulcer, esophageal ulcer, gastric ulcer, gastrointestinal (GI) ulcer, peptic ulcer disease (PUD), stomach ulcer, stress ulcer, ulcers.	
		Platelet count < 100 x 10^9/L (First drawn within 24 hours of arrival)	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG report, respiratory therapy report, emergency room record, progress notes, history & physical.	Thrombocyte count	
		Hemoglobin < 10 g/dL, **Hematocrit < 30%** (First labs drawn within 24 hours of arrival)	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG report, respiratory therapy report, emergency room record, progress notes, history & physical.	Hemoglobin: Hb, Hgb Hematocrit: HCT, Hematocrit, PCV (packed cell volume)	
		Treatment with warfarin on discharge: Select this option if there is documentation that warfarin was prescribed at discharge	Physician order sheet, discharge summary, nursing discharge note, transfer sheet.	Coumadin	

G. Aspirin at Discharge					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		Renal insufficiency (Creatinine > 3 mg/dL): Select this option if the patient had a creatinine > 3 mg/dl at any time during the hospital stay.	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG report, respiratory therapy report, emergency room record, progress notes, history & physical.	Cr, Creat, Creatinine(Cr)	BUN/Creatinine ratio
		No: Select this option if none of the above are true			

H. ACE Inhibitor at Discharge for Low LVEF					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
H1. LVEF < 40%?	Does the patient have an LVEF < 40% or described as severe or moderate dysfunction?	**Yes:** Select this option if there is documentation that the patient has an LVEF < 40% or described as severe or moderate dysfunction. **Unknown** **No:** Select this option if the patient's LVEF is greater than or equal to 40%. **Stop (go to section I).**	History & physical, Emergency room notes, nursing admission notes, progress notes, MUGA scan, echocardiogram (echo), or cardiac catheterization.	LVEF: SYSTOLIC function is a description of the function of the left ventricle based on how much blood is emptied from the left ventricle during contraction. Include: contractility, EF Ejection fraction, function, left ventricular function, LVEF. **Mild or moderate dysfunction**: Diffuse hypokinesia, global	LVEF: RIGHT, atrial or diastolic function. Local/ localized function.

H. ACE Inhibitor at Discharge for Low LVEF					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
				hypokinesia, low, moderate, moderate-severe, moderate to severe, moderately severe, significant, abnormal, compromised, decreased, depressed, diminished, dysfunction, depressed, hypokinesis, impaired, impairment, mild, reduced. **Severe dysfunction:** Severe, very severe, very low/poor, akinesis, dyskinesis, global akinesis, marked, markedly, poor, severe, very low, very poor, very severe.	
H2. ACEI at discharge?	Was an ACE Inhibitor prescribed at discharge?	**Yes:** Select this option if there is documentation that an ACE Inhibitor was prescribed at discharge. **If Yes, Stop – go to section I.** **No**: Select this option if there is no documentation that an ACE Inhibitor was prescribed at discharge	Physician order sheet, discharge summary, nursing discharge note, transfer sheet.	(See attached medication sheet for ACE Inhibitors)	
H3. Contraindications/ Exclusions	Does the patient have any contraindications to ACE Inhibitor therapy at discharge?	**Yes:** Select this option if any of the following are true:			

H. ACE Inhibitor at Discharge for Low LVEF					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		Allergy/intolerance to ACE Inhibitors	History & physical, emergency room notes, nursing admission notes, progress notes, discharge summary.	Record only those associated with a reaction to ACE Inhibitor: Adverse drug event, adverse drug reaction, allergy, anaphylaxis, intolerance, sensitivity. (See attached medication sheet for ACE Inhibitors)	Documentation which states ACE Inhibitor caused upset stomach or didn't agree with patient.
		Aortic stenosis: Select this option if aortic stenosis was noted on the echocardiogram	Test reports, history & physical, emergency room notes, progress notes, discharge summary.	2+, 3+ or 4+ aortic stenosis, aortic stenosis (AS) without mention of degree, aortic valve area < 1.0 square cms, critical aortic stenosis, moderate aortic stenosis, severe aortic stenosis.	1+ aortic stenosis, aortic insufficiency, aortic valve prolapse, aortosclerosis, mild aortic stenosis, subaortic stenosis.
		Serum creatinine > 2 mg/dL: Select this option when the patient had a serum creatinine > 2 mg/dl any time during the hospital stay.	Laboratory report, ICU flow sheet, nursing flow sheet, diabetic flow sheet, graphic sheet, EKG report, respiratory therapy report, emergency room record, progress notes, history & physical	Cr, Creat, Creatinine(Cr)	BUN/Creatinine ratio
		Last systolic BP < 100 mm hg and not discharged on an ACE Inhibitor: Select this option if the patients last recorded systolic BP is < 100	Physician order sheet, discharge summary, nursing discharge sheet, transfer sheet, discharge instruction	If two blood pressures are recorded at the same time record the blood pressure with the highest systolic reading, if a range is	

H. ACE Inhibitor at Discharge for Low LVEF					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
		mm hg and the patient is not discharged on an ACE Inhibitor.	sheet, graphic sheet, nursing notes.	recorded, record the mid-point. (See attached medication sheet for ACE Inhibitors)	
		No: Select this option if none of the above are true.			

I. Smoking Cessation Counseling					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
I1. Cigarette use in the year prior to arrival?	Is there a history of cigarette use within the year prior to arrival?	**Yes:** select yes if there is documentation that the patient smokes or has smoked in the year prior to arrival. **No:** Select no when there is no documentation that the patient smoked in the year prior to arrival. **If "NO", skip to J1.**	History & physical, emergency room notes, nursing admission notes, progress notes.	+ smoker, + tobacco use, history of cigarette use within one year prior to arrival, History of smoking within one year prior to arrival where the type of product is not identified, History of smoking/tobacco/cigarette use without mention of a time frame.	Chewing tobacco, cigar smoking, illegal drugs (ex. Marijuana), pipe smoker, remote smoker, stopped smoking 1 or more years in the past.
I2. Smoking cessation counseling?	Did the patient receive smoking cessation counseling	**Yes:** Select this option if there is documentation that the patient was counseled about smoking. **No:** Select this option if there is no documentation that the patient was counseled about smoking.	Progress notes, discharge summary, history & physical, emergency room notes.	Advised to quit smoking whether or not the patient is a current smoker, shown smoking cessation video, given brochures or handouts on smoking cessation, discharged on smoking cessation aid such as nicoderm or zyban..	

J. Screening and Treatment for Dyslipidemia					
Data Element	**Question**	**Instructions**	**Recommended Location**	**Synonyms**	**Exclusion**
J1 Lipid profile during hospitalization at the discharge facility? Results of lipid profile	Was a fasting lipid profile obtained at ONE OF THE FACILITIES that provided care for this patient? Results of the first lipid profile obtained on this AMI patient at one of the facilities.	**Yes:** select yes if there is documentation that a fasting lipid profile was obtained at one of the facilities that provided care for the AMI pt. Record the results of LDL and HDL cholesterol and triglyceride levels in mg/dl **No:** Select no when there is no documentation that a fasting lipid profile was obtained at any of the facilities for this AMI patient.	History & physical, emergency room notes, nursing admission notes, progress notes, doctors' orders. Laboratory results	LDL cholesterol alone could be considered as yes, since that is the most critical determinate of therapy.	If only total cholesterol was obtained, answer no to this question.
J2. Lipid therapy?	If LDL cholesterol ≥ 100 mg/dl, what treatment plan was documented in the chart during hospitalization or at the time of discharge?	Circle all that apply **Dietary Counseling-**Look for documentation that dietary counseling was provided in the hospital or ordered at the time of discharge. If provided or ordered, circle this choice, if not provided or ordered, don't circle. **Lipid lowering medication-** Was the patient sent home on lipid lowering medication? If yes, circle this choice; if no don' t circle. **Cardiac rehabilitation program-** Circle this choice if	Progress notes, discharge summary, history & physical,. Nurses' notes, doctors' orders. Discharge orders and discharge summary. Doctors' orders, nurses' notes,	(See attached medication sheet for anti-lipemic agents)	

		the patient was referred to a cardiac rehabilitation program after discharge. If no referral made, do not circle. **None**-Circle this choice if there is no documentation at the discharge facility that any of the above three treatment modalities were recommended or provided.	discharge orders and discharge summary.		

Synonyms/Inclusions for Aspirin:

- A.S.A.
- Acetylsalicylic Acid
- Acuprin 81
- Adult Aspirin
- Adult Aspirin
- Amiprin
- Andylate
- Anisin
- Antalgesic
- Antrin
- Antrin Junior
- Apo-ASA
- Apprin
- Arthrinil
- Arthritis Pain Formula
- Arthritis Pain Formula S-C
- Arthritis Pain Formula S/C
- Arthritis Relief
- Arthrotrin
- ASA
- ASA Ent. Coated
- ASA Enteric Coated
- ASA (Baby)
- ASA (Buffered)
- ASA (Children's)
- ASA (EC)
- ASA (Enteric Coated)
- ASA Anteric
- ASA Baby
- ASA Baby Chewable
- ASA Baby Coated
- ASA Bayer
- ASA Bayer Children's
- ASA Chewable
- ASA Chewed
- ASA Chewy
- ASA Children's
- ASA Childrens
- ASA Childs
- ASA Childs
- ASA Coated
- ASA Coated Enteric Slow Releas
- ASA Coated Enteric Slow Releas
- ASA Coated Enteric SR
- ASA Coated Enteric SR
- ASA EC
- ASA Enseal
- ASA Enteric
- ASA Enteric Coated
- ASA Enteric Coated Aspirin
- ASA GR V
- ASA Rectal
- ASA Supp
- ASA Supp.
- ASA Suppository
- ASA-Chew
- ASA-Coated
- ASA-EC
- ASA/Maalox
- ASA/Maalox Buffer
- Ascrip
- Ascriptin
- Ascriptin A/D
- Ascriptin ES
- Ascriptin Extra Strength
- Asparin
- Asper-Lox
- Asper-Lox DS
- Asperbuf
- Aspercin
- Aspergum
- Aspir-10
- Aspir-Low
- Aspir-Lox
- Aspir-Lox AD
- Aspir-Mox
- Aspir-Mox IB
- Aspir-Trin
- Aspirin
- Aspirin (Baby Aspirin)
- Aspirin (Baby)
- Aspirin (Bayer Childrens Aspir
- Aspirin (Bayer)
- Aspirin (Children's)
- Aspirin (Coated)
- Aspirin (Enteric Coated)
- Aspirin AC
- Aspirin Adult
- Aspirin Baby
- Aspirin Buffer
- Aspirin Buffered
- Aspirin Chew
- Aspirin Chewable
- Aspirin Chewtab
- Aspirin Child
- Aspirin Child Tabs Chew
- Aspirin Children
- Aspirin Children Chewable
- Aspirin Children's
- Aspirin Childrens
- Aspirin Childs
- Aspirin Childs

- Aspirin Coated
- Aspirin E.C.
- Aspirin EC
- Aspirin EC Tab
- Aspirin EC Tab
- Aspirin Ecotrin
- Aspirin Enseal
- Aspirin Ensea
- Aspirin Ent Coated
- Aspirin Enteric
- Aspirin Enteric Cated Tab
- Aspirin Enteric Coate
- Aspirin Enteric Coated
- Aspirin Enteric-Coat
- Aspirin Enteric-Coated
- Aspirin For Children
- Aspirin Grains
- Aspirin Lite-Coat
- Aspirin Low-Strength
- Aspirin Maximim Strength
- Aspirin Plus Antacid
- Aspirin Rectally
- Aspirin St Joseph's Baby
- Aspirin Supp
- Aspirin Suppository
- Aspirin Tab (Child)
- Aspirin Tab (Children's)
- Aspirin Tablet Chewable
- Aspirin Tablet Chewable
- Aspirin Tri-Buffered
- Aspirin W/Aluminum/Magnesium
- Aspirin W/Antacid
- Aspirin W/Antacid A/D
- Aspirin With Codeine
- Aspirin, Enteric
- Aspirin, Enteric Coated
- Aspirin,Enteric-Coated
- Aspirin-Baby
- Aspirin-Baby Chewable
- Aspirin-Chewable
- Aspirin-Coated
- Aspirin-For-Arthritis
- Aspirin/Buffers
- Aspralum
- Aspralum E.B.
- Aspri-Mox
- Aspricin
- Aspridrox
- Asprimox
- Asprimox E/P
- Asprimox ID
- Asprin
- Asprin Childrens
- B ASA
- B ASA
- B. ASA
- Baby ASA
- Baby ASA
- Baby ASA (Chewable)
- Baby Aspirin
- Baby Asprin
- Baby EC ASA
- Baby Ecasa
- Baby Enteric Coated Aspirin
- Bayer
- Bayer 8-Hour
- Bayer Adult Aspirin EC
- Bayer ASA
- Bayer Aspirin
- Bayer Aspirin EC
- Bayer Aspirin Maximum
- Bayer Children's
- Bayer Children's Aspirin
- Bayer Childrens Aspirin
- Bayer Enteric Coated Aspirin
- Bayer Plus
- Bayer Supp
- Bayer Tab
- Bayer Therapy
- Biobuffer
- Bioteric
- Buff
- Buff ASA
- Buff Cap
- Buff-A
- Buffaprin
- Buffered Arthritis
- Buffered ASA
- Buffered Aspirin
- Buffered Baby ASA
- Buffered Baby ASA
- Bufferin
- Bufferin Analgesic
- Bufferin Arthritis Strength
- Bufferin Tri-Buffered
- Bufferine
- Buffex
- Buffex Sani-Pak
- Cama
- Chew ASA
- Chew Baby ASA
- Chewable ASA
- Chewable Aspirin
- Chewable Aspirin
- Chewable Baby Aspirin
- Child Chew ASA

- Child's Aspirin
- Children ASA
- Children Aspirin
- Children's ASA
- Children's Aspirin
- Children's Chewable ASA
- Children's Chewable Aspirin
- Childrens ASA
- Childrens Aspirin
- Childrens Chewable ASA
- Childrens Chewable Sa
- Childs ASA
- Childs Chewable ASA
- Cild Chew ASA
- Coat-A-Prin
- Coated ASA
- Coated Aspirin
- Coated Baby Aspiriin
- Coated Baby Aspirin
- Coated Low Dose Aspirin
- Coprin
- Cosprin
- Daily Aspirin
- Daily Aspirin
- Dasprin
- Dewitt's Aspirin
- Dewitt's Children's Aspirin
- E ASA
- E-ASA
- E-Co-Aspirin
- E.C. ASA
- E.C. Prin
- E.C.ASA
- Easa
- Easa
- Easprin
- EC ASA
- EC Aspirin
- EC Baby ASA
- EC-ASA
- Ecaasa
- Ecasa
- Ecofair
- Ecotrin
- Ecotrin (Coated Aspirin)
- Ecotrin (Enteric Coated)
- Ecotrin ASA
- Ecotrin Aspirin
- Ecotrin GR V
- Ecotrin Grain
- Ecotrin Grains
- Ecotrin Maximum Strength
- Ecotrin Or Aspirin
- Ecotrin-Coated Aspirin
- Ecotrin-Coated Aspirin
- Ectasa-Orange
- Empirin
- Empirin Aspirin
- Enc ASA
- Encaprin Maximum Strength
- Encaprin Regular Strength
- Encoprin
- Ent. Coated ASA
- Entab-650
- Entaprin
- Entercote
- Enteric Coated Aspirin
- Enteric ASA
- Enteric Aspirin
- Enteric Coated ASA
- Enteric Coated Aspir
- Enteric Coated Aspirin
- Enteric Coated Aspirin Grains
- Enteric Coated Baby ASA
- Enteric Coated Baby Aspirin
- Enteric Coated Baby Spirin
- Enteric Coated One Aspirin
- Enteric Coated Or Buffere
- Enteric Coatred Aspirin
- Enteric-Coated Asipirin
- Enteric-Coated Aspirin
- Enterically Coated Baby Aspiri
- Enterin
- Entrogesic
- Entrophen
- Genacote
- Gennin
- Genprin
- Grain Aspirin
- Halfprin
- Hipirin
- Kiddies Aspirin
- Lite Coat Aspirin
- Lite-Coat Aspirin
- Litecoat Aspirin
- Magnaprin
- Maprin
- Maprin A/D
- Maprin I-B
- Measurin
- Megaprin
- Minitab
- Noncoated ASA
- Noncoated ASA
- Noncoated Aspirin
- Noncoated Aspirin

- Noncoated Aspriin #5
- Noncoated Aspriin #5
- Norwich Aspirin
- One Baby Aspirin
- Or-Prin
- Over Abundance Of ASA
- Pain Reliver Super Strength
- Pediatric Aspirin
- Poaby ASA
- Quality Aspirin
- Reg ASA
- Reg ASA
- Regular ASA
- Regular ASA
- Ridiprin
- Salagen
- Sloprin
- Soluable ASA
- Solualde ASA
- Soluble ASA
- Soluble Aspirin
- Special Buffered Aspirin
- St. Joseph Aspirin
- St. Joseph Aspirin Children
- St. Joseph Low-Dose Aspirin
- Stanback Analgesic
- Stanback Max Analgesic
- Tri Buffered Aspirin
- Tri-Buff Aspirin
- Tri-Buffered Aspirin
- Tri-Buffered Bufferin
- Tribuffered Aspirin
- Trinprin
- TX-Prin
- Ud Aspirin
- Uni-As Plus
- Uni-As Plus A/F
- Uni-Asplus
- Uni-Asplus A/F
- Uni-Buff
- Uni-Buff 3
- Uni-Tren
- Valumag W/Aspirin Buffered
- Verin
- Zorprin
- Zorprin SR

ACE Inhibitors

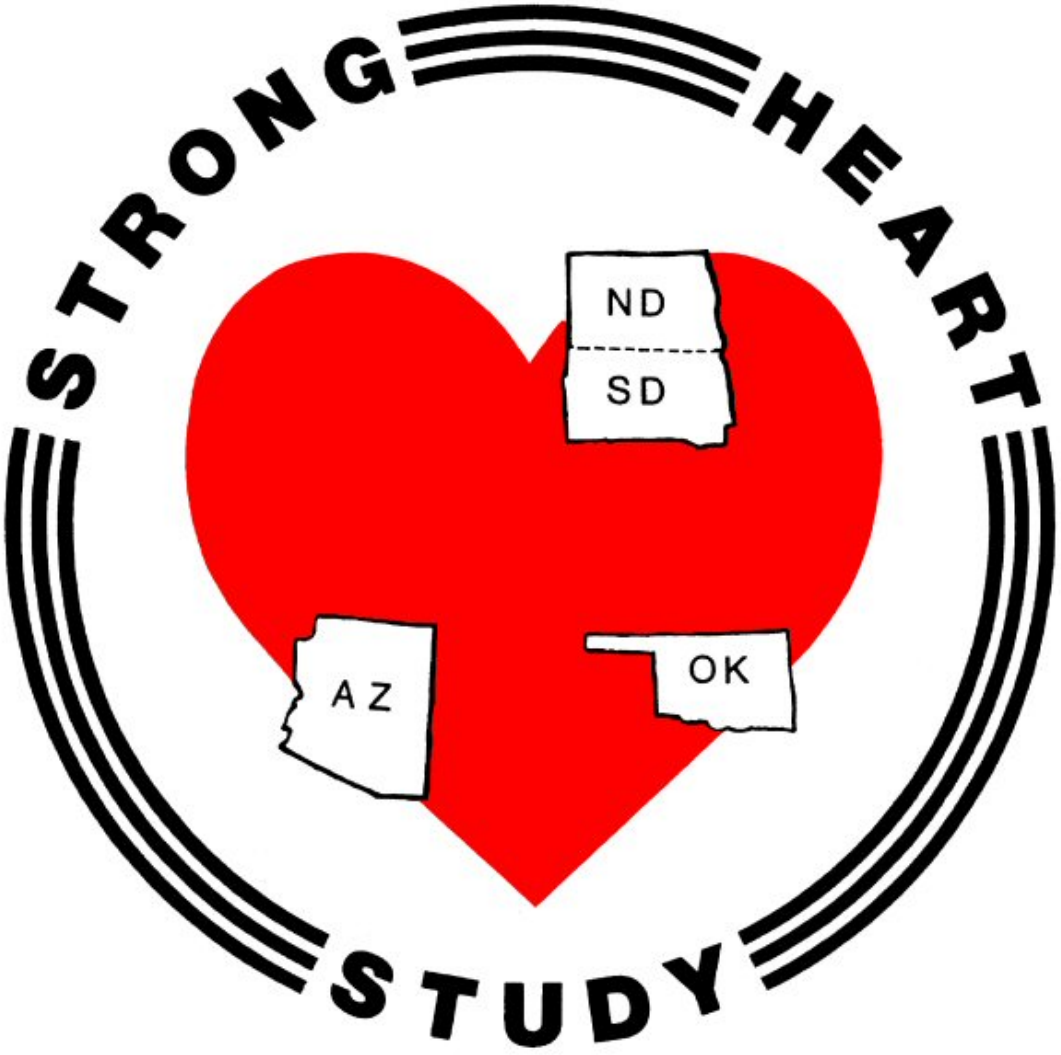
- Accupril
- Altace
- Amlodipine/Benezepril HCL
- Benazepril
- Benazepril HCL
- Capoten
- Capozide
- Captopril
- Enalapril
- Enalapril maleate
- Enalapril Maleate HCTZ
- Enaliprilat
- Fosinopril
- Fosinopril sodium
- Lexel
- Lisinopril
- Lisinopril HCTZ
- Lotensin
- Lotensin HCT
- Lotensin HCT
- Lotrel
- Mavik
- Moexipril HCL
- Monopril
- Quinapril
- Quinapril HCL
- Ramipril
- Prinivil
- Prinizide
- Trandolapril
- Univasc
- Vaseretic
- Vasotec
- Zestoretic
- Zestril

Beta Blockers

- Acebutolol
- Acebutolol HCL
- Atenolol
- Atenolol/Chlorthalidone
- Betabloc
- Betapace
- Betaxolol
- Betaxolol HCL
- Bisoprolol
- Bisoprolol fumarate
- Bisoprolol Fumarate/HCTZ
- Blocadren
- Carteolol
- Carteolol hydrochloride
- Cartrol
- Corzide
- Corgard
- Detensol
- Esmolol
- Esmolol Hydrochloride
- Inderal
- Inderal LA
- Inderide
- Inderide LA
- Inderide LA
- Kerlone
- Levatol
- Levatrol
- Lopressor
- Lopressor HCT 100/50
- Lopressor HCT 100/25
- Lopressor HCT 50/25
- Lopressor HCT
- Metoprolol
- Metoprolol succinate
- Metoprolol Tartate/HCTZ
- Metoprolol tartrate
- Nadolol
- Novanpranol
- Penbutolol
- Penbutolol sulfate
- Pindolol
- Propranolol
- Propranolol HCL
- Sectral
- Sotalol
- Sotalol HCL
- Tenoretic
- Tenormin
- Timolide
- Timolol
- Timolol maleate
- Timolol Maleate/HCTZ
- Toprol XL
- Visken
- Zebeta
- Ziac

Anti-lipemic Agents

Atorvastatin
Atromid-S
Atromids
Baycol
Cerivastatin
Cholestin
Cholestryami
Cholestryram
Cholestyramine
Cholestyram
Cholestyrami
Choloxin
Clofibrate
Colesevelam
Colestid
Colestipol
Colestipolhc
Fenofibrate
Fluvastatin
Gemfibrozil
Lescol
Lipitor
Locholest
Lopid
Lorelco
Lovastatin
Mevacor
Niacin
Niaspan
Nicotinic Acid
Pravachol
Pravastatin
Prevalite
Questran
Questranlight
Simvastatin
Slo-Niacin
Tricor
Welchol
Zocor



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Three

PERSONAL INTERVIEW AND GENERAL EXAMINATION

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Three

PERSONAL INTERVIEW AND GENERAL EXAMINATION

July 1, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME III

PERSONAL INTERVIEW AND GENERAL EXAM

Table of Contents

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

CHAPTER ONE

Clinical Examination - General

1.1 INTRODUCTION

Participants of the Phase III pilot family study and/or the Phase IV family study are invited to enroll in the Phase V re-exam. This component of the study consists of a personal interview, a limited physical examination, and laboratory tests. The Phase V Strong Heart Family Study provides unique opportunities to examine the genetic basis of a wide spectrum of cardiovascular phenotypes to enable continued quantification of CVD, to assess secular trends in cardiovascular risk factors and CVD events, with a focus on diabetes, and to further evaluate the alarming prevalence of diabetes, diabetes-associated risk factors and preclinical CVD in young AI.

The examination will be conducted at local IHS hospitals, clinics, and tribal community facilities. In the Dakotas, it will be performed at the Aberdeen Area IHS hospitals and private clinics on three reservations. In Phoenix, the Tribal hospital at Sacaton (GRIC), the Tribal outpatient clinic at Salt River (SRIC), the outpatient clinic at AkChin, and various community centers will be the examination sites. In Oklahoma, the IHS hospital in Lawton and the IHS clinic in Anadarko will provide space and facilities for the examination. In some Communities, SHS will need to rent clinic space to perform the examinations, because of lack of space at IHS facilities.

The objectives of the Strong Heart Study and the examination procedures will be explained to the participants, and informed consent will be obtained from each participant. Appendix A below contains the consent forms for each of the 3 field centers. Persons who are institutionalized will be excluded. Pregnant women will not be examined until at least six weeks post partum, and lactating women must be at least six weeks post partum.

All examinations are performed by trained personnel, nurse practitioners, registered nurses, medical assistants, health profession students, health aides, medical assistants, physician assistants or physicians. All examination items are within the scope of training that these providers have received and are usual, if not daily, parts of physical examinations. Detailed descriptions and training are aimed at achieving consistency from examination to examination, and among centers.

The training of the registered nurses, nurse practitioners, health profession students, physician assistants and physicians on the Phase IV protocol occurred on March 14 – 16, 2006 at the University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma and was based on the written protocol. Each Study Center has designated a primary examiner and at least one other person who is available to perform examinations in the absence of this primary person.

Certification requires adequate performance of the components of the examination as validated during training. In case of loss of a center's staff member, a replacement may be trained locally by someone certified in the procedure(s). The same certification requirements as used in the initial training must be met. Quality control focuses on the potential for false positive

examinations. Because most participants are healthy, the frequency of abnormal findings is relatively small. The presence of real abnormalities among those with normal examinations is also small (a low false negative rate), and this makes it inefficient to re-examine the many individuals with normal findings. The review of positive findings is part of the medical data review. After the initial training, continuing education includes regular review of the protocol.

1.2 COMPONENTS OF THE CLINICAL EXAMINATION, ENDPOINTS AND RISK FACTORS

1.2.1 Components of the Clinical Examination

The clinical examination has two parts: a personal interview and a physical examination.

1. Personal Interview

The following questionnaires will be administered:

1) Personal information including health facility(ies) normally used. In Phase V, the data on this form are NOT transmitted to the CC, but are kept in secure files in the field for use as needed by authorized SHS personnel.
2) Demographic information, marital status, education, weight satisfaction, artificial sweetener use, income, tobacco use, passive smoking, alcohol intake, and perceived stress.
3) Medical history, including reproductive history, and Rose questionnaire for angina pectoris and intermittent claudication.
4) Dietary survey: The Block Food Frequency questionnaire as modified to add foods identified to be commonly eaten in SHS communities, will be self-administered following instruction by clinic staff.
5) Psychosocial information: MOS SF-12 (Quality of Life), CES-D (depression) scale, social support, posttruaumatic stress screening scale, generalized anxiety screening scale, spirituality, and fatalism questionnaires.

2. Physical Examination

The physical examination includes the following procedures that were used previously:

1) Anthropometric measurements will be made with participants in loose clothing without shoes, and with heavy objects removed from pockets:
    i) Weight -- The scale will be balanced on a level and firm surface prior to weighing a participant. The participant will stand in the middle of the scale platform, head erect and looking straight ahead. Results will be rounded to the nearest kg.
    ii) Height -- The participant will stand erect on the floor with his back against the vertical mounted ruler, heels together and looking straight ahead. The right angle will be brought down snugly but not tightly on the top of the

head so that height can be accurately measured and rounded to the nearest centimeter.

iii) Waist and hip circumferences -- For the waist, anthropometric tape will be applied at the level of the navel with the patient supine and breathing quietly. Results will be rounded to the nearest cm. For the hip, the participant will stand erect but relaxed with weight distributed equally over both feet. The measure will be made at the level of maximum protrusion of the hips with the tape kept horizontal. These measurements are rounded to the nearest centimeter.

iv) Body fat measurement -- Using an RJL bioelectric impedance meter, resistance and reactance are recorded. Percent body fat will be estimated by the RJL formula based on total body water.

v) Arm circumference -- The participant will sit with his right arm hanging freely, with the right hand resting on the right knee. The tape measure will be placed horizontally at the midpoint between the acromion and olecranon. Results will be rounded to the nearest cm. The measure will be used to select the proper size blood pressure cuff.

2) Examination of the following:

i) Pedal pulses – With the participant supine, the presence of posterior tibial (palpating inferior to the medial malleolus of each foot) and dorsalis pedis (palpating superior) pulses will be determined.

ii) Ankle edema -- With foot coverings removed, participant will be examined in the supine position. Gentle but firm pressure will be applied along the mid-tibia, anteriorly down to the ankle in each leg. The degree of edema (absent, mild, marked – 1 - 3) will be recorded.

3) Blood pressure measurements:

i) With the participant sitting with right arm on table, the brachial artery will be palpated (just medial to and above the ante-cubital fossa), and this location will be marked for stethoscope placement. The correct cuff size will be chosen and the cuff will be wrapped around the arm with the center of the bladder over the artery. After a 5-minute wait, the cuff will be connected to a standard manometer, and the pulse obliteration pressure will be established and recorded. The participant will be asked to raise the measurement arm for five seconds and then wait another 25 seconds with the arm on the table. The cuff will then be inflated to +30 mm above the obliteration pressure and held constant for 5 seconds. The cuff will be slowly deflated (2 mm/sec) while reading pressures for 1st and 5th phases. Before measurements 2 and 3 are taken, the participant will raise the arm for five seconds. After another 25 seconds with arm on the table, the measurement will be repeated 2 more times. The average of these last two measurements will be used for analysis.

ii) Using a Doppler, with the participant supine, right brachial and both ankle systolic pressures will be measured two times.

4) Twelve-lead resting ECG measurement -- Using a Marquette MAC 1200 EKG machine, a 12-lead EKG will be obtained in a standard manner. EKGs will be electronically transmitted to Cornell University, and confirmed interpretations will be transmitted back to the field location to be filed in the participant's medical record. Tracings will be Minnesota coded electronically.

5) Fasting blood samples will be obtained for measurements of total triglyceride (TG), cholesterol, LDL and HDL cholesterol, plasma fibrinogen, leptin, CRP, serum FFA, glucose, HbA1c (when glucose > 100 mg/dl), creatinine, insulin, chemistry profile, CBC and DNA isolation, *As a point of clarification, ALL tubes will be will be taken from patients who are on renal dialysis or have had a kidney transplant.*

6) Urine will be collected at the beginning of the physical examination for measurement of albumin and creatinine.

7) Ultrasound examinations of the carotid and popliteal arteries: See Volume V of the Manual for details.

8) Echocardiography: See Volume V of the Manual for details.

9) Pedometry will be used to assess physical activity of the participants at home for one week. Each participant will wear an Accusplit pedometer for 7 days (from waking till going to bed each day), recording daily activity counts on the 7-day pedometer record sheet, and returning the record to the clinic after recording 7 consecutive days of activity.

The IHS medical records will also be reviewed to determine whether the participant was hospitalized or received outpatient treatment for ESRD, stroke, myocardial infarction, or other manifestations of CVD.

Checklists to be used for the physical examination and as a reminder of post examination activities are given in Appendix A-2 (a) and (b).

The clinical examination will last approximately three to four hours. The participant will arrive at the clinic fasting in the morning. After registration, a study staff member will explain the study and procedures to the participant, answer questions, if any, and have the consent form signed (see Appendix A – 1 below for consent forms used in the 3 centers). The participant will then be instructed to go to the laboratory for blood drawing and to provide a urine specimen. The participant will then be offered a light snack. The nurse clinician and other staff will then conduct the personal interview, obtain anthropometric measurements, blood pressure, impedance measurement for body fat composition, and obtain an echocardiogram, an ultrasound assessment of the carotid and popliteal arteries, and ECG measurements. After all the procedures are completed, the participant will receive payment or sign the payment form and be thanked for his/her participation.

If possible, all of the components, except for the FFQ, psychosocial questionnaires, and echo exams, should be completed in one visit. If an individual leaves before the examination is completed, it must be completed before the study is completed. The personal interview and consent may be completed up to two weeks prior to the physical examination if such arrangements are more convenient. The FFQ and psychosocial questionnaires may be given to the participant to complete before attending the clinic visit. If they are not complete, every effort should be made to have the participant complete them while in the clinic for the rest of the exam.

1.2.2 Endpoints and Risk Factors (see Volume 2 of this manual)

A. MORBIDITY EVENT CRITERIA

1. Definite Myocardial Infarction (MI)

   Minnesota codes 1.1.x or 1.2.x except 1.26. and 1.28 with no 7.1 or 7.4
   or History of MI verified by chart review as definite MI

2. Possible Myocardial Infarction

   Minnesota codes 1.3.x, 1.2.6, or 1.2.8 with no 7.1 or 7.4
   or History of MI verified by chart review as possible MI

3. Definite Coronary Heart Disease (CHD)

   Definite MI,
   or Definite CHD verified by chart review to include cardiac cath, indicating coronary artery occlusion, PTCA, coronary artery bypass grafting, or abnormal stress ECG plus abnormal imaging (i.e., both must be abnormal),
   or Angina Pectoris plus LBBB (7.1.1) or
   ST changes (4.1) or
   T wave changes (5.1) or
   verified possible MI,

4. Possible Coronary Heart Disease

   Possible ECG MI (1.3.x, 1.2.6, 1.2.8)
   or Angina Pectoris
   or Minnesota codes 7.1, 4.1, 4.2, 5.1, 5.2, 7.4
   or Unconfirmed history of MI
   or Positive functional test of ischemia (such as treadmill) without invasive confirmation
   or Possible ECG or imaging in scintigraphic studies (not both).

5. Definite Cardiovascular Disease (CVD)

   Definite CHD
   or Definite stroke
   or Congestive Heart Failure
   or Cardiomyopathy
   or Valvular Heart Disease
   or Left ventricular Hypertrophy by Echocardiogram
   or Left ventricular Hypertrophy by ECG (3.1 or 3.3 plus 4.1-4.3 or 5.1-5.3)
   or Ankle Arm Index <= 0.8
   or Atrial Fibrillation
   or Minnesota codes 4.1, 5.1, 6.1, 6.2, 6.8, 7.1, 7.2, 7.4

or Non-coronary heart surgery or carotid or other vascular surgery
or Pacemaker implantation
or Bruits by physical examination
or Intermittent Claudication by Rose Questionnaire
or Positive non-coronary angiography

6. Possible Cardiovascular Disease (CVD)

Possible CHD
or Possible stroke
or Congestive Heart Failure
or Cardiomyopathy
or Valvular Heart Disease
or Left ventricular Hypertrophy by Echocardiogram
or Left ventricular Hypertrophy by ECG (3.1 or 3.3 plus 4.1-4.3 or 5.1-5.3)
or Ankle Arm Index <= 0.8
or Atrial Fibrillation
or Minnesota codes 4.1, 5.1, 6.1, 6.2, 6.8, 7.1, 7.2, 7.4
or Non-coronary heart surgery or carotid or other vascular surgery
or Pacemaker implantation
or Bruits by physical examination
or Intermittent Claudication by Rose Questionnaire
or Positive non-coronary angiography

1.3 RECRUITING

1.3.1 Recruitment Techniques

Always remember that the participant is here on a voluntary basis.

Recruiting participants to the Strong Heart Family Study is more than simply getting the person to come into the clinic for an exam. Their participation in the Study is the result of an ongoing effort of Strong Heart personnel to recognize, establish trust with, and care about the people who take time to participate in the Study. Without our participants, we have no Strong Heart Family Study.

Eligible participants for the Phase V exam are the previous participants of the Phase III pilot family study and/or the Phase IV family study; only these previous participants are eligible for enrollment in Phase V, which is a re-exam of all surviving family study participants.

Greet people wherever you see them. Call them by name and make the effort to greet them first.

Take time to be in places like the Tribal Office, Post Office, Hospital and any location where there is a large gathering of people. Talk gently with them about other subjects and then slowly talk with them about Strong Heart participation.

Don't sit in the car and honk the horn when making home visits **(unless you have safety concerns).** Walk to the door and tell them why you are there. Take the initiative to visit with them first and see how they are.

People without a car often feel shut-in and frustrated. It is important to visit with them about a variety of things first before approaching them about participating in the Study.

Sometimes, when possible, it helps to offer a helping hand in things that need to be done, let people know that you recognize them as a person and not only a participant.

Dress casually and never act like you can't be touched with a ten-foot pole.

Enjoy your home visits as most people like someone coming in with a smile. It really helps to enjoy what you do.

Be patient and explain things in a variety of ways so that people will understand what they are being asked to do.

PLEASE always remember that the SHS participants are volunteers. Treat them with courtesy and recognize that they have often gone to a great deal of effort in both time and energy in coming into the clinic to participate.

Recruiting is not a 9 to 5 job. It is important to recognize the people who do it very well and to support them.

Set goals that are clear to all personnel and allow sufficient time for the recruiters to reach them. Everyone should contribute to the recruitment effort.

Recognize the daily rhythms of your community. Some participants are affected more by the community events, seasons and check days than others are. Try to be sensitive to the participant's needs when scheduling.

Let the participant know you may not have answers to all questions, but that you will try to find answers **and follow-up.**

Let people know you will provide transportation to and from clinic when necessary.

Give people encouragement, even when they are doing well.

Research Clinic is not a "priority" to some people. Take your time - don't reschedule them continuously.

Be willing to let the participant take part in as much as possible. Although it is ideal to have the participant complete the entire exam at once, it is not always possible. Be willing to adjust your schedule to accommodate the participant.

Regular team meetings are important in setting goals, communicating with team members in a meaningful way, in helping to focus efforts and in supporting the efforts of the personnel. Sometimes personnel can become discouraged when events do not go as they were planned. This does not have to mean that things are going badly. Be aware of staff burn-out and the need to stop and to promote other team members or to give them a helping hand.

There may be times a "potential" participant is going through a personal crisis. Allow them time to deal with it and go back in a couple of weeks, if possible.

1.3.2 Recruitment Instructions

For the Phase V clinical examination, eligible participants are the previous participants of the Phase III pilot family study and/or the Phase IV family study; only these previous participants are eligible for enrollment in Phase V, which is a re-exam of all surviving family study participants. Some local publicity and mailed information will alert the eligible participants before their enrollment in Phase V is requested.

When contacting an eligible participant, the interviewer re-introduces the Strong Heart Family Study and once again explains its purpose and importance. A brochure and a letter explaining the purpose of the study and exam are used for recruitment. The voluntary nature of the study and the confidentiality of the collected data are stressed. If the participant is not at

home at the time of the phone call or visit, call backs are made as necessary to meet the individual and schedule the clinic appointment. 100% participation is the goal.

In all areas, the recruiter should wear an identification badge. When scheduling appointments, the recruiter should emphasize the following:

1. That the volunteer should not eat breakfast the morning of the exam and should not eat or drink anything but water after 9:00 p.m. the previous evening;

2. That the volunteer should bring with him/her all medications, which he/she has been prescribed and is currently taking (including any they purchased on their own);

3. That the volunteer should not take any of his/her morning medications; he/she will take them later at the clinic after blood drawing is completed;

4. That the volunteer should not use tobacco or engage in vigorous activity before the clinic visit;

5. That the volunteer should wear loose clothing (ladies should wear a skirt and blouse or pants and shirt, rather than a dress).

If the participant is *mentally handicapped* or otherwise mentally incapacitated, a surrogate must accompany him/her to the examination, preferably someone who is very familiar with the medical and family history.

The recruiter schedules the appointment with the clinic for each subject. Whenever possible, eligible members of a single household are scheduled on the same day. The recruiter should also verify name, address, and social security number at the time of the recruiting visit. When possible, participants should be reminded by phone or in person the day prior to the visit.

After the visit appointment is made, the clinic staff should assemble all forms and labels necessary for the exam and arrange *when possible,* to have the hospital chart for that participant available the morning of the clinic visit.

1.4 PERSONAL INTERVIEW

1.4.1 Components of the Personal Interview

The personal interview is designed to obtain demographic information, medical history, health behavior, and stress data that are considered important in identifying risk factors for cardiovascular disease. The following questionnaires (see forms in Appendix C of this volume) will be administered during the clinical examination (note: psychosocial forms (item #8) and diet questionnaire (item #11) are self-administered and may be given to the participant up to 2 weeks prior to the exam):

1. Personal Interview Forms (I and II)
2. Medical History Form
3. Reproduction and Hormone Use
4. Rose Questionnaire
5. Physical Exam Form
6. Sample Collection Checklist
7. CBC Results
8. PSYCHOSOCIAL QUESTIONNAIRES
    - Quality of Life (SF-12)
    - CES-D Scale (Depression)
    - Social Support
    - Other (posttruaumatic stress screening scale, generalized anxiety screening scale, spirituality, and fatalism)
    - Psychosocial Checklist
9. Seven-Day Pedometer Record
10. Medication Checklist
11. Food Frequency Questionnaire – (FFQ) (Dietary Form)

Personal living habits such as dietary, cigarette smoking and alcohol consumption, and stress have been considered as important risk factors for cardiovascular disease. Data on these factors as well as demographic information will be collected by using the Personal Interview Forms (I and II) and the FFQ. Other pertinent forms are the Medical History Form (questions on medical conditions), the medications form, and the Rose Questionnaire for angina pectoris and intermittent claudication. These questionnaires are included in Appendix C.

1.4.2 Guidelines for Interviewers

1. Introduction

The personal interview is probably one of the most important procedures for data collection in epidemiologic research. The personal interview usually increases response over self-administered questionnaires. Most of the SHS questionnaires are interviewer administered with the exception of the diet (FFQ) and psychosocial forms, which are designed to be self-administered. The interviewers will need to assist some participants in completely filling out those forms.

When rapport is established between the interviewer and the interviewee, the interview has been shown to be an excellent source of high quality information for epidemiologic research purposes. However, the interviewer must be able to show tact, care, and sensitivity to be effective. Not everyone can become a successful interviewer.

Also, the personal interview can lead to a lack of standardization in the data collected, particularly in a multicenter study such as the Strong Heart Family Study. Since the interviewer is known to have a large effect on the quality of the data obtained, interviewer training is very important. Please read this interviewer's manual frequently, and refer to it as needed during the study. It is also recommended that each Study Coordinator hold monthly interviewer meetings to go over common problems and clear up any questions about the interview procedures and the interview forms in the Strong Heart Family Study. If there are ever questions about the proper procedures for collecting study data, please look to the manual as the authority. If problems are identified, changes will be made to the manual. Therefore, it is important to keep the manual updated and readily available to maintain consistency across centers. Consistency is extremely important if data across the centers in the Strong Heart Family Study are to be used in combined data analyses.

2. Types of Interviews

Structured versus Unstructured Interviews

In an unstructured interview the responses to questions are open-ended, and information given is to be recorded as given. In a structured interview the questions are usually closed, with a specific set of answers provided in the questionnaire.

For the Strong Heart Family Study, we are using both structured and unstructured interviews. The use of structured interviews is the best way to maintain consistency in the data being collected. Interviewer training is important in order to maintain as much consistency in the interviews between study centers as possible.

Because we are using structured and unstructured interviews, we can achieve even more consistency if all interviewers conduct the interviews in a similar way. Therefore, ask each question as it is written. Do not reword the question. Also, ask the questions in the order they are given in the interview form. Hopefully, by following these procedures we can achieve a high degree of consistency in the way the interviews are conducted.

3. Style of the Interview

The interview style is also important and some of the components that are generally considered to be acceptable interview style are listed below. In addition to the components of style listed below, the following interviewer characteristics are also very important: Politeness is very important since we will be asking sensitive questions to strangers, in a situation where they may be uncomfortable. Sensitivity on the part of the interviewer is also important, in order to

know how and when to be more or less assertive in asking for information. Besides these qualities, please develop your style in accordance with these guidelines:

a. Non-judgmental, non-evaluative style. A large portion of the impression, which the respondent has of the interviewer is based solely on the interviewer's voice and the manner with which the interviewer responds to the respondent's comments. A judgmental or evaluative response would indicate that the interviewer has made a judgment of the relative goodness, appropriateness, effectiveness, or rightness of the respondent's statement. The interviewer should not, in response to the respondent's statements, state what the respondent should or should not do in a given situation. The interviewer's task is simply to ask the question and record the participant's answer.

b. Non-interpretive style. As above, the interviewer should not use a style that might be considered teaching or preaching. An interpretive response is one, which indicates that the interviewer's intent is to teach. We are interested in the respondent's impression of what was happening, not in the interviewer's impression.

c. Allow for respondent to complete sentences. Do not try to help the respondent by answering the questions for him/her. No matter how slowly the respondent is speaking, putting words in the respondent's mouth or not allowing the respondent to finish thoughts will generally alter the information which the respondent is attempting to give. However, long hesitations may be bridged by asking appropriate questions.

d. Supportive remarks. Remarks which indicate that the intent of the interviewer is to reassure, to pacify, or to reduce the intensity of the respondent's feelings are appropriate. However, these should be in keeping with local terms and expressions, and should be short so as not to detract from the interview itself.

e. Probing. This is an important response style, which will be discussed further. A probe is a response, which indicates that the interviewer's intent is to seek further information, to provoke further discussion along a certain line, or to question the respondent. Direct probes will be specific questions about details of what the respondent said.

f. Non-directive, or understanding. A typical non-directive response might be "I see". This is the general idea of understanding murmuring. The interviewer might also repeat what the respondent just said. This may prompt the respondent to elaborate.

4. Gain Rapport with the Interviewee before Commencing Interview

The first step in gaining the confidence of the respondent is a straightforward, believable introduction of the interview and the reason for this contact. It may help in gaining rapport with

the respondent if you tell him/her a little about yourself, such as where you are from, and your background, etc. If the respondent seems to hesitate or has some questions, the interviewer must be prepared with a more detailed explanation of why the information is needed. Also, if the respondent raises the issue of the confidentiality of the information collected, the interviewer must be prepared to reassure him/her of the precautions taken to respect their privacy.

5. Interviewer Error

We should try to minimize interviewer error during this study. The primary objectives of epidemiologic research are (1) to obtain measurements of exposure to disease variables relevant to the objectives of the study, and (2) to maximize completeness and minimize error in these measurements. The presence of an interviewer may both reduce error and increase error. It may reduce error by increasing the response rate, motivating the subject to respond well and probing to obtain complete data when the responses volunteered fall short of what is desired. The presence of an interviewer may increase error if, by his or her appearance, manner, method of administration of the questionnaire or method of recording of the responses, he or she exerts a qualitative influence on the subject's responses. Possible sources of error in the interview for data collection include (1) conditions of administration (privacy, heat, light, ventilation, freedom from distraction, lack of time, etc.); (2) interaction of the personality, sex or race of the interviewer with that of the subject; and, (3) performance by the interviewer (questioning, prompting and recording of responses).

The following are the common interviewer errors:

a. Asking errors. Omitting questions or changing the wording of questions. This may be particularly important if the interview is performed in Native language.

b. Probing errors. Failing to probe when necessary, biased probing, irrelevant probing, inadequate probing, preventing the respondent from saying all he or she wishes to say.

c. Recording errors. Recording something not said, not recording something said, incorrectly recording response.

d. Flagrant cheating. Not asking a question but recording a response, recording a response when the respondent does not answer the question asked. These kinds of errors do occur, and this has been amply documented by various studies. Cheating has been shown to be more common when the interviewer is in an uncomfortable situation with the interviewee, i.e., he/she is difficult. In such situations the question should still be asked, and if the participant refuses to answer the question(s), the refusal should be documented on the form.

6. Circumstances for the Interview

We will not have very much control over the circumstances for the interviews. However the following should be considered in arranging for conducting interviews:

a. Time. There will be little control over the time of the interviews, since we will have many different interviews to carry out over a short period of time. When possible, the interview should be conducted after the snack has been served, otherwise the interviewee may tend to be somewhat uncomfortable.

b. Place. The place for the interview should be chosen where there are as few distractions as possible. Try to select a place where the location is quiet, comfortable and private. If it is possible, it is ideal to sit at a table, with the interviewer facing the interviewee, so that the interviewer can organize the papers. Privacy is very important. If the respondent will need to refer to records during the interview, be sure that the records are available before the interview begins.

7. Asking Procedures

In general the rules for asking questions in structured interviews can be summarized as follows:

a. Questions must be asked according to the instructions for each form and question. Be sure to read and re-read the instructions for each questionnaire you are using, and to ask all the questions in the same way to each person interviewed.

b. Read the questions exactly as they are worded in the questionnaire. If the question is misunderstood, then it may be repeated, interchanging local terms, if necessary for understanding.

c. Read each question slowly.

d. Use correct intonation and emphasis.

e. Ask the questions in the order that they are presented in the questionnaire.

f. Ask every question that applies to the respondent (all inapplicable questions will be identified as such by skip instructions in the questionnaire).

g. Repeat questions IN FULL that are misheard or misunderstood.

h. Read all linking or transitional statements exactly as they are printed.

i. Do not add apologies or explanations for questions unless they are printed in the questionnaire.

PROBING: Probes are additional questions asked or statements made by the interviewer when the answer given by a respondent is incomplete or irrelevant. Probing has two major functions: (1) To motivate the respondent to reply more fully; (2) to help

the respondent focus on the specific content of the question. It must fulfill these functions without biasing the respondent's answers. However, probes, when they are used, MUST be neutral. Probing can introduce bias, such as by summarizing your understanding of the response to the subject when an unclear response has been given, or by offering some alternative interpretations from which the respondent can choose, and this must be guarded against.

The following are NON-DIRECTIVE methods of probing:

a. Repeat the question (RQ). All that may be required to clear up a vague answer may be to repeat the question. You may begin by saying "I am not sure that I understood you, let me just repeat the question so that I can be sure to get your answer right."
b. The expectant pause. Waiting expectantly will tell the respondent that the interviewer is expecting more information than has been provided.
c. Repeat the reply. Repeating the reply aloud while recording it may stimulate the respondent to provide more details.
d. Neutral questions or comments. Various neutral probes may be used for purposes such as clarification, specificity, or completeness: "What do you mean exactly?", "In what way?", "Could you be more specific about that?", "Anything else?", "Can you tell me more about it?"
e. Interpretation. Make sure that the question was understood, since that may be the reason for incomplete answers. You may need to ask the question again, perhaps substituting some local terms, if there is a problem in interpretation.

FEEDBACK: The provision of feedback by the interviewer to the respondent about his or her performance has been the subject of much research. Some studies have shown that the use of feedback in health-related surveys increased the amount of reporting of most events. Your decision about whether to provide feedback may depend upon the performance of the person you are interviewing and your experience in the benefits of providing feedback.

8. Specific Instructions for Telephone Interviewing

The principles outlined above have been derived solely from research into and experience of face-to-face interviewing. While it is generally believed that these apply to telephone interviewing, the evidence that this is true is very limited. Telephone interviewing is probably not simply the transfer of face-to-face techniques to the telephone. Use of visual cues, such as "show cards", is impossible on the telephone and must be compensated for in questionnaire design. There is evidence that this compensation may lead to response differences. In addition, other non-verbal communication, both from the interviewer to respondent and respondent to interviewer, is absent. The "expectant pause", for example, may be much more difficult to use as a probe for additional information on the telephone. It is also more difficult for the interviewer to establish the legitimacy of the interview on the telephone, and the pace of the interview may be faster (because of the need to keep talking) leading to hurried and, perhaps, less thoughtful responses. On the positive side, the telephone should eliminate non-verbal biasing activity by

the interviewer, and may encourage more honest reporting of threatening behaviors. Empirical data, however, have not shown consistent evidence of these effects.

9. Instructions for Recording Responses

In the study manual (Appendix B of this volume), each interview and form contains a set of instructions covering each question in the interview form to clearly describe the information that is being solicited. These instructions should be read carefully and understood before attempting to fill out an interview form.

In addition, see the attached instructions for filling out forms. The following are some additional guidelines for recording responses:

a. Make sure that you understand each response.

b. Make sure that the response is adequate.

c. Do not answer for the respondent (i.e., do not infer a response from an incomplete or inadequate reply).

d. Begin writing as soon as the respondent begins talking. (The respondent's interest may be held by repeating the response aloud as you are writing).

e. Use the respondent's own words and record the answers verbatim.

f. Include everything that pertains to the question's objectives.

g. Note in the questionnaire the nature and place of each probe used.

h. Do not erase anything. If a response is wrong, strike it out and enter the correct response above the previous response.

i. Write "refused/8" beside any question that the respondent refused to answer.

1.4.3 **Training & Quality Control of Interviewers**

1. Training

Central training for interviewers was conducted at the training session in Oklahoma City (March 14-16, 2006) prior to the start of exams. Interviewers were trained in the use of a standardized procedure for administering each questionnaire. Training included instructions in research interviewing techniques and in completing each form. Interviewer skill training includes:

(a) adherence to the standardized protocol
(b) use of non-judgmental attitudes

(c) degree and nature of prompting permitted
(d) dealing with problem interviewing situations
(e) handling participants' comments and recording relevant information on the note logs
(f) post-interview responsibility for the data

2. Quality control of interviewers

To insure consistency and accuracy and to minimize interviewer variances, the study coordinator will monitor and tape one interview during the first exam month on interviews conducted by each interviewer. For "new staff", this should be repeated each month until the Coordinator determines that the interviewer has met the standards of the study. Then, new staff members will be observed on a quarterly basis along with the experienced interviewers. Should any interviewer fall short of the required standards, retraining will be required with special attention given to problem areas. If the problem persists, the interviewer will be removed from the task of conducting interviews.

1.5 RATIONALE FOR MEASUREMENTS

1.5.1 Blood Pressure

As blood pressure rises, so does risk of ischemic heart disease and stroke. The range of normal blood pressures is wide. Even within the "normal range", risk increases as the upper limits are approached. Usually, blood pressures are expressed as systolic pressure/diastolic pressure; values. 140/90 mmHg or higher are considered to be hypertensive for nondiabetic adults and 130/80 for those with diabetes. Hypertension is an especially strong risk factor for stroke, renal disease, and, to a lesser extent, for peripheral vascular disease. Most of the knowledge of the consequences of high blood pressure arises from studies of sitting arm blood pressure.

1.5.2 Measurement of Body Fat

Although early records are not conclusive, all evidence indicates that obesity among American Indians was rare until the last century. Their farming and hunting lifestyles, which were associated with high degrees of physical activity and the lack of consistently abundant food sources, probably assured the maintenance of a lean population. However, with the advent of "Westernization" and the reservation system, obesity has increased steadily among all Indian tribes and is now a major health problem. It is thus essential to evaluate the extent of obesity in the individuals in this study in order to ascertain its heritability, role in cardiovascular disease, and relationship to risk factors such as diabetes and hypertension.

In the past, assessment of obesity in population studies was invariably accomplished either by algorithms such as ratios of weight to height, or by measurements of skin folds using calipers. This was because assessment of body composition required either very expensive equipment or time consuming procedures, such as underwater weighing. Instrumentation is now available to allow estimates of body composition from measurements of tetrapolar impedance. This measurement of bioelectrical impedance is quick and easy to perform and has been extensively validated against densitometry. These validations were first performed by Lukaski et. al. and by Roche et. al. in a wide variety of individuals. The conductivity increases in individuals with low percent body fat, and the instrumentation calculates the percent body fat utilizing a computerized algorithm.

1.5.3 Anthropometric Measurements

Among obese individuals, the distribution of body fat is related to certain patterns of morbidity. Vague and co-workers have observed that body fat distribution differs among obese individuals, and that obese subjects can be roughly divided into two groups depending on whether accumulation of body fat is subcutaneous and peripheral (referred to as gynecoid or female type obesity) or whether the fat accumulation is central and primarily in the omentum (referred to as central or android obesity). The latter distribution has been shown in a number of studies to be consistently associated with dyslipidemia, hypertension, insulin resistance, and cardiovascular disease. Most studies have shown that central obesity is a risk factor for coronary artery disease.

The quantification of central vs. peripheral obesity is not well standardized. Original studies were done simply by photographs and visual evaluations. This was supplanted by body circumference measurements with investigators generally taking the waist circumference or the ratio of the body circumference at the waist to the hip or the thigh as a measure of fat distribution. However, it is clear that the body fat of interest in central obesity is the non-subcutaneous, and therefore, whole body scanning devices are necessary for a precise evaluation of this depot. Nevertheless, it has been shown in a number of population studies that the comparative circumference measurements are an approximation of the body fat distribution, and the only practical techniques usable in a field study.

1.5.4 Measurements of Peripheral Vascular Disease

The atherosclerotic process affects vessels in many parts of the body. While the most conspicuous morbidity and mortality arise from coronary atherosclerosis, large vessel peripheral arterial disease (PAD) often results in significant incapacitation of the lower extremities and has also been strongly associated with the incidence of coronary heart disease. Criqui and co-workers have shown that large vessel PAD is strongly and significantly predictive of all cause mortality in both sexes with a relative risk of 4 to 5, and this was independent of other cardiovascular risk factors in a multivariate analysis. Moreover, data from the Framingham study indicate that diabetes was associated with an even greater magnitude of increase of peripheral vascular disease than was coronary heart disease.

A thorough evaluation of peripheral arterial occlusive disease usually entails both a history and a physical examination including measurements of pulses and segmental blood pressures and then more complex measures such as angiography or sonography. The following indices of peripheral vascular disease will be made in this study.

1. Rose Questionnaire for intermittent claudication.
2. Palpation of posterior tibial and dorsalis pedis pulses.
3. Measurement of the ratio between blood pressures taken at the antecubital fossa (brachial) and ankle (posterior tibial) using a Doppler listening device (Nicolet Imex Elite 100 Doppler).
4. To provide direct measures of peripheral arterial disease, the geometry and presence of atherosclerotic plaque in the popliteal arteries (PA) will be assessed by ultrasound.

1.5.5 Electrocardiograms

All participants will have a resting electrocardiogram so that evidence for ischemic changes and left ventricular hypertrophy can be determined. Heritability of ECG abnormalities can be evaluated and related to their ability to predict CVD.

1.5.6 Overview of Laboratory Measurements

Table 1. Definition of Lipoproteins

Class	%Lipid	% Protein	Origin and Function
Chylomicrons	99	1	Intestine; transport of newly absorbed dietary fats; normally not detectable in plasma after a 12-hr fast; creamy layer on top of plasma tube after l2 hrs in the refrigerator.
VLDL, very low density	90	10	Liver; transport of newly synthesized triglycerides to peripheral tissue; lipoprotein approximately 80% of plasma TG is in this fraction
LDL, low density lipoproteins	75	25	Liver; derived from VLDL after the triglycerides have been metabolized; transport of cholesterol; approximately 75% of plasma cholesterol is in this fraction
HDL, high density lipoproteins	45	55	Liver and intestine; transport of cholesterol from peripheral tissues back to the liver

1.5.6.1 Penn Medical Lab (SHS Core Lab) Assays The following are assays conducted at baseline that will be repeated on samples from the Phase V re-examination.

1. Lipoproteins

The relationship between cholesterol and coronary heart disease is well established. Lipoprotein measurements, especially LDL cholesterol and HDL cholesterol are important predictors of atherosclerosis. While somewhat more controversial, triglyceride concentrations, especially in relation to HDL cholesterol, are an important factor in assessing the risk of coronary heart disease in either populations or individuals. Although genetic regulation of lipoprotein metabolism is well-recognized and has been described in detail by SHS investigators and others, few studies have evaluated the genetic determinants of changes in lipoprotein concentrations and the relations among these changes and manifestations of preclinical disease, such as ECHO and carotid measures. We chose not to re-measure apoB and apoA1 in Phase V, because our analyses of the cohort data show they are not as effective predictors of CVD as LDL and HDL. Lipoprotein subfractions, measured in a subset late in Phase IV, will not be repeated unless important linkage signals for them are found.

Measurement of Lipoproteins. The beta estimate will be used to measure lipoprotein profile. Lipids are analyzed on plasma samples on the Johnson & Johnson Vitros 950 and 250 using dry,

multilayered, analytical elements coated on a polyester support. The final reaction for the cholesterol, triglyceride, and HDL cholesterol assays involves the oxidation of a leuco dye by hydrogen peroxide, catalyzed by peroxidase. The density of the dye formed is proportional to the lipid concentration present in the sample and is measured by reflectance spectrophotometry. The cholesterol analysis is based on an enzymatic method similar to that proposed by Allain et al. The CV is 1.1-2.0%. The triglyceride analysis is based on an enzymatic method as described by Spayd et al. The CV is 1.9-2.7%.

HDL is separated by the precipitation of the low density lipoprotein (LDL) and very low density lipoprotein (VLDL) using dextran sulfate (MW 50,000) and magnesium chloride. The reagent used contains iron particles that are coated with a polymer that enhances the capture of the non-HDL lipoproteins onto the particles. The supernate containing HDL cholesterol is prepared by removing the precipitated lipoproteins when a magnetic field is applied. The CV is 1.8-3.7%.

The difference between the cholesterol value of the supernate and that of the untreated specimen is equal to the amount of the LDL cholesterol in the sample. CV for calculated LDL is 1.8-3.7%. LDL Direct is a reflex test and is performed if triglycerides are > 400. In the SHS, approximately 10% of participants require LDL Direct measurements. The LipiDirect Magnetic LDL Cholesterol Test contains a buffered polyanionic reagent that precipitates LDL while leaving HDL and VLDL in the supernatant solution. Applying a magnetic field to the mixture pulls away precipitated LDL and the supernate is then assayed using an enzymatic cholesterol reagent. CV averages 2.0-2.6%.

2. Fasting Plasma Glucose and Fasting Insulin

Diabetes is a well-established risk factor for CVD, and this condition occurs with great frequency in the SHS population. Insulin resistance and obesity also occur frequently and are known risk factors for diabetes. Understanding the genetic and environmental determinants of these phenotypes is an important part of our genetic analyses of CVD; re-measuring key analytes in the family members will allow us to monitor the increasing prevalence of insulin resistance and diabetes that is apparent from our initial exam and permit examination of change over time. Because of time constraints in the exam, and the correlation between fasting glucose and OGTT for identifying diabetes in our population (particularly in the younger members), we will rely on fasting glucose and omit the glucose tolerance test.

***Measurement of Glucose*.** The Vitros GLU slide is a multilayered, analytical element coated on a polyester support. It measures glucose concentration in serum and plasma. The inter-assay co-efficient of variation is 1.2-1.8%.

***Measurement of Insulin*.** Plasma insulin is measured on the Immulite 2000 analyzer using the Insulin reagent kit from Diagnostic Products. Immulite Insulin is a solid-phase, two-site chemiluminescent assay. Calibrators and controls are supplied by Diagnostic Products. Linearity for this assay is 0.2-400 IU/mL, and CV is < 10%.

3. Hemoglobin A1c

HbA1c will be measured in individuals whose fasting plasma glucose >100 mg/dL. During Phase IV, we used 110 mg/dL as the cutoff; we have revised this downward to coincide with the

redefinition of impaired fasting glucose by the American Diabetes Association (ADA). This approach minimizes the expense of measuring A1c in normoglycemic individuals, a low-yield endeavor. Moreover, A1c provides an integrated measure of glycemia, allows a better estimate of glucose control, and may be a better marker of the entire symptom complex of diabetes than glucose values derived from the oral glucose tolerance test. Changes in A1c may be correlated with other genetic analyses focused on progression of diabetes and the relations among diabetes severity and cardiovascular abnormalities.

Measurement of Hemoglobin A1c. The assay will be performed on frozen whole blood samples using a Primus CLC385 automated HPLC system and reagents supplied by the manufacturer. The assay is directly standardized to DCCT values. The assays use a boron affinity column, and the values produced after freezing are indistinguishable from those obtained on fresh samples. Our method is certified traceable by the DCCT and the National Glycohemoglobin Standardization Program (NGSP). CV is 1.7-3.7%.

4. Fibrinogen

Fibrinogen, a marker of both coagulation and inflammation, is an established risk factor for prevalent and incident CVD. In the SHS, fibrinogen is an independent predictor of incident CVD. Fibrinogen also has been shown to be associated with markers of preclinical cardiovascular disease. Moreover, fibrinogen has been shown to be closely correlated with markers of inflammation, such as CRP and adiponectin (inverse). Our genetic analyses will focus on the interactions among genetic determinants for fibrinogen, PAI-1 and CRP, and whether there are determinants that predict changes in fibrinogen concentrations or its relations to measures of preclinical disease. PAI-1 will not be re-measured because its variance was high; and it is unlikely that we could detect change over time with sufficient precision.

Measurement of Fibrinogen. Fibrinogen is measured in an automated clot-rate assay based upon the original method of Clauss, using the STA-R Instrument (Diagnostica Stago), with standardization with the CAP reference material. Proficiency is checked with the CAP Coagulation Proficiency Testing Program. Inter- and intra-assay precision testing resulted in a CV of 3%. Both frozen and lyophilized controls are used.

5. Urinary Albumin/Creatinine

Increased concentration of albumin in the urine of diabetic individuals predicts all-cause and CVD mortality in the SHS and in other studies. It is hypothesized that the albumin "leak" in the glomeruli reflects a widespread capillary vasculopathy affecting the heart, eyes, and perhaps other organs. However, nephropathy may not be a simple consequence of diabetes. Family studies indicate that diabetic nephropathy is more likely to occur among children of parents with nephropathy, families with hypertension, or in siblings of patients with nephropathy. It is clear from studies of both types of diabetes that albuminuria clusters among families, and several candidate genes have been proposed. The ability to monitor changes in albuminuria in the family members and relate these to changes in ECHO, carotid and popliteal parameters will add additional power to our genetic analyses.

Measurement of Urinary Albumin. Urine microalbumin is measured with the Hitachi 717 auto analyzer by using an immunoprecipitin assay (Microalbumin SPQ II Kit, DiaSorin). Albumin in

the sample reacts with a specific antibody to form insoluble antigen-antibody complexes. Calibrators and three levels of quality controls are used for each testing, and the reportable range of the assay is 5-240 mg/dL. CV averages 2.1-4.6%.

Measurement of Urinary Creatinine. Urine creatinine is measured with the Hitachi 717 auto analyzer using the standard kinetic picric alkaline method. Creatinine reacts with picric acid in an alkaline medium to produce a complex that absorbs light at 510 nm. Absorbance is directly proportional to concentration. Controls are purchased from Bio-Rad (Lyphocheck Quantitative Urine Controls Normal/Abnormal) and NIST(NERL) Standard 15. Three levels of quality control samples are used. CV averages 3.5-5.5%.

6. CBC and Chemistry Profile

The hematocrit and CBC will be determined locally at each center by standardized automated methods. A 16-analyte chemistry profile will be done by the core laboratory. Total protein determinations will be used to estimate whole blood viscosity. Numerous studies document that increased hematocrit, plasma viscosity, or whole blood viscosity are associated with hypertension and diabetes and predict subsequent cardiovascular events. One possible mechanism of these associations is the increased shear stress imposed on the arterial intima by more viscous blood flowing past it. The chemistry profile is a cost-efficient group of tests that also will be used to assess comorbidities, such as hepatocellular disease (transaminases, bilirubin) and gall bladder/bile duct obstruction (alkaline phosphatase, bilirubin, hyperproteinemia, and electrolyte imbalance). Total serum protein concentration can be used for evaluation of nutritional status. Creatinine is a function of lean body mass and can be used to compute an estimated GFR.

Measurement of Chemistry Profile. A total of 16 analytes will be measured in this profile: glucose, BUN, creatinine, Tprot, Alb, Na, K, Cl, Alk Phos, AST, Tbili, B/C, A/G, ALT, and Cal., using the Johnson & Johnson Vitros 950 and 250. All reagents are tailored to the specific analyte to be measured. Two quality control samples are monitored for accuracy, precision, and stability. The following have a CV < 5%: Na, K, Cl, Alk Phos, AST, Tbili, B/C, A/G, and Cal. ALT has a CV < 10%.

7. Free Fatty Acids

Free fatty acid metabolism is central to several metabolic pathways that are implicated in the atherosclerotic process. The role of free fatty acids (FFAs) as regulators of lipoprotein metabolism has been understood for a number of years; elevations of FFA stimulate hepatic TG synthesis and drive VLDL production, and this has been postulated to be a major mechanism of the elevated VLDL observed in insulin resistance and diabetes. Fatty acids participate in several aspects of the metabolism of glucose and insulin. Elevated FFAs decrease cellular glucose metabolism and reduce insulin-mediated glucose disposal. In addition, fatty acids suppress insulin secretion and thus are postulated to be one of the mediators of the beta-cell failure that occur in type 2 diabetes. Finally, elevations of FFAs influence vascular function; they cause endothelial damage, leading to vasoconstriction, release of inflammatory cytokines, and enhanced thrombosis. For these reasons, it will be of interest to include FFA in the genetic analyses, both to search for linkage signals, and to examine potential interactions with regions that control lipoprotein metabolism, insulin action, and vascular function.

Measurement of Free Fatty Acid. Free fatty acids (FFA) are measured by using the Wako NEFA C test kit (Richmond, VA), an in vitro enzymatic colorimetric method for the quantitation of FFA in human serum. In brief, this method relies upon the acylation of coenzyme A (CoA) by the fatty acids in the presence of added acyl-CoA systhetase (ACS). The acyl-CoA thus produced is oxidized by added acyl-CoA oxidase (ACOD) with generation of hydrogen peroxide. Hydrogen peroxide, in the presence of peroxidase (POD), permits the oxidative condensation of 3-methyl-N-ethyl-N-(β-hydroxyethyl)-aniline (MEHA) with 4-aminoantipyrine to form a purple colored adduct, which can be measured colorimetrically at 550 nm. The sensitivity of the assay is 0.01 mEq/L. CV is < 5%.

8. C-reactive protein (CRP)

Numerous studies have shown that CRP levels predict CVD and cardiovascular events in apparently healthy individuals. A close association between CRP and type 2 diabetes is also becoming evident. To date, much in vitro data have emerged in support of a role for CRP in atherogenesis. The proinflammatory, proatherogenic effects of CRP that have been documented in endothelial cells include the following: decreased nitric oxide and prostacyclin and increased endothelin-1, cell adhesion molecules, monocyte chemoattractant protein-1 and IL-8, and increased plasminogen activator inhibitor-1. In monocyte-macrophages, CRP induces tissue factor secretion, increases reactive oxygen species and proinflammatory cytokine release, promotes monocyte chemotaxis and adhesion, and increases oxidized low-density lipoprotein uptake. Also, CRP has been shown in vascular smooth muscle cells to increase inducible nitric oxide production, increase NFkappa(b) and mitogen-activated protein kinase activities, and, most importantly, upregulate angiotensin type-1 receptor resulting in increased reactive oxygen species and vascular smooth muscle cell proliferation. In addition, a number of polymorphisms in the genes controlling CRP expression and other inflammatory cytokines have been identified. Thus, we will re-measure CRP to assess genetic determinants of changes and their relationship to atherosclerosis.

Measurement of CRP. High sensitivity CRP in human serum or plasma is measured using the BN II Systems. In brief, polystyrene particles coated with monoclonal antibodies specific to human CRP are aggregated when mixed with samples containing human CRP. These aggregates scatter a beam of light passed through the sample. The intensity of the scattered light is proportional to the concentration of the relevant protein in the sample. The result is evaluated by comparison with a standard of known concentration. The sensitivity of the assay is 0.175 mg/L, and the CV is < 4.1%.

9. Leptin

Leptin is a plasma protein encoded by the *ob* gene, secreted by adipocytes and involved in the control of body weight. Plasma concentrations of leptin are increased in human obesity and positively correlated to the body fat mass in lean and obese subjects. In addition to long-term regulation of the body weight, hyperleptinemia has been considered a component of the metabolic syndrome and a role for leptin as a possible cause of vascular disease has been recently suggested. Recent studies found that, in patients with angiographically confirmed coronary atherosclerosis, leptin is a novel predictor of future cardiovascular events independent

of other risk factors, including lipid status and CRP. It has been shown that leptin might exert an atherogenic effect through the generation of oxidative stress in endothelial cells.

Measurement of Leptin. Serum levels of leptin will be measured using standardized radioimmunoassay (RIA) kits from Linco Research (St. Charles, Mo). For leptin, the kit uses human recombinant leptin for both standard and tracer, with anti-serum raised against human recombinant leptin. The limit of detection is 0.5-100 ng/ml (100 ul sample size). The intra- and inter-assay coefficients of variation are < 6% and < 9%, respectively.

1.5.6.2 Children's National Medical Center (CNMC), Research Center for Genetic Medicine The following are candidate gene assays to be conducted on samples from the Phase V re-examination.

Candidate gene genotyping will be carried out at the Research Center for Genetic Medicine at Children's National Medical Center (CNMC), in collaboration with Dr. Joe Devaney. This activity will be overseen by Dr. Lyle Best, PI of the Dakota Field Center.

The main emphasis of genetic investigation in the Strong Heart Family Study is linkage analysis and subsequent identification of positional candidate genes conducted by the SHS Genetics Center at the Southwest Foundation for Biomedical Research (SWF). Linkage analyses and fine mapping are being performed by SWF under its U01 funding. This section outlines plans by SHS investigators in collaboration with Dr. Devaney and the CNMC to analyze a few carefully selected candidate genes. Criteria for candidate gene selection, and the rationale for each are presented in this section.

This aspect of SHSV is an assessment of the relation of major vascular endpoints to a limited number of compelling polymorphisms in candidate genes not guided by the linkage study. In particular, this work is designed to test hypotheses regarding intermediate phenotypes and pathways that are less well represented in the SHS (and, therefore, candidate genes that are difficult to exclude on the basis of the linkage studies) but are of potential importance to vascular disease. Most important in this are novel vascular risk factors, including the innate immune system, cell adhesion, endothelial dysfunction, inflammation, and insulin sensitivity. Investigation will be limited to polymorphisms showing some evidence of functionality. Given the fall in costs of genotyping, where convincing functional variants exist, this potentially allows testing of novel hypotheses and areas of biology more cheaply than additional phenotyping. Importantly, it also allows examination of key polymorphisms (and contribution to meta-analysis) of data from American Indians--a group generally underrepresented in other large studies. Finally, it will allow assessment of associations of these genes with markers of preclinical disease obtained from echocardiographic, carotid and popliteal ultrasound results. In the course of our adiponectin studies in Phase IV, baseline DNA samples have been genotyped for this marker. The typing of DNA from baseline samples has been highly successful (almost 100% of tested samples) using approximately 5 ng of DNA -- less than 0.01% of existing DNA resources for participants. The following is a justification for our choices:

1. Mannose binding lectin (MBL)

This serum protein opsonizes a variety of pathogenic microorganisms by binding mannose moieties on their surface and activating complement via the lectin pathway prior to antibody formation. Major decreases in opsonization detected in 5-7% of Caucasians and commonly among other populations result from markedly decreased levels of MBL related to variations of both structural and promoter portions of this gene. In both children and adults, an increased risk of certain infections has been associated with low levels of MBL or genotypes predictive of low levels. There are two previous reports of an association between MBL genotypes and measures of CVD; and one study failing to find a relationship between MBL levels and a peripheral vascular disease. A recent paper described the association of *C. pneumoniae* infection and CAD, but only in the presence of variant MBL genotypes.

We examined DNA from 434 participants in the SHS. Genotypes for three common MBL coding variations and one promoter polymorphism were determined. The frequency of a composite genotype conferring low MBL levels was 20.7% in 217 cases and 11.1% in matched controls. After adjustment for demographic and CAD risk factors, including type 2 diabetes mellitus, fibrinogen, triglycerides, and hypertension, the OR was 3.2 (95% CI 1.5-7.0, p = 0.004). The high prevalence of variant MBL alleles and their relation to CAD in this population suggests potentially important public health implications.

2. Interleukin 6 (IL6) -174 C to G

Interleukin 6 is a key stimulator of release of acute phase proteins, including fibrinogen and C-reactive protein. A -174 C to G polymorphism in the IL-6 promoter has been described. In vitro expression supports a functional role, with lower expression in the presence of the C allele. In non-disease states, the C allele is associated with lower concentration of IL-6 as well as lower glucose concentrations and relative insulin sensitivity and higher endothelium dependent vasodilatation. IL-6 -174 C to G also has been proposed as a candidate gene for vascular disease, and the C allele has been associated with reduced carotid intimal medial thickness and coronary heart disease in some but not all studies.

3. Thrombospondin 4 (A387P variant)

Thrombospondins are a family of extracellular matrix glycoproteins involved in cell adhesion. A large-scale screen of functional polymorphisms in the GeneQuest study highlighted the A387P variant as having the strongest association with vascular disease (Odds Ratio of myocardial infarction for P allele of 1.89). The A387P variant also appears to have functional consequences, affecting folding and secretion of the protein and also influencing adhesion of endothelial cells where the protein is expressed.

4. Lymphotoxin-α (G252A, A804C variants)

Variants in the lymphotoxin-α gene were found to have a significant association with myocardial infarction (OR 1.78) in a large Japanese case control study using genome-wide SNP analysis screening 92788 gene-based SNPs. The G252A variant lies in intron 1 and influences transcription of this key cytokine and in turn expression of a range of adhesion molecules and cytokines, while the A804C variant causes an amino acid change.

5. Toll-like receptor-4 (TLR-4)

Toll-like receptors, such as TLR-4, respond to microbial lipopolysaccharide by activating the NFkappaB signaling pathway, and induce a wide variety of cytokines and other inflammatory mediators. Many immunohistochemical, human cultured coronary artery cell, and model animal investigations have provided evidence for the influence of TLR-4 receptors on processes related to atherosclerosis. Genotypic variants of TLR-4 have been associated with CRP and WBC response to pulmonary LPS challenge in humans. Various lines of clinical evidence suggest a role for TLR-4 in the pathogenesis of CVD. The Asp299Gly polymorphism has been associated with incident CVD outcomes and IMT measurements. Additionally, the efficacy of pravastatin is modified by this same TLR-4 polymorphism.

6. Peroxisome Proliferator-Activated Receptorγ (PPARγ) Pro12Ala

PPARγ is an important candidate gene for insulin sensitivity and has previously been related to vascular disease. In addition to very rare loss of function mutations (*PPARγ* mutations, digenic mutations of *PPARγ* and *PPP1R3*), it is now clear that a common mutation (Pro12Ala) of *PPARγ* has both functional consequences *in vitro* and relates reliably to development of type 2 diabetes in large populations. Pro12Ala was calculated to contribute 25% of population-attributable risk of type 2 diabetes in a Scandinavian population with a protective effect of the rarer Alanine 12 allele. More recently, the Alanine 12 allele has been associated with protection against incident myocardial infarction (OR 0.71).

Methods for genotyping. Genotyping will be carried out at the Research Center for Genetic Medicine at Children's National Medical Center (CNMC), in collaboration with Dr. Joe Devaney. The Research Center acts as a core facility for several large-scale studies and is well equipped for high-throughput genotyping. The CNMC facility contains the following equipment that will be useful in these studies: an ABI 7700 Sequence Detection System, two Transgenomic denaturing high performance liquid chromatography systems, six high-throughput sequencers (three ABI 16-capillary laser-induced fluorescence sequencing systems, an ABI 96-capillary laser-induced fluorescence sequencing system, and two Beckman CEQ 2000XL 8-capillary laser-induced fluorescence sequencing systems), an Hitachi Genespec II spectrophotometer, an Applied Biosystems Voyager matrix-assisted laser desorption ionization time of flight/time of flight mass spectrometer [MALDI TOF/TOF], and a Perseptive Biosystems cytoflour 96-well plate reader.

i. *SNP Discovery by DHPLC.* Genomic DNA is amplified using PCR with primers designed to each candiate gene promoter region. PCR will be performed in a final volume of 10 µl containing 50 ng genomic DNA, 10 pmol of each primer (Invitrogen, Carlsbad, CA), 250 µM of each dNTP (Invitrogen), 1 µl of GeneAmp 10x buffer II, 0.8 µl of 25 mM $MgCl_2$, and 0.5 units of AmpliTaq Gold polymerase (Applied Biosystems, Foster City, CA). Thermal cycling is performed at 94°C for 12 min, 94°C for 0.5 min, 55°C for 0.5 min, and 72°C for 1 min for 35 cycles. The PCR reaction is performed in an MJ Research 96-well block Tetrad thermocycler (Waltham, MA).

PCR products then will be screened with DHPLC using liquid chromatography column temperatures selected based on sequence and base pair length of PCR product. The HPLC system used is the Wave DNA fragment analysis system (Transgenomic, Inc., San Jose, CA) with a DNASep column that has a stationary phase consisting of 2-µm nonporous alkylated (C_{18})

poly (styrene-divinylbenzene) particles, a UV detector set at 260 nm, and an autosampler with the capacity to handle 192 samples (Transgenomic, Inc., San Jose, CA). The two eluents used for analysis on the HPLC system are A: 0.1 M triethylammoniumacetate (TEAA) and B: 0.1 M TEAA/25% acetonitrile.

PCR products from above (10 µl per sample) are eluted at a flow rate of 0.9 ml/min with a linear acetonitrile gradient. The elution gradient and melting temperature predictions were determined by WAVEMAKER software (Transgenomic). The separation gradient (% B per min) for analysis is adjusted to elute the amplicon between 1.0 and 2.5 min and is analyzed at multiple column temperatures to ensure heteroduplex detection. Optimal run temperatures are empirically determined on the basis of each fragment's characteristic melting profile. Data analysis is based on comparison with a normal control included in the analysis of each region. Heterozygote profiles are detected as distinct from homozygous wild-type elution profile.

Finally, amplicons that showed heteroduplexes, as compared with controls, will be sequenced to identify the base change. Prior to sequencing, enzymatic treatment is accomplished by mixing the PCR product (10 µl) with ExoSAP-IT (4 µl) incubating at 37 °C for 15 min followed by 80 °C for 15 min to inactivate the exonuclease and alkaline phosphatase enzymes prior to sequencing. Twenty ng of pure PCR product is sequenced in both directions using the identical primers used for the initial PCR with the BigDye™ Terminator 3.1 Kit (Applied Biosystems) according to the manufacturer's instructions. After the sequencing reaction, the products are purified using ethanol precipitation. Samples will be analyzed on an ABI PRISM® 3100 Genetic Analyzer (Applied Biosystems). Nucleotide changes will be identified by aligning sequence generated for comparison with corresponding Genbank sequence using SEQUENCHER 4.1.4 analysis software (Gene Codes, Ann Arbor, MI).

ii. *SNP Database Searching*. The candidate genes will be searched in two databases for genetic variation: 1) dbSNP (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Snp), and 2) Celera (http://www.celera.com).

iii. *SNP Genotyping*. In allelic discrimination assays, the PCR assay includes a specific, fluorescent, dye-labeled probe for each allele. The probes contain different fluorescent reporter dyes (VIC and FAM) to differentiate the amplification of each allele. During PCR, each probe anneals specifically to complimentary sequences between the forward and reverse primer sites. AmpliTaq gold DNA polymerase cleaves probes that hybridize to the allele. Cleavage separates the reporter dye from the quencher dye, which results in increased fluorescence by the reporter dye. The signal generated by PCR amplification indicates the alleles that are present in the sample.

1.5.6.3 Penn Medical Lab (PML) Sample Storage and Quality Control The following describes receipt, storage, and quality control of samples received by PML.

An SOP for DNA and sample storage has been approved by the SHS Indian Communities. It is contained in the Volume 4 of this manual.

The SHS field centers notify PML at least one day in advance of shipments via the laboratory's customer service e-mail account PennMedLab@medstar.net. Upon receipt of the specimens, the Specimen Processors at PML open the package and count the number of specimens. The SHS specimens are logged into the logbook and, based on the turn-around-time, the processing and assaying schedule is set. Samples for storage are treated upon arrival as "tests" (i.e., they are assigned lab sequence numbers and the "result" of the test is the site of storage by freezer, shelf, and box number). The computerized storage of this information allows timely inventory of stored material and quick retrieval when needed.

1. Storage Conditions

SHS samples are stored in gasketed Corning CryovialsTM at –80°C in Revco Freezers at MedStar Research Institute. The freezers are continually monitored for variations in temperature, and they also are connected to a robotic alarm system that telephones laboratory supervisors and technical personnel if a temperature deviation is sensed. Emergency backup power is supplied by a diesel generator tested according to JCAHO regulations.

2. Automated Inventory System

PML has recently re-inventoried all SHS samples in preparation for converting the existing inventory to a comprehensive database inventory system. The system upgrade, currently underway, enables researchers to learn about the specimens available for future research needs.

Each specimen logged into the database is assigned a unique, bar-coded, inventory number with the following information recorded: participant ID, laboratory accession number, other identifying numbers, if applicable, type of specimen, volume, description of storage tube, condition of specimen, storage box number, grid location within the storage box, column and row assignment within a particular freezer, and physical location of the freezer. The new sample storage inventory maintained by PML can query the database by patient ID, laboratory accession number, volume, and type of specimen. Such versatility makes the retrieval of specimens easier and more accessible to researchers. Additionally, freeze/thaw cycles and disposition of specimens are electronically tracked when specimens are removed from the freezer for assaying.

From this storage repository and inventory, we can easily access specific samples for analyses when needed. Although some case control studies have been done, ample amounts of samples remain, even for the key CVD endpoints.

3. Off-Site Storage of Subset of Specimens

In accordance with the NIH recommended sample storage policies, PML, under the direction of the Sample Storage Committee, during the first year of Phase V, will send a subset of the storage samples to an off-site storage location. The location of the facility will be outside of the Washington, DC, metro area, but close enough for access to the specimens if necessary. Storing a portion of the study specimens off site in a geographically diverse location provides an additional layer of security and helps ensure the preservation of the samples in the event of a natural disaster, terrorist attack, or other catastrophic event occurring in the vicinity.

4. Sample Retrieval, Processing, and Accounting

Upon receiving written authorization from the Sample Storage Committee to release specimens, PML generates a pull list from the inventory database. The Clinical Research Supervisor creates the pull list by querying the database on one or more database fields. A basic pull list will contain, but is not limited to, the following information: participant ID, lab sequence number, specimen type, volume, box number, freezer number, and freezer location.

The Clinical Research Supervisor compares the pull list to the authorization form, and depending upon the purpose for the samples, an epidemiologist or the Coordinating Center may be asked to review and verify the IDs on the list prior to PML staff retrieving the samples. The samples, as they are pulled from inventory by the Research Coordinators and/or Specimen Processors, are checked out of their designated permanent freezer location and their temporary location is logged via the "Sample Disposition" function so that there is an audit trail created for each specimen. Upon completion of the aliquot, the specimens are checked back into their designated permanent location in the inventory. During the check-in process, the database is updated with the new volume and a revised freeze/thaw count. Additionally, a batch database function enables the lab staff to quickly import a brief description of why the specimens were removed from inventory.

Every 6 months, the Coordinating Center and PML will reconcile datasets to ensure all laboratory results have been resulted and no discrepancies exist. Additionally, the two entities will reconcile storage rosters. The Coordinating Center will provide PML with a list of all SHSV participants who should have storage samples in the inventory. PML will compare the Coordinating Centers list to the inventory roster. All discrepancies will be researched, and unresolved issues will be properly documented and reported to the SHS Steering Committee.

Samples are released to investigators studying CVD, pulmonary disease, or their risk factors only by written authority of the SHS Steering committee according to guidelines approved by tribal councils and IRBs of participating institutions. Regulations concerning confidentiality, such as HIPAA, are strictly followed. In addition, because the samples in this study are ultimately the property of the participating Indian Communities, unused material is returned to PML so that community oversight can be maintained. PML maintains a computerized database of stored samples. The policies governing release of specimens are contained in Volume 1 of this manual.

5. Quality Control

i. *Procedures*

Penn Medical Laboratory and the SHS participate in extensive internal and external control programs to ensure stable, accurate, and precise measurements. Quantitative measurements are performed according to strict written guidelines conforming to those of the College of American Pathologists (CAP). Good Laboratory Practice rules are used throughout the laboratory. Instrumentation is maintained according to manufacturer's standards, and performance is monitored according to CAP guidelines. Reagents are purchased from stable sources and purity is monitored according to CAP regulations. Assays are checked for linearity, sensitivity, parallelism, effects of freeze/thaw, recovery, and within-batch and between-batch coefficients of variation. All sample storage, short-term or long-term, is at -80°C to minimize degradation. Controls at several levels are run with every batch and plotted on Levy-Jennings plots. Whenever possible, lyophilized and frozen controls are used for long-term drift assessment.

PML technicians receive ongoing continuing education and rigorous periodic performance evaluations. Standard Westgard rules are applied to quantitative assays using at least two, and no more than three, quality control samples per run. Standard rules used for assay acceptance include Quality 2_{2s} $10_{x,}$ 1_{3s}. Quality control rules are programmed into on-line software (BioRad DADE), and technicians are required to visually review Levy-Jennings plots to look for drift. All assay results are reviewed by a technical supervisor before final release into the data system.

Quality control pools are purchased from Bio-Rad. PML participates in all available CAP proficiency tests. In addition, PML takes part in CDC-NHLBI Lipid Standardization, CAP, and Northwest Lipid Research Laboratories (NWLRC) Standardization (ReLABS) programs to ensure external comparability and precision. When no formal proficiency tests are available, PML cross-exchanges samples with other reference labs not less than once each quarter. These laboratories include NWLRC (S. Marcovina) and the University of Vermont (R. Tracy). Additional internal controls include monthly linearity checks and 20-sample precision runs on all quantitative analytes. PML uses an internal blinded duplicate system, in which samples are introduced into the receiving area at least bi-monthly, and results are reviewed by the laboratory director. The entire laboratory staff participates in monthly quality control meetings, in which each analyte is reviewed and actions taken to address problems are critiqued. Laboratory errors and deviations from standard operating procedures are documented in quality assurance incident reports that undergo multiple levels of supervisory review. These reports are used to implement training or revise procedures to continually minimize variance and maximize adherence to standard procedures.

Data are downloaded electronically from the autoanalyzer and randomly audited for accuracy. Our data system has multiple levels of electronic redundancy, culminating in an off-site daily copy. Access to the LIS (Laboratory Information System) is double-password-secured, and SHS samples are only identifiable by their lab sequence number and numeric study ID. A clear trail of sample processing and handling is available to allow tracing of the pathway of any given sample through the laboratory. A random sample of 5% of all SHS data points is audited monthly. This audit examines sample processing, analytical procedures, and data consistency from bench-top to data output. The results of the audit are reviewed at the monthly lab meeting. All off-line data are entered into the laboratory information system by the bench technologist, who double-checks the entries before sending them to the Technical Supervisor. An additional 10% random quality check is performed by the Technical Supervisor before the results are verified and released. The data system is fully documented and maintained according to CAP regulations.

Emergency power sources maintain the system in case of blackout, and the network is backed-up every 24 hours. Weekly images of the database are kept off-site in fireproof safes. PML has been accepted by CAP as a specialty laboratory and was inspected in January 2006.

ii. ***Field Training***

PML published a detailed lab manual for the field centers (see Volume 4 of this manual). Central training (group and individual) for the laboratory staffs and phlebotomists of the 3 centers was conducted at the training session in Oklahoma City (March 14-16, 2006) prior to the

start of exams. The training sessions emphasized uniform and optimal sample handling, as well as shipping procedures designed to ensure accountability and safe transfer of samples. Site technicians were trained or re-trained in the safe handling of biologic specimens, and considerable emphasis was placed on maintaining communication between the sites and the lab. To maximize uniform and optimal collection of samples across sites, the lab produced color, plastic laminated flip-charts. The flip-charts were designed to be used at the phlebotomy stations as quick reminders of SHS sample processing procedures. These were well received, and this methodology has been widely used by our colleagues in other studies.

The lab receives monthly reports of the variance from the Coordinating Center summarizing the data by site for the blinded duplicates for each analyte. These are reviewed by the lab director. If the data suggested a sample mix-up, the coordinator at that site is contacted and the local procedures are reviewed and corrected as necessary. The lab provides visits by the PML Laboratory supervisor, if necessary, to train new personnel.

1.5.7 Measurement of Physical Activity – Pedometry

Pedometer – Activity Monitor

The physical activity questionnaire, in general, is the most common measure of physical activity levels in research studies. However, an activity questionnaire alone may not be the best way to quantify lower intensity, variable frequency, lifestyle activities such as walking (Kriska, 1990; Sallis, 1985). Step monitors are now successfully being used to estimate levels of movement expressed as "daily steps taken throughout the day" and to document activity changes in intervention efforts (Yamanouchi, 1995). However, pedometers also have their own set of limitations, such as the inability of capturing cycling, swimming and upper body movement. The Accusplit pedometer will be given to each participant at the time of the clinic visit to wear at home for seven consecutive days. The Accusplit pedometer is a pocket-sized pedometer that displays the number of steps taken. Verbal and written instructions for the monitors will be presented to the participant with a record sheet that needs to be completed on the seven days that the monitor is worn (see form in Appendix C of this volume). The participants will keep the pedometers and will be encouraged to use them to monitor and increase their physical activity levels in their normal daily lives.

Central training on pedometry for the personnel of the 3 field centers was provided by Ms. Kristi Storti and Dr. Andrea Kriska during the training session in Oklahoma City (March 14-16, 2006) prior to the start of exams.

1.6 PHYSICAL EXAMINATION

During the examination, participants wear a gown, or loose fitting clothes that do not impair accurate body measurements and the examination. It is helpful to have them wear shorts or large scrub pants (to enable the pant legs to be rolled up) for the ECG and popliteal artery examinations. Shoes and socks are removed for the supine examination and weight and height measurements. The form to be used is given in Appendix C.

1.6.1 Anthropometry

Anthropometry is performed before the clinic snack with the participant's bladder empty. The subject may wear a scrub suit or light clothing into the station. Measurements may be taken over the scrub suit or light clothing only. Make sure that the pockets are empty and the belt is removed. Height and weight measurements are not to be taken with the participant wearing shoes.

Measurements, if possible, are taken by a team of two persons (one acting as observer, the other as recorder). If two are available, the first observer takes the measurements, calling out the value of the measurement.

The first observer keeps the measuring instrument in place until the recorder repeats the number. The recorder also checks the examinee's position during the procedure. If a single observer performs the measurements, each should be recorded immediately after they are taken. Values taken are rounded to the nearest unit indicated for each measure. Fractions less than 0.5 will be omitted and fractions greater than or equal to 0.5 will be rounded up to the next higher unit.

1. Height and Weight

   a) Standing Body Height

   The participant stands erect on the floor or the horizontal platform with his/her back against the vertical mounted ruler, heels together and against the vertical ruler, looking straight ahead with his/her head in the Frankfort horizontal plane (the horizontal plane which includes the lower margin of the bony orbit and the bony socket containing the eye the most forward point in the supratragal notch just above the anterior cartilaginous projections of the external ear) (Figure 1). The right angle is brought down snugly but not tightly on the top of the head. A footstool is used if the examiner is shorter than the participant so that the examiner's view is level with the point of measurement on the head of the participant. The participant's height is recorded to the nearest centimeter using the rounding method described above. The participant is instructed to stand as straight as possible but with feet flat on the floor. (A check is made to be sure the floor is level, the wall is at a 90 degree angle to the floor, the wall is straight and the metal ruler is mounted perpendicular to the floor). A chart converting

centimeters to inches is on the wall or available for use in informing the participant of his/her height in inches.

b) Body Weight

Before a participant is weighed, the scale is balanced so that the indicator is at zero when no weight is on the scale. The scale must be level and on a firm surface (not a carpet). The participant is instructed to stand in the middle of the platform of the balance scale (Tanita BWB-8005 Adult Digital Scale) with head erect and eyes looking straight ahead. Record the results to the nearest kilogram using the rounding method described above. To maintain accuracy, the scale is zeroed daily and must be calibrated with a known weight (50-lb) every month or whenever the scale is moved. To calibrate the scale, check that the 50-lb weight weighs 50 lbs. after zeroing the scale. Furthermore, the operator should make sure that an adult must weigh 50 lbs. more when standing on the scale holding the weight.

2. Supine Waist (Abdominal) Girth

An anthropometric tape is applied at the level of the umbilicus (navel) with the patient supine (Figure 2), and the participant is instructed to "breathe quietly". The measurement is made and recorded to the nearest centimeter using the rounding method described above.

3. Erect Hip Girth

Instruct the participant to stand erect yet relaxed with weight distributed equally over both feet. The hip girth is measured at the level of maximal protrusion of the gluteal muscles (hips) (Figure 3). Keep the anthropometric tape horizontal at this level and record the measurement to the nearest centimeter using the above rounding method. Only one measurement is made. The greatest source of error for this measurement is due to not having the tape horizontal. Technician(s) should check the position of the tape to assure its correct position from both the front and back.

4. Upper Arm Circumference

The participant sits on a table or stool so that the right arm hangs freely with the right hand resting on the right knee. The observer applies the tape measure horizontally at the midpoint between the acromion and olecranon (Figure 3). Record the measurement to the nearest centimeter using the rounding method described above. This measurement is used to select the proper size blood pressure cuff.

A Novel Products Figure Finder tape measure is used to measure both abdominal and hip girth and the upper arm circumference.

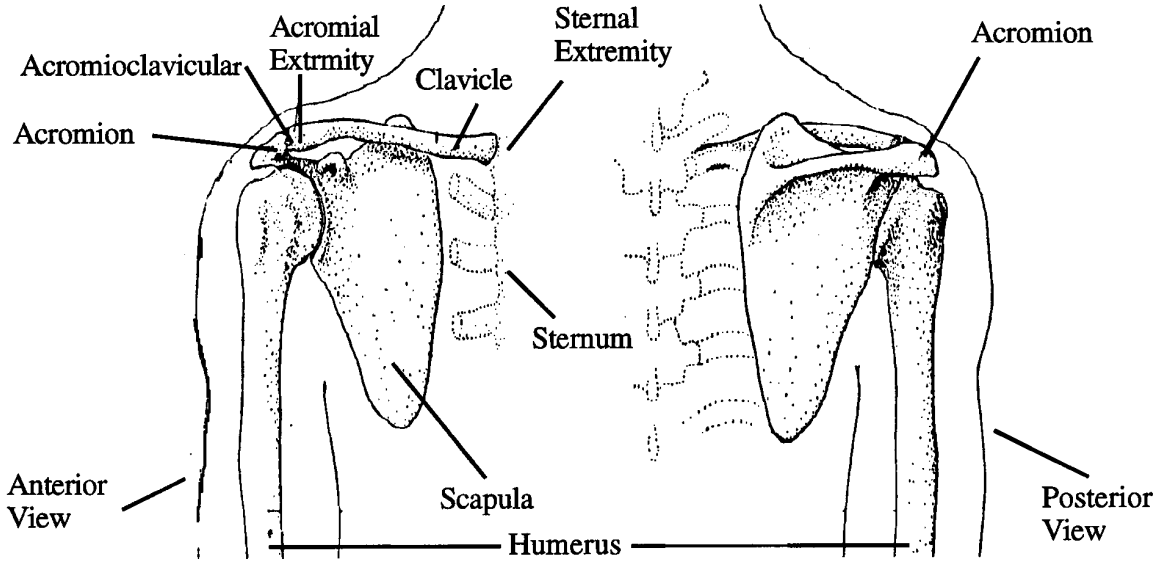


Figure 1 (a). General Description: The **scapulae**, or shoulder blades, are large, triangular, flat bones situated in the dorsal part of the thorax between the levels of the second and seventh ribs. A sharp ridge, the spine, runs diagonally across the posterior surface of the flattened, triangular body. The end of the spine projects as a flattened, expanded process called the **acromion**. This process articulates with the clavicle.

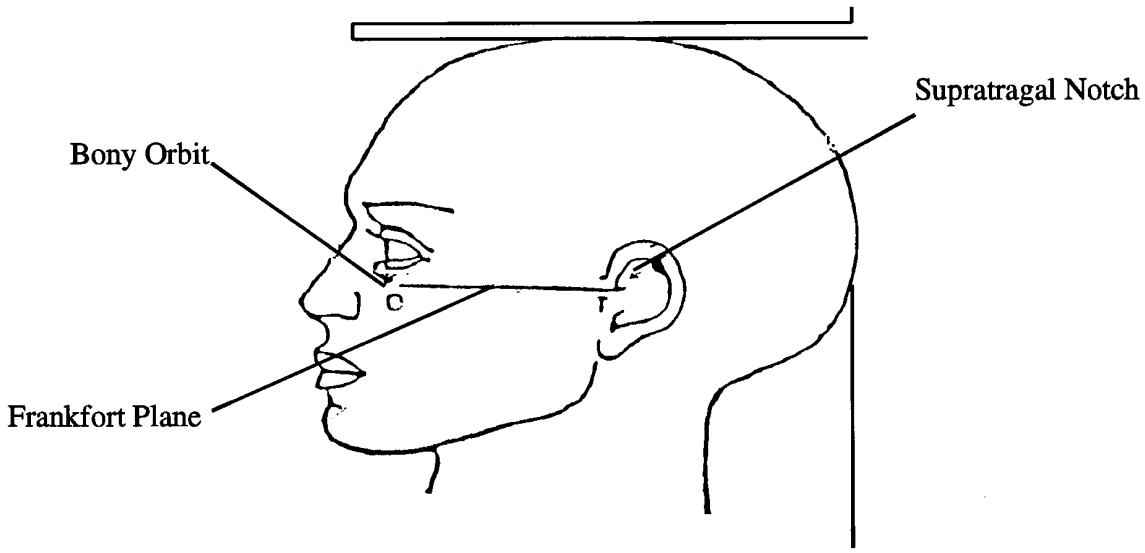


Figure 1 (b). the Frankfort Plane: The horizontal plane which includes the lower margin of the bony orbit, the bony socket containing the eye and the most forward point in the supratragal notch, the notch just above the small prominence of skin covered cartilage projecting over the meatus of the external ear.

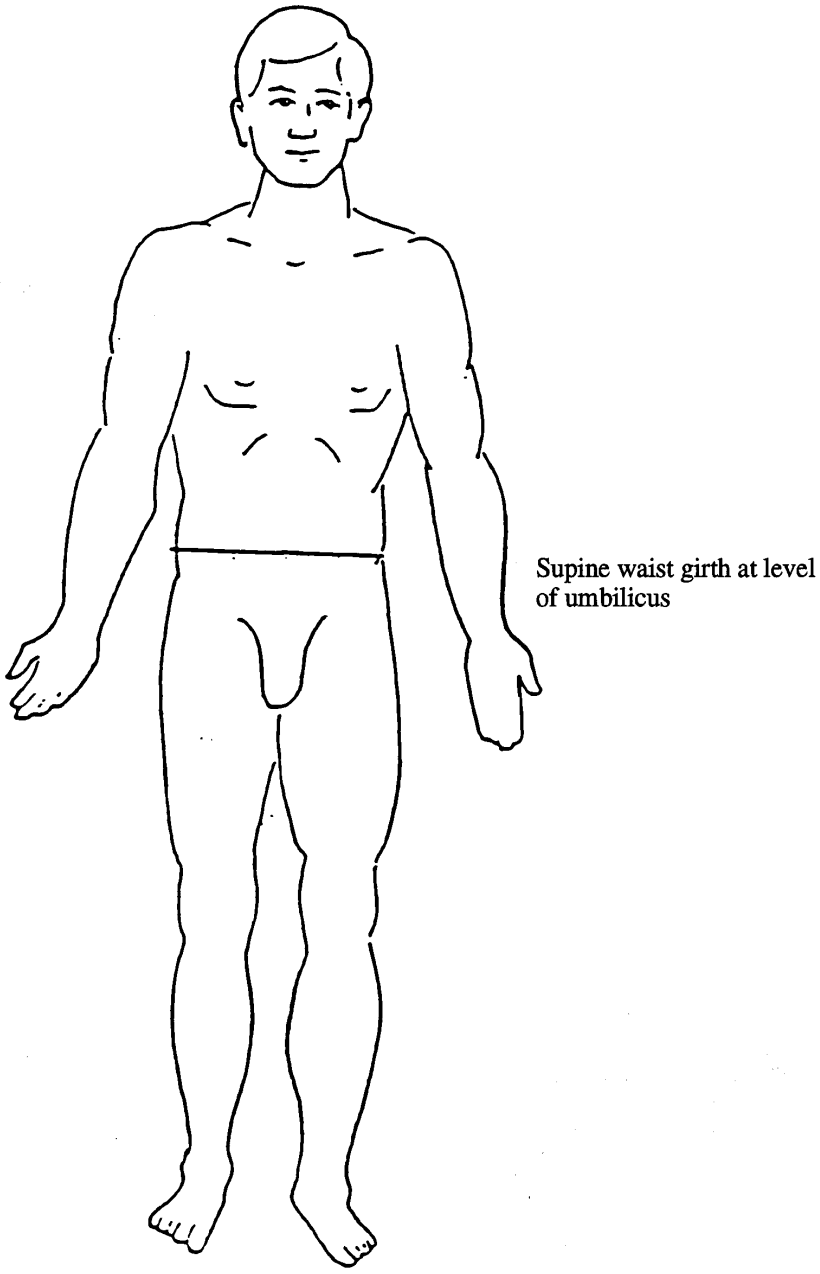


Figure 2. Location of Waist Girth Measurement

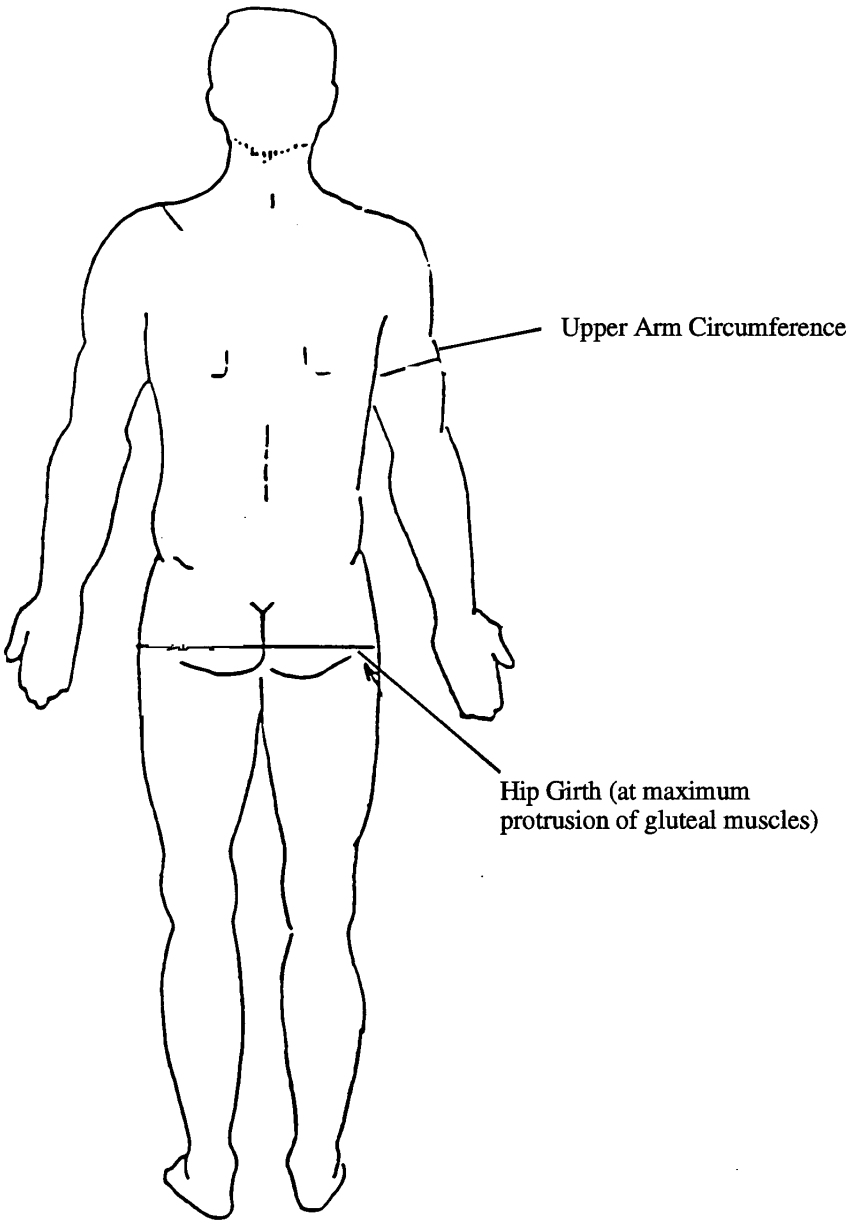


Figure 3. Location of Upper Arm, Hip, and Calf Circumference

1.6.2 Training and Certification for Anthropometry

Each technician must undergo training and certification by staff experienced in anthropometry. The training program for taking body size measurements consists of the following components.

1. Training is conducted centrally by a staff experienced in anthropometry.

2. Each field center trains one or two individuals before the start of the examinations. One individual from each center is designated the center's anthropometry supervisor.

3. If additional personnel are needed by a center to perform anthropometry, training is provided by the center's anthropometry supervisor.

4. Training includes:

    a. Introduction - rationale for body size measurements, overview of technique, expected limits of reproducibility, and pitfalls related to anthropometry.
    b. Demonstration of technique – the trainer demonstrates the proper technique of each measurement on a volunteer subject. This includes a description of proper and improper techniques, as well as recording of data.
    c. Practice - technicians perform measurements on each other or on a volunteer under the observation of an experienced anthropometrist. Differences in technique and clarification of problems are discussed.
    d. Testing - several subjects are assessed independently and blindly by each technician. Each technician's measurements are compared with the trainer's measurements and the results discussed with the technician.
    e. Certification - technicians must measure one or more test subjects and be within the standards of error:

        1) The waist and hip measurements must agree within 2 cm on each subject, and the arm and height measurements must agree within 1 cm.

        2) The weight must agree within 1 kg.

    If these are met, the staff member receives certification for field work. Trainees who have problems are identified, and they are allowed to practice and try again to be certified.

1.6.3 Sitting Blood Pressure

1. Introduction

In the Strong Heart Study, sitting blood pressure is measured in a resting state, using 3 measurements with a Baum mercury sphygmomanometer. Within any one individual, variation in blood pressure is substantial, even within a few minutes and particularly under conditions perceived as stressful. Use of three replicate readings tends to reduce this short-term variation.

2. Standardized Clinic Procedure

Correct measurement of blood pressure is of the utmost importance to the success of this study. It is essential that the procedure described below for measuring blood pressure be followed exactly. Precision is essential for valid comparisons of blood pressure between groups of people and in individuals on different occasions.

3. Description of the Equipment

a) Stethoscope

A standard stethoscope with a bell is used. Korotkoff sounds are best heard with the bell because of their low pitch. Stethoscope tubing should be about 10-12 inches from the bell piece to "Y" branching. This length provides optimal acoustical properties and allows the observer to read the sphygmomanometer at eye level and in a comfortable position. Earpieces should fit comfortably and snugly in the ears. Four points should be observed in using the stethoscope.

i) The earpiece should be directed downwards and forwards into the external ear canal.
ii) The earpieces should be tight enough to exclude outside sound but not so tight that they cause discomfort.
iii) The valve between the bell and the diaphragm should be turned in the correct direction.
iv) The bell of the stethoscope should be placed lightly on the skin overlying the brachial artery - immediately below the cuff and medial to the cubital fossa above the medial epicondyle of the radius and posterior to the biceps muscle. Light pressure accentuates the low-pitched sound and avoids compression murmurs. When pressing too heavily with the bell on the artery a murmur can be heard, which may prolong the apparent duration of phase 4 and give inaccurate readings.

b) Sphygmomanometers

Standardized Baum mercury instruments are used for all clinic visits. The mercury manometer consists of a screw cap, a face with numbers, a lined glass column, a reservoir containing mercury, rubber tubing, and a metal case. The rubber tubing from the mercury manometer connects to the rubber tubing from the inflatable rubber bladder of the cuff. As the inflatable rubber bladder is filled with air, the air pressure in the bladder

travels through the connecting rubber tubing. The pressure pushes the mercury out of the reservoir and into the lined glass column. The number for each line is read when the rounded top of the mercury, the meniscus, is level with it. If the meniscus is exactly between the lines, the reading is made from the line immediately above, i.e., rounded up to the nearest even number.

c) Cuffs and Bulbs

Proper size of the cuff is essential for accurate blood pressure measurement. Study Centers have four standardized Baum cuffs available – pediatric, adult, large adult, and thigh cuff.

The range markings on commercial cuffs overlap from size to size and do not offer a precise guideline. In the Strong Heart Study, arm size is measured, and the cuff size is selected as follows:

Table 2 Determination of cuff size based on arm circumference (Mid humeral)

Cuff Size	Arm Circumference
Pediatric	< 24 cm
Adult	24 to 32 cm
Large Adult	33 to 41 cm
Thigh	> 41 cm

4. Blood Pressure Measurement Instructions

Some of the many extraneous factors influencing blood pressure are controlled by standardizing the measurement technique and the environment in which the measurement is made. Uncontrolled factors, such as time of day, arm circumference, recent use of caffeine, and identity of the observer are recorded, so that they can be taken into account during analysis.

The SHS participants are asked to avoid caffeine (tea, coffee, chocolate, and soft drinks), eating, heavy physical activity, smoking and alcohol intake for twelve hours and to refrain from smoking for at least one-half hour prior to the clinic visit. Current drug intake, including medications affecting blood pressure and non-prescription drugs, is recorded on the day of the examination. A detailed history of smoking and alcohol intake are also recorded.

5. Staff Preparation for Measuring Blood Pressure

In relating to the Strong Heart participants, remember that participation in the study is voluntary. Participants are given a full explanation and instructions about the preparation for the blood pressure examination and an opportunity for questions. The setting in which blood pressure measurements are made is standardized.

6. Measurement Procedures

The sitting arm blood pressure is measured three times at each clinic visit. It takes approximately 10 minutes to make three blood pressure measurements including the initial five-minute rest. The blood pressure measurements are made early in the clinic visit sequence immediately following the reception and informed consent, and more than 15 minutes after phlebotomy. Once the participant is given instructions and explanations and the equipment has been checked, blood pressure measurement begins. The following steps must be followed precisely.

a) If the participant indicates that there is a medical or postsurgical reason for not having the blood pressure measured on the right arm (or if the right arm is missing), reverse chairs and proceed with the left arm. Indicate on the data collection form that the left arm is used. If in doubt, or if the participant prefers not to have a blood pressure taken on either arm, consult with the supervisor.

b) Seat the participant with the right arm on the table. The bend at the elbow (ante-cubital fossa) should be at heart level. Legs should be uncrossed and head support comfortable. The participant should be able to relax the neck and shoulder muscles as much as possible.

c) Palpate the brachial artery (just medial to and above the ante-cubital fossa), and mark this location for stethoscope placement. Choose the correct cuff size and wrap the cuff on the arm with the center of the bladder over the artery. If the participant seems particularly apprehensive, delay wrapping the cuff until after the five-minute wait.

d) Record the time. Allow a five-minute wait before taking the blood pressure. Conversation should be limited. However, a brief explanation of the procedure can be repeated at this time if necessary.

e) Connect the cuff to a standard manometer and establish the pulse obliteration pressure by slowly inflating while palpating the radial artery until pulse is no longer felt. Deflate and record the pulse obliteration pressure. Have the participant raise measurement arm for 5 seconds and the wait another 25 seconds with the participant's arm on the table.

f) Measurement 1: Connect the cuff to the manometer. Inflate rapidly to the pulse obliteration level + 30 mm. Holding the pressure constant with the bulb, wait 5 seconds. Place the bell of the stethoscope on the brachial artery and slowly deflate the cuff (2 mm per second) while listening. Record the 1st and 5th phases, reading the pressure in mmHg to the nearest even number. The first sound heard in a series of at least two sounds is recorded for systolic blood pressure (phase 1). The first silence in a series of at least two silences is recorded for diastolic blood pressure (phase 5), not the last sound heard. If the sounds do not cease completely, the fourth Korotkoff sound will be used. If the mercury column falls in between two scale marks at the time the first or fifth Korotkoff sound is heard, the **higher number** should be used.

g) Measurements 2 and 3: Have the participant raise his/her measurement arm for five seconds. After waiting another 25 seconds with the participant's arm on the table, repeat the measurement in step f above and disconnect cuff.

Average blood pressure readings are calculated using the second and third blood pressure readings. Because of the importance of the blood pressure averages, to inform the participant and for the purposes of referral, all arithmetic is done with a calculator.

If for any reason the observer is unable to complete, or has forgotten to complete any portion of the examination (and the participant is gone), draw two horizontal lines through the space(s) on the form. This is the correct way to indicate missed information. If an entire reading is missed and the participant is still sitting at the blood pressure workstation, completely deflate the cuff and start over with a replacement reading.

7. Reporting the Blood Pressure Results to the Participant

Using a calculator, average the second and third readings and mention the results to the participant. State clearly the systolic and diastolic pressures.

8. Procedure for changing the peak inflation level

Occasionally the Korotkoff sounds may be heard as soon as one places the stethoscope over the brachial pulse. If this happens, the peak inflation level used was too low. The observer immediately deflates the cuff by releasing the thumbscrew and disconnecting the cuff tube. Then have the participant hold the cuff-wrapped arm vertically for five seconds. Proceed with blood pressure measurement, starting at a new peak inflation level, 10 mmHg above the previous level.

9. Sitting Blood Pressure Training and Certification

At each field center a minimum of two clinic staff persons are trained for measuring sitting blood pressure. They need not be health professionals, but they must be trained and

certified in the blood pressure measurement technique. Observers should also have experience in relating to people.

The first training session begins with a description and demonstration of the correct blood pressure measurement procedure. Trainees watch the American Heart Association blood pressure instruction videotape. A checklist is used for certifying all persons taking BPs (Appendix A – 3). Simultaneous BPs will be recorded using a Y stethoscope as described in Appendix A – 4.

It is the responsibility of each field center to conduct these procedures and report to the Coordinating Center when the procedures are completed.

Y tube stethoscope observations are made in conjunction with the blood pressure training video during initial training and for quarterly quality control. The trainer has the observer-trainee go through the entire blood pressure measurement procedure using a quality control checklist. The observer and trainer listen with the Y Tube and record the values on separate sheets. Two measurements on one subject are obtained. Measurements by the trainer and the trainee should agree within 4 mmHg on any one reading (systolic or diastolic) and averages should agree within 3 mmHg.

10. Quality Control

To ensure the accuracy of the blood pressure measurements throughout the study, quality control measures are developed centrally and applied at all field centers. These measures include:

a) recruitment of the most qualified personnel
b) standardized training and certification
c) retraining as necessary
d) observation of data collection by supervisors, using the checklist given in Appendix A – 3. One checklist is used for each technician and mailed to the Coordinating Center
e) frequent staff meetings to provide feedback
f) editing of data, both manual and by computer
g) a quality assurance program administered by the Coordinating Center
h) simultaneous Y Tube observation of each technician by the blood pressure supervisor
i) equipment maintenance program

11. Technician Training and Quality Control

Blood pressure technicians are trained centrally prior to participant recruitment. New technicians hired after the start of the study are trained locally by the Study Coordinator or a designated "Blood Pressure Supervisor".

The Coordinating Center directs a blood pressure quality assurance program to review six-monthly data. This includes quality analysis and review of blood pressure data every 3 months, comparing means for each technician with the values for all technicians, by center. These statistics are adjusted for weight, age and sex of the participants by the use of Z-scores. Arbitrary levels of Z-scores, (which can be modified according to performance) are used to detect possible systematic deviations in blood pressure measurement by individual technicians. Digit preference is also monitored for each technician. The Form for Recording Simultaneous Blood Pressure Observations in Appendix A – 4 will be used.

12. Equipment Maintenance

Each study center is responsible for the proper operation and maintenance of its equipment. Maintenance responsibility is assumed by the nurse clinician, and all staff are instructed to report any real or suspected equipment problems to that person promptly.

All checks, inspections, cleanings and problems indicated are documented and recorded by date in a permanent log. Problems and solutions are also recorded. The local nurse clinician sends a copy of this log monthly to the Coordinating Center. A copy of this log is given in Appendix A – 5(a).

The standard sphygmomanometer is inspected once a month. These inspections include a check of:

i) the zero level
ii) air leakags
iii) manometer column for dirt or mercury oxide deposit
iv) condition of all tubing and fittings

The equipment is cleaned if inspection indicates it is needed, or at least once a year. Specific maintenance instructions for the standard sphygmomanometer are provided in Appendix A – 6.

1.6.4 Ankle-Brachial Index (ABI) Measurement

1. Move the participant to the supine position.

Assist the participant in moving to the supine position on the examination table.

2. Procedure for Measuring Brachial (arm) Blood Pressure

a) By consulting the participant's Data Form, the observer verifies that the same arm and the same cuff size are used as for the sitting blood pressure readings. If the participant had his/her sitting blood pressure taken on the right arm earlier in the clinic examination, the cuff is applied on the right arm at this time. The blood

pressure cuff is applied over the brachial artery according to the instructions found in the Sitting Blood Pressure section of this manual.

b) The observer then uses the Doppler to record the brachial pressure. The pressure recorded in the arm is used to calculate the ankle-brachial systolic pressure ratio for both lower extremities (see below).

3. Procedure for Measuring Ankle Blood Pressure

a) Apply the blood pressure cuff.

The appropriate ankle blood pressure cuff is applied on the right calf. The same size cuff should be used on the lower leg (calf) as the one used on the arm. In special instances, different cuff size may be used.

At this point, a blood pressure cuff is applied above the ankle of the right leg, as shown in Figure 4 (see below). Place the cuff flat on the table (the surface marked "side to the patient" face up) with the appropriate ankle centered on the cuff. At this time disregard the "over the artery" marker. The lower edge of the cuff (from which the hoses extend) should be approximately 2 to 2.5 inches above the medial malleolus. Following the contour of the lower leg, wrap the end of the cuff with the velcro "fabric" over the ankle, as shown in Figure 5. Note that depending on the degree of tapering in this area, the cuff corner will be offset from parallel toward the knee. Holding the cuff from sliding, wrap the other end over the ankle (step 3 in Figure 5 below), again following the contour of the ankle, and secure the Velcro. Check to be sure that the corners of the cuff extending above the upper edge of the cuff are about equal: if one end extends more than the other, loosen the Velcro and adjust the wrap. Next, locate the "over the artery" marker of the cuff, and rotate the cuff so that this line is directly over the posterior tibial artery. The cuff may be rotated more easily by sliding it toward the malleolus, and after alignment, the cuff can be made snug by pulling it up toward the calf. The cuff should conform closely to the shape of the ankle, with the lower edge 2 to 2.5 inches above the malleolus.

The posterior tibial artery is usually palpated as it courses posteriorly to the medial malleolus. Even if the posterior tibial pulse is not palpable, the posterior tibial artery is used as the location for the marker line on the cuff for the "over the artery position". Any kinks in the tubing are removed, and any "tugging" of the tubing on the participant's leg is relieved.

b) Palpate both posterior tibial pulses and mark these locations. Apply ultrasound gel to the posterior tibial areas over the pulse or in the area shown in Figure 4.

c) Listen for the right posterior tibial pulse using the Nicolet Imex Elite 100 Doppler. If no pulse is audible or palpable, then try to use the dorsalis pedis pulse

for the determination of blood pressure. If no pulse is audible, record zero for ankle blood pressure after the absence of pulses is verified by a second observer.

d) Inflate cuff to a pressure reading 20 mm higher than the "Peak Pressure" used for the sitting arm pressure (i.e., obliteration plus 50 mmHg) and utilize identical deflation techniques while listening with the Doppler. Record the first sound heard as systolic blood pressure on the physical exam form.

e) Take a second blood pressure using the same techniques, and record the second blood pressure on the Physical Examination Form.

f) Repeat this procedure to record the left ankle blood pressure.

If it appears impossible to obliterate the sounds, pump the cuff (with no break in pumping) to 250 mmHg to confirm lack of obliteration and then record 999 on the physical examination form.

To determine the right ankle-arm index, add the 2 right ankle measurements and divide by 2 to obtain the average right ankle reading. Then add the 2 right arm measurements and divide by 2. Now divide the average of the right ankle by the average of the right arm to obtain the right ankle-arm index. For the left ankle-arm index, obtain the left ankle arm average by dividing the 2 left ankle readings by 2. Then divide this left ankle average by the right arm average to obtain the left ankle-arm index. If the ratio of the ankle/arm pressure is less than 0.8 in either leg, the participant should be referred to his/her health care provider.

The observer now removes all conduction jelly. Socks and a robe or other garments are now replaced, and the participant is escorted to the next workstation.

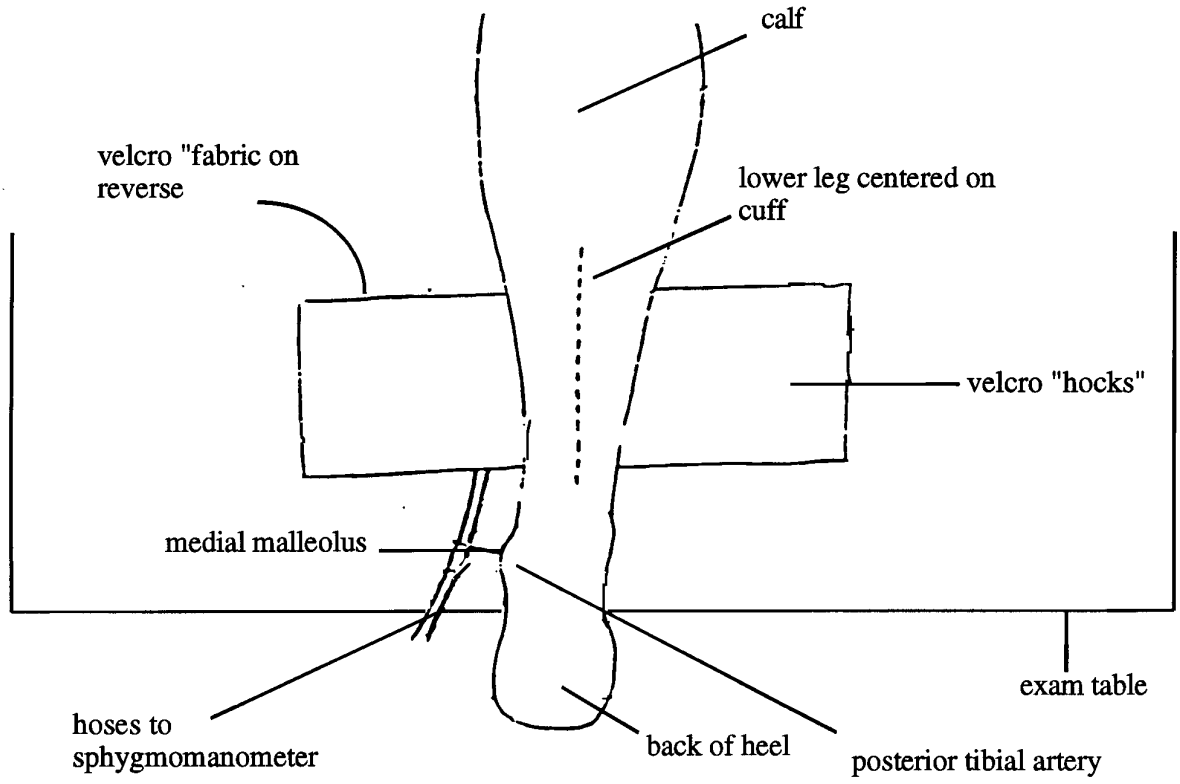


Figure 4. Placement of the blood pressure cuff on the ankle. Step 1 - Positioning the lower leg on the cuff.

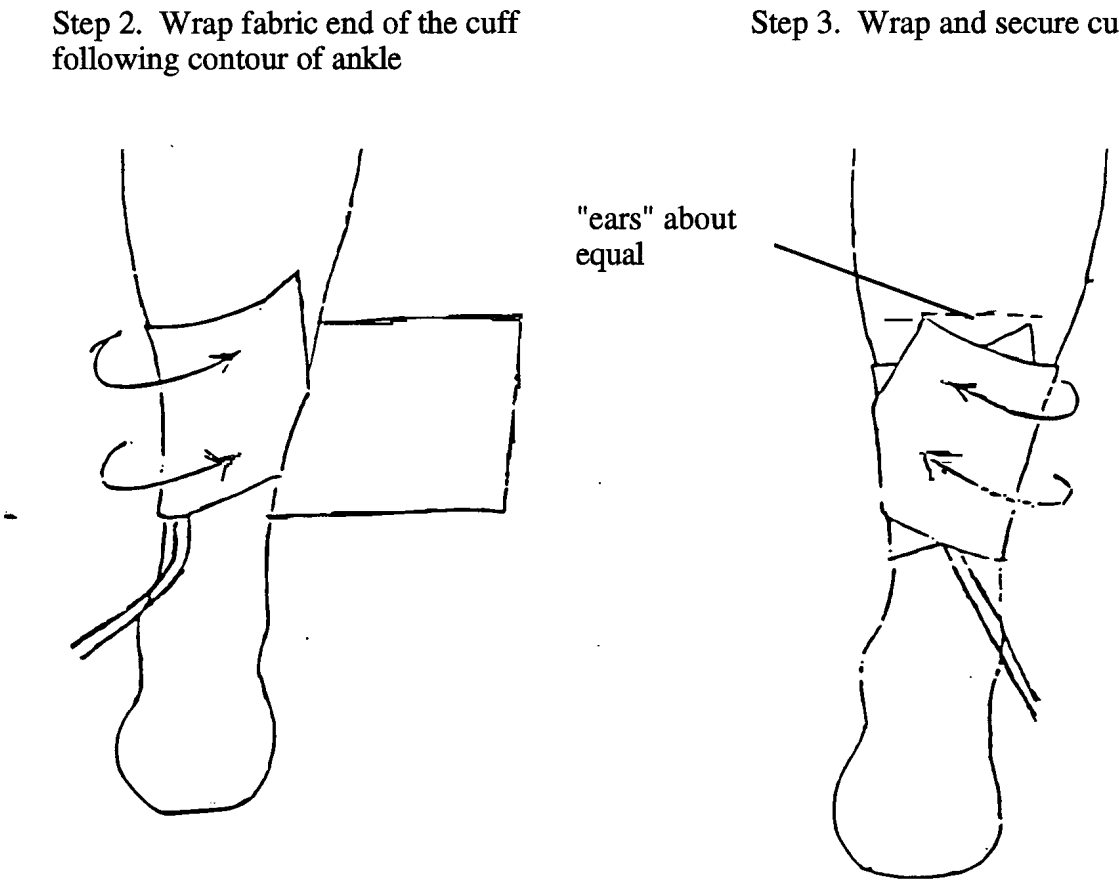


Figure 5. Placement of the blood cuff on the ankle. Step 2 and Step 3: Wrapping and securing the cuff

1.6.5 Electrocardiogram

1. Basic description

   a) A Marquette Mac-1200 based system will be used (see Volume VI of this manual).

   b) All ECGs will be transmitted centrally to the New York Hospital - Cornell Medical Center in New York electronically by modem.

c) All ECGs will be read in a standard manner at the ECG Reading Center by Board Certified or Board Eligible Staff Cardiologists and transmitted or mailed back to the site of origin for clinical correlation or other action, if required. In any case, all ECGs will be overread and promptly returned.

d) All ECGs will be Minnesota coded at Cornell by computer analysis.

e) The Strong Heart Study will itself maintain a permanent copy of all cardiograms in its possession to assure "perpetual" availability of the study data for study members.

f) A standard level of competence must be demanded of our personnel performing ECGs at each site. A "competency exam" will be conducted of all persons recording ECGs at individual sites by a physician (or other designated person) who will judge the ability of the person being examined to adhere to standard protocol.

2. Minimal Equipment Requirements

a) A Mac-1200 with modem (see Volume VI of this manual) will be used at each clinic.

b) New York Hospital - Cornell Medical Center will provide free use of their mainframe MUSE (Marquette Universal System for Electrocardiology) system (except for study hook-up costs and paper costs) for the duration of the study. This system can be accessed 24hrs/day by modem and stores all study cardiograms together or by center. Also, floppy disc downloading can be accomplished to a Mac-1200 compatible format. Transmission instructions and Standardized ECG are given in Volume VI of this manual.

Procedures will differ at each center concerning how ECG readings are supplied to local physicians and IHS health records. A copy of the ECG obtained at the time of performance, if marked "unconfirmed", can be included in the patients chart that day (if so indicated on the participant's consent form). A clinical reading will be performed at Cornell and returned by reverse transmission procedure WITHIN one week. A hard copy of this clinical reading will also be sent to the Coordinating Center for storage.

All ECGs will be Minnesota coded at Cornell using computer analysis of the ECGs. The Minnesota codes will then be added to the ECG data set by the Coordinating Center for data analyses.

1.6.6 Impedance Measure

The measurement of body fat is accomplished using the Quantum II Impedance Meter made by the RJL Equipment Company. This involves a small low frequency current that travels

across the body through the extracellular fluids. The measurement of bioelectrical impedance is related to the volume of the conductor and, when expressed as impedance or conductance, is proportional to fat free mass. The participants do not feel anything when this measurement is obtained.

1. Procedure

a) Before beginning, explain to the participant why you are making the measurement, and check to see that the participant has not exercised vigorously for the past 12-hours and has not consumed alcohol in the past 24-hours. Make sure that the subject is not dehydrated. Record past vigorous exercise or alcohol consumption on the data form.

b) Before beginning the test, be sure that the subject cable is securely attached to the RJL spectrum, have the participant remove the right shoe and sock and lie down with the right side nearest to the analyzer.

c) If the examination table is metallic, it must have a foam pad - all of the body must be on the pad.

d) For best results:

i) Use electrodes only once.

ii) Legs should be far enough apart so that the thighs do not touch each other. A towel may be used to prevent the legs and thighs from touching.

iii) Hands and arms should be far enough apart so that the arms and hands do not touch the torso. A towel can be used to prevent the arms from touching the body.

iv) No body parts should be in contact with any external metal (pins in bones will not affect the results). Jewelry should be removed from the side on which the electrodes are placed.

v) Participant's skin should be clean, dry and warm to the touch. If the skin is oily, clean it with an alcohol swab before attaching the electrodes.

Prior to the attachment, cut the electrodes in half bisecting the foil tab. The cut edge of the electrode placed on the ankle and wrist should face toward the shoulder and thigh respectively. The cut edge of the other two may face in either direction.

e) Electrode Placement:

i) Attach the black wires to the foot with the red clip connected to the electrode at the ankle (F1). Attach the red wires to the hand with the red clip connected to electrode at the wrist (H1).

ii) Put H1 on an imaginary line from the protruding bone of the wrist to bisect the ulnar head; make sure that the cut edge of the electrode is toward the shoulder.

iii) Put H2 just above the knuckles of the right hand or on any finger; there should be at least 5 cm difference between H1 and H2.

iv) Put F1 on an imaginary line between the protruding ankle bones to bisect the medial malleolus; make sure that the cut edge of the electrode is toward the thigh.

v) Put F2 just above the toes of the right foot or on the great toe (there should be 5 cm difference between F1 and F2)

Once the electrodes have been properly attached to the subject, depress the button for "resistance" and record the resistance value on the physical examination form (S6). Then depress the button for "reactance" and record the reactance value on the S6 form. See Appendix C below.

2. Instructions for Impedance Meter

Checking Instrument

Before testing the first patient, be sure that the cables are not crimped or damaged. Place the Resistance/Reactance switch in the resistance position. Place the switch labeled x1/x10 in the x1 position. Attach the 2 clips from one patient cable to one side of 500 ohm resistor provided.

Attach the two clips from the other cable to the other side of the resistor. Turn power on. Resistance displayed should be between 490 and 510 ohms. If resistance is in this range, proceed with patient testing.

Note: Patient cables are made of silver. Take care not to bend or abuse cables. They should be left plugged into instrument to minimize handling, except when relocating instrument.

3. Quality Control for Impedance Measure

Training for the measurement of body fat using the bioelectric impedance meter was accomplished by an experienced nurse to demonstrate the following steps:

a. Instructions concerning the use and verification of the machine.

b. Demonstration by instructor of the procedure.

c. Practice by the individual operators.

d. Certification of operators if instructor and operator achieve an impedance measure where resistance and reactance were each within 15 ohms.

For ongoing quality control in each center, one individual will be designated as supervisor of the impedance measures. This individual will assure that each of the other operators of the instruments is re-certified quarterly by having him/her perform an impedance measure on the same individual as the instructor. These should agree within 15 ohms. In addition, the instructor is responsible for the monitoring of the impedance meter.

1.6.7 Examination of the Pulses

a) Ankle Edema

The socks or other foot covering are removed. The participant is examined in the supine position. Gentle but firm pressure is applied along the mid-tibia, anteriorly down to the ankle in each leg. Pitting or indentation remaining after pressure is removed constitutes definite edema. The examiner identifies the mid-point between the prominence of the medial malleolus and the inferior border of the patella. Pitting at or above that mid-point is recorded as "marked" edema. Pitting only below that point is recorded as "mild" edema. The degree of edema is based on the extent.

b) Posterior Tibial Pulse

The examiner palpates inferior to the medial malleolus of each foot. The presence or absence of arterial pulsation is recorded. If in doubt, the examiner compares with the radial pulsation.

c) Dorsalis Pedis Pulse

The superior aspect of each foot is palpated for the presence or absence of this pulse.

1.7 REFERRAL GUIDELINES

It is the intention of the Strong Heart Study that individuals who participate in the physical examination will be provided both with education and encouragement concerning a healthy life style aimed at preventing cardiovascular disease. If significant medical conditions are uncovered during the course of the study, participants will receive assistance in arranging appointments for medical care. They will also receive assistance arranging transportation for emergent, immediate and urgent referrals.

1. Referral procedure:

   a) All participants reporting for the medical exam will receive appropriate educational materials concerning a heart healthy lifestyle. In addition, the examining personnel, when possible, will endeavor to educate the participants during the exam concerning the importance of risk factor reduction and modifications that the individual might make to improve his/her risk for cardiovascular disease. At the end of the exam, the participant will receive a copy (see Appendix A – 7(a) of this volume) of their BP and glucometer readings and their BMI calculation, as well as any significant physical findings that may have been noted. The importance of any abnormal findings from the exam and recommendations for referral will be communicated to the participant at this time. For referrals in the emergent, immediate or urgent categories, the participant will be assisted in arranging transportation and appointments. Whenever possible, findings and measurements indicating referral will also be communicated directly to the participant's provider or clinic of choice (see Appendix A – 7b for a sample letter to be sent when an emergent, immediate, or urgent referral is needed but repeated efforts to contact the participant have failed). For routine referrals, the reason for the referral and information necessitating referral will be given to the participant and a referral letter will be sent to the provider of their choice.

   b) When the clinically useful laboratory results and ECG report have returned, a follow-up letter will be mailed to each participant thanking him or her for participating and supplying him/her with basic medical information obtained during the exam. Any results requiring referral will be pointed out in this letter and a referral letter will also be sent to the provider designated by the participant at the time of their exam. (See example of letter and suggested interpretation in Appendices A – 7(c) and A – 8 below)

   c) When the carotid and popliteal ultrasound and echocardiogram reports have returned, a follow-up letter will also be mailed to each participant supplying him/her with basic medical information obtained during the exam. Any results requiring referral will be pointed out in this letter, and a referral letter will also be sent to the provider designated by the participant at the time of their exam. (See example of letter and suggested interpretation in Appendices A – 7(c) and A – 8)

d) In order to ensure that the patient receives appropriate referral and treatment for significant medical conditions uncovered during the course of the study, consistent referral levels have been established as described below which will be applied at each center. Communication with the participant will be initiated at the time results indicating Emergent, Urgent and Immediate referrals are made available to the field centers. Communications regarding results indicating routine referrals may be held for short periods of up to two weeks to allow batching of results and somewhat fewer letters.

e) Before exams begin, the local SHS director will discuss the referral process with the clinical director for the primary IHS clinic for the community. The proposed method of notifying patients regarding referral will be reviewed, and the clinical director's input will be sought as to which individual or office will be receiving referral information. There needs to be a designated provider to accept referrals for participants who do not specify a particular provider at that facility; the provider handling emergency duty for that day would be the most reasonable for Emergent and Immediate referrals. The clinical director should also designate which provider(s) will be responsible for handling Routine and Urgent referrals, and who would assume that responsibility if a particular provider were on leave or otherwise unavailable. The basic plan should be documented in writing and signed by the clinical director and SHS representative.

It is understood that it is the responsibility of SHS to provide referral information to the participants and to the provider or clinic of their choice. Assistance will often be given in arranging an appointment or providing transportation, but further follow-up of missed appointments and secondary referrals to specialty care by the participant's provider will not be the responsibility of SHS.

2. Referral Levels

The Strong Heart Study refers participants using established guidelines for referral. Uniform criteria for referral of participants are implemented at all centers. Emergency, immediate, urgent, and routine referrals are made. Methods for referring participants who have no physician are established with the participant. All referrals are documented on a separate log, and copies of the referrals are kept in the Strong Heart Study folders. The following levels of referral are established:

a) Emergency Referral: The patient is immediately escorted to a physician, **or** an emergency squad or an ambulance is summoned.

In such situations study personnel will provide emergency care to the best of their ability and training as appropriate to the emergencies that arise. Findings and measurements indicating referral will also be communicated directly to the emergency staff.

b) Immediate Referral: The participant is urged to see his/her physician within one day.

The SHS staff notifies the participant's physician or nearest IHS facility and makes appropriate arrangements for the SHS participant to be seen within 24 hours. The participant is provided with an IHS referral form or other written summary to take to his/her physician and transportation is provided or arranged if needed. Whenever possible, findings and measurements indicating referral will also be communicated directly to the participant's provider or clinic of choice.

c) Urgent Referral: The participant is urged to see his/her physician within one week.

SHS staff makes an appointment for needed follow-up whenever possible. An IHS referral form or other written summary is provided to the participant and transportation is arranged if needed. Whenever possible, findings and measurements indicating referral will also be communicated directly to the participant's provider or clinic of choice.

d) Routine Referral: The participant is contacted, and it is suggested that they see their physician or provider within one month, or at the first convenient appointment.

An IHS referral form or other written summary is filled out and sent to the provider of choice. When a group of participants is referred for routine referral by sending a packet of referral materials to a provider or clinic, an individual who will take responsibility for distribution of this material to the proper providers must sign for receipt of the referrals; or alternatively, a certified letter could be sent to the provider or clinic. (Please see 1.d above)

e) No Referral: At the conclusion of the exam, if there are no findings requiring referral, the participant will be given the results of BP and glucometer readings, and BMI calculation, and advised that they are within acceptable limits. They will also be advised that further results from laboratory tests will be sent to them in the mail, and that results of carotid and popliteal ultrasound and echocardiograms will be sent to their provider (if so designated in the consent form).

3. Standing orders for nursing or staff referral:

Guidelines for referral are provided in the table below. The SHS nursing staff determines the acuteness of the findings, as well as whether or not the condition is being followed by a physician.

If the participant is aware of and being followed medically for a condition, judgment is exercised about whether to refer. The standard IHS referral form or other

written summary is used to provide appropriate clinical information to the health care professional who will evaluate the patient. A copy of this referral will be retained with the research forms to document the referral that was made.

Referral at the time of examination

Emergency Referral	**Statement to Participant *("Consult M.D. immediately")***
SBP $\geq$ 200 mmHg	Your BP is very high
DBP $\geq$ 120 mmHg	Your BP is very high
Sure Step Hospital Meter (SSHM) glucose <50	Your blood sugar is very low.
Any finding or symptom suggestive of a life-threatening illness, including evidence of acute MI, unstable angina, or pulmonary edema	Describe rationale for referral to participant

Immediate Referral	**Statement to Participant *("Consult M.D. today")***
SHHM fasting glucose > 400	Your blood sugar is very high
SBP 180-199 mmHg	Your BP is very high
DBP 110-119 mmHg	Your BP is very high
Diabetic foot ulcer	Your foot must be seen by a physician
Angina in last day	Your chest pains may be important
Neurologic symptoms in past week	Your symptoms may be important
Other severe symptoms or findings	Your symptoms may be important
Untreated asthma or worsening asthma	You may have a serious problem in your lungs
Carotid ultrasound findings indicate possible >75% obstruction	You may have a serious problem in your neck vessel(s)

Popliteal ultrasound findings indicate possible >75% obstruction or deep vein thrombosis	You may have a serious problem in your leg vessel(s)
Cardiac Echocardiogram indicating significant pericardial effusion or an intracardiac mass	You may have a serious problem with your heart.

Urgent Referral	**Statement to Participant *("Consult M.D. within a week"*)**
SBP 160-179 mmHg	Your BP is not in proper control. Recommend that participant confirm blood pressure reading within 1 week
DBP 100-109 mmHg	Your BP is not in proper control. Recommend that participant confirm blood pressure reading within 1 week
Angina over 24 hours ago	Your chest pains may be important
Neurologic symptoms, untreated, one week to six months ago	Your symptoms may be important
Suspected congestive heart failure	Your symptoms may be important
Other acute, but less severe symptoms	Your symptoms may be important
Inappropriate medication usage	Taking medication incorrectly may be dangerous
Non-diabetic with a fasting SHHM glucose of $\geq$ 200 Diabetic with fasting SHHM glucose >300	Your blood sugar is high
Chronic cough, fever, weight loss, and other symptoms suggestive of active TB or valley fever	You may have a serious problem in your lungs
Carotid ultrasound findings indicate possible 50-75% obstruction	You may have serious problem in your neck vessel(s)
Popliteal ultrasound findings indicate	You may have serious problem in your

possible 50-75% obstruction	leg vessel(s)
Routine Referral	**Statement to Participant** ***("Consult M.D. within one month or at first convenient appointment")***
SBP 140-159 mmHg	Your BP is not in proper control. Recommend that participant confirm blood pressure reading within 1 month
DBP 90-100 mmHg	Your BP is not in proper control. Recommend that participant confirm blood pressure reading within 1 month
SBP 130-139 mmHg	Diabetic: Your BP is not in proper control for someone with diabetes. Recommend that participant confirm blood pressure reading within 1 month Non-Diabetic: Your BP is in a range that puts you at risk for high blood pressure. There may be some things that you need to do to bring it into a better range. Recommend that participant confirm blood pressure reading within 1 month
DBP 80-89 mmHg	Diabetic: Your BP is not in proper control for someone with diabetes. Recommend that participant confirm blood pressure reading within 1 month Non-Diabetic: Your BP is in a range that puts you at risk for high blood pressure. There may be some things that you need to do to bring it into a better range. Recommend that participant confirm blood pressure reading within 1 month
Non-diabetic with a fasting SHHM glucose of > 130 Diabetic with fasting SHHM glucose >150	Your blood sugar is high
Old MI (Rose Questionnaire), previously unrecognized	Your chest pain may be important

Neurologic problem (stroke, TIA symptoms) > 6 months ago, unrecognized	Your symptoms may be important
Claudication, previously unrecognized	Your leg pain may be important
Both pedal pulses are missing in one extremity and not previously referred ***or*** the ratio of Doppler pressure of ankle/arm < 0.8	You may have a problem in your feet. You should check with your doctor.

Referral After Lab and Other Test Results Are Available

1) Critical values -- See next page for critical values of various laboratory results.

   Laboratory will call field center; or use an alternative system involving a verified receipt (e.g., certified Email, FAX with return message confirming). Follow-up will be considered either immediate or urgent as indicated in the list of critical values. For immediate referral, SHS staff should notify participants by phone, or home visit, and (if they can not be reached personally within 4-6 hours) by certified letter. Efforts should continue to contact the participant and discuss results in person. SHS staff should help arrange transportation if needed. An IHS referral form or other written summary is provided.

2) Routine report -- Copies of routine results are sent to each participant with an interpretation of results. If the participants have new findings that they have not previously been advised of, such as newly diagnosed diabetes, or cholesterol > 300, an IHS referral form or other written summary should be provided, and SHS staff should assist the participant in making an appointment and arranging transportation for follow-up (see sample letters in Appendix A – 7 and interpretations in Appendix A – 8).

3) Carotid and Popliteal Ultrasound -- The Cornell Reading Center will call the field center if > 50% obstruction is noted in the carotid or popliteal artery. If the obstruction is $\geq$ 75%, the participant should have an immediate referral (within 24 hours) for follow up. If the obstruction is between 50 and 74%, the participant should have an urgent (within the week) referral. If non-obstructive plaque (< 50%) is detected, the participant should be referred for risk factor assessment and counseling by his/her primary health care provider.

4) Echocardiogram -- The Cornell Reading Center will call the field center if there is a significant pericardial effusion, intracardiac mass, or other finding of serious consequence to the participant. Level of referral will depend on the urgency of the condition, as assessed by the Reading Center and other medical consultants to the field centers.

Strong Heart Study Critical Values for Laboratory Results

Test	***Critical Value***	***Immediate or Urgent Referral***
Fasting Glucose	≤ 60 or ≥ 400 mg/dl	Immediate*
Total Cholesterol	≥ 300 mg/dl	Urgent
Total Triglyceride	≥ 1000 mg/dl	Immediate
Plasma Creatinine	≥ 3.0 mg/dl	Immediate**
Na	≤ 125 or ≥ 150 MEQ/dl	Immediate*
K	≤ 3.0 or ≥ 6.5 MEQ/dl	Immediate*
Ca	≤ 8.0 or ≥ 12.0 mg/dl	Immediate*
PO_4	≥ 6.0 mg/dl	Urgent
Total Bilirubin	≥ 4.0 mg/dl	Urgent
ALK PHOS	≥ 400 IU/L	Urgent
BUN	> 40 mg/dl	Immediate**
Cl	None	
Uric Acid	None	
Mg	None	
AST (SGOT)	None	
ALT (SGPT)	None	
Total Protein	None	
Albumin	None	
TSH	≤0.4 or ≥ 4,0 microunits/ml	Urgent
CBC	Local IHS Laboratory critical values for CBC results will be followed	

* Note: Since these involve lab values determined at MedStar labs and thus a minimum of 24 hours old, due to shipping and other considerations, immediate referral (within 24 hours) seems appropriate, even though some extreme values represent very serious conditions.
** Note: When the field center is aware of End-Stage Renal Disease, or dialysis treatments for the participant, these values can be simply noted as abnormal on the summary sheet to the participant, with the explanation that we expect these to be abnormal when an individual has ESRD or is on dialysis.

ECG REFERRAL:

a) *ECG findings requiring review by a physician before participant leaves SHS clinic or before SHS staff leave participant's home or prompting phone call from ECG Core Lab for emergency referral:*

Call should be made to Reading Center by field staff at (212) 746-4655, or SHS Dakota Center MDs:

Dr. Lyle Best:	701-246-3884
Dr. Jeff Henderson:	605-348-6100

Dr. Tom Welty: 928-526-0955
or SHS Arizona Field Center MD:
Dr. Marie Russell 602-277-0488

If unable to obtain consultation from above sources, initiate emergency referral for the following:

- ST segment elevation or depression consistent with acute myocardial infarction or subendocardial ischemia
- 3rd degree AV-block
- ventricular tachycardia
- sustained supraventricular tachycardia with heart rate >135
- any heart rate < 30

b) *ECG findings to be reviewed the same day or prompting phone call from ECG core lab for immediate referral:*
- any heart rate <35 or >135
- atrial fibrillation or atrial flutter with ventricular rate <50 or >110
- QT prolongation

c) *ECG findings where urgent referral is appropriate:*
- VPC couplets
- 2nd degree AV block
- New left bundle branch block
- New right bundle branch block
- Wolff-Parkinson-White
- Left ventricular hypertrophy
- T-wave inversion consistent with myocardial ischemia
- myocardial infarction of indeterminate age or age undetermined

d) *Examples of isolated abnormal ECG findings that do not require referral but can be sent to participant's physician as part of routine report:*
- single ectopic beats of any frequency
- left axis deviation/left anterior hemiblock
- unusual p-wave axis (non-sinus atrial rhythm), wandering atrial pacemaker, av junctional rhythm
- old left or right bundle branch block
- incomplete right bundle branch block (right ventricular conduction delay)
- ST elevation consistent with early repolarization
- 1st degree AV block

1.8 QUALITY ASSURANCE (QC) PROGRAM

A quality control committee oversees the conduct and evaluation of QC procedures. Field center coordinators will be responsible for reviewing all QC data as they become available and following up on any problems that are detected. The QC committee will monitor efficacy of retraining and problem solving.

a. Data collection

Every data form will be checked for completeness at the field center. Ambiguous or erroneous items will be clarified and corrected. The data entry programs generated by the Coordinating Center will provide an additional quality control check by building in range and logic checks. The program refuses to accept such data until the errors are corrected. The field centers will double-enter 10% of the forms each month (or at least one double entry per transmission). The Coordinating Center will track the data entry error rates. If the data entry error rate of any field center is greater than 0.5% for any transmission, that center will be asked to re-enter (as second entry) the data of all the forms in that transmission. Computer printouts of inconsistent data items will be sent back to each field center for clarification or correction. Summary statistics such as mean, median, range, maximum and minimum for continuous variables and frequency distributions for categorical variables will be calculated monthly for each center, and data not meeting consistency checks will be flagged. Summary statistics will be generated quarterly to identify any peculiar or unreasonable values. Further verifications will be made and errors corrected.

b. Quality Control site visits

Two quality control site visits will be made to each of the three centers in the first year and one in each year thereafter. The site visit teams will include representatives from the program office at NHLBI and investigators and staff members from each of the centers. Procedures used in the clinical examination will be carefully observed for adherence to protocol. Equipment will be inspected and problems noted. The site visitors then will meet with all the clinic staff to inform them of any observed discrepancies. In addition, a written evaluation, including corrections or improvements needed, will be sent to each center.

c. Quality Control -- Equipment

Other quality control measures will include maintenance of the scale, impedance meter, sphygmomanometer, Doppler, and ECG machine. The scale will be zeroed daily and calibrated with a known weight (50 lbs) every month or whenever the scale is moved. The standard sphygmomanometer will be inspected once a month. These inspections will include checking of the zero level, mercury leakage, manometer column for dirt or mercury oxide deposit, and the condition of all tubing and fittings. Other quality control measures for the blood pressure measurements will include simultaneous Y-tube observation of each technician and frequent staff meetings to provide feedback.

d. Quality Control -- Examination

1) Anthropometry and blood pressure

Duplicate measures of brachial artery blood pressure (systolic and diastolic) simultaneously using a double head stethoscope with two observers will be taken quarterly. Duplicate measures of anthropometry (height, weight, waist, and electrical impedance measurements) will be performed by a second observer on a quarterly basis. These data will be sent to the Coordinating Center for analysis. Results of the analysis will be provided to the field centers and the Steering Committee. Differences between duplicate measures exceeding the following values will be considered unacceptable:

i.) Systolic Blood Pressure: 4 mmHg, using Y-shaped stethoscope for two simultaneous observations.
ii.) Diastolic Blood Pressure: 4 mmHg, using Y-shaped stethoscope for two simultaneous observations.
iii.) Height: 1 cm
iv.) Weight: 1 Kg
v.) Resistance: 15 ohms
vi.) Waist circumference: 2 cm
vii.) Hip circumference: 2 cm
viii.) Arm circumference: 1 cm

In addition, distributions of measurements and digit preference for each staff member will be compiled and repeated quarterly.

2) Laboratory tests

Duplicate blood and urine specimens will be collected on approximately 5% of the participants and sent to the Core Laboratory in a blind fashion. Results obtained for each test will be analyzed quarterly by the Coordinating Center for accuracy and consistency. The percent of pairs with differences within 5% and 10% will be computed. Correlation coefficients and technical error rates will be calculated. Poor correlation or unreasonably high technical error will be reported to the Laboratory and the Steering Committee.

3) Personal interview

Personal interviews by new staff will be observed monthly by the study coordinator until the staff member meets the standards of the study. Then new staff will be observed on a quarterly basis along with experienced interviewers.. Problems and errors are identified using a checklist and corrected immediately.

4) Food Frequency Questionnaire (FFQ)

The Block FFQ is self-administered; participants receive guidance from SHS staff in how to fill out the questionnaire. The developer, Block Dietary Data Systems (BDDS), has provided documentation (see Volume 9 of this manual) that describes each question. During the March 2006 training sessions in OK, Jean Norris, MS, RD, DrPH (BDDS) provided training for the field staffs in how to instruct participants and how to check the FFQs for completeness, for

proper pencil entries on the FFQ bubble forms, and for correction of the bubble forms if improperly filled in (e.g., pen instead of pencil). Trained staff members will assist any participants having difficulty with the FFQ.

5) Certification of technicians

Each center will recruit the most qualified personnel. Clinical staff were centrally trained and certified before the examination began, and newly hired personnel will be trained at each clinic. The study coordinators will monitor the technicians quarterly to ensure accurate and consistent performance.

6) Monitoring of Study progress

The Coordinating Center will work closely with the field centers to monitor recruitment and progress of the examinations. At the beginning of the study, a projected monthly number of participants to be recruited was generated, and the Coordinating Center will monitor the progress of each field center according to these projected numbers and provide monthly progress reports to the Steering Committee. If the percentage of projected recruitment in a certain field center falls below 80%, the PI and the field coordinator will be informed, so that the efforts can be focused on recruitment. This program proved to be an efficient tool for monitoring the progress of SHS- in previous phases and will be continued in Phase V of SHS. The Coordinating Center will also monitor the number of double entries, QC physical exams, and QC blinded blood samples and report to the Steering Committee quarterly.

e. Confidentiality and security of data

All personnel with access to the collected data are required to sign a confidentiality pledge. Completed data forms are placed in locked file cabinets at every center and are accessible by authorized staff members only. At the Coordinating Center, the data are stored on computers that are used exclusively by the Strong Heart Study and are safeguarded by passwords that are known only to authorized personnel. The data are stored on hard disk and four copies of optical diskettes. Two of the Zip disks/optical diskettes are stored in two different locations other than the Coordinating Center office.

APPENDIX A

APPENDIX A -- 1

Consent Forms for

the Arizona Field Center,

the North/South Dakota Field Center,

and

the Oklahoma Field Center

MedStar Research Institute Informed Consent for Clinical Research

INTRODUCTION

We invite you to continue to take part in a research study called the Strong Heart Study (SHS). You were asked to take part in the fifth phase of the SHS, because you joined during an earlier phase of SHS. Please take your time to read this form, ask any questions you may have and make your decision. We encourage you to discuss your decision with your family, friends and your doctor(s). If you have trouble reading this form, one of the staff will read it to you.

WHAT IS THE PURPOSE OF THIS STUDY?

This purpose of this study is to learn how heart disease and its risk factors change over time. We also want to learn more about genetics, or things you inherit from your parents, to help explain why cardiovascular and lung diseases happen. This will be done by comparing the results of this exam to your previous one and by continuing to test the genetic material (DNA) in the blood sample you gave previously for genes that may cause or protect against cardiovascular, or lung diseases or their risk factors.

WHAT ELSE SHOULD I KNOW ABOUT THIS RESEARCH STUDY?

It is important that you read and understand several points that apply to all who take part in our studies:

- Taking part in the study is entirely voluntary and refusal to participate will not affect any rights or benefits you normally have;
- You may or may not benefit from taking part in the study, but knowledge may be gained from your participation that may help others; and
    - You may stop being in the study at any time without any penalty or losing any of the benefits you would have normally received.

The nature of the study, the benefits, risks, discomforts and other information about the study are discussed further below. If any new information is learned, at any time during the research, which might affect your participation in the study, we will tell you. We urge you to ask any questions you have about this study with the staff members who explain it to you and with your own advisors prior to agreeing to participate.

WHO IS IN CHARGE OF THIS STUDY?

The investigator is Barbara V. Howard, PhD. The research is being sponsored by The National Heart Lung and Blood Institutes (NHLBI). MedStar Research Institute is being paid by NHLBI to conduct this study with Dr. Howard as the primary investigator.

WHO CANNOT PARTICIPATE IN THIS STUDY?

You cannot be in this study if you did not join an earlier phase of SHS.

WHAT IF I AM PRESENTLY PARTICIPATING IN ANOTHER RESEARCH STUDY?

Are you presently participating in any other research studies? Yes ☐ No ☐

If yes, please state which study(ies)_____

While participating in this study, you should not take part in any other research project without approval from the people in charge of each study. This is to protect you from possible injury arising from such things as extra blood drawing, extra x-rays, interaction of research drugs, or similar hazards.

HOW MANY PEOPLE WILL TAKE PART IN THE STUDY?

About 8200 people will take part in this study, at three sites, 1251 people will be recruited at this site.

WHAT HAPPENS IF I AGREE TO BE IN THE STUDY?

By joining this study, you agree to have a physical examination to study cardiovascular and lung diseases and risk factors that go along with these diseases. The examination and questions will take about 3 to 4 hours and will be done in 1 or 2 visits.

The physical examination will include:

1. **Blood Tests**. Twelve or more hours after you last ate anything, we will take a drop of blood from your finger and four ounces from your arm to find the level of sugar, cholesterol and other fatty substances. Some of the blood will be saved at Penn Medical Research Laboratories in Washington, D.C. for future tests, including gene testing, to learn about cardiovascular and lung diseases, and risk factors for those diseases. Other laboratories may do some of these tests. We will not test your blood for other things without your permission. The blood will be stored until it has no more scientific value for studying these problems; then it will be disposed of like any other laboratory or clinic that tests your blood. Your blood cells will not be kept growing, cloned, and your blood will not be used to develop products that will be sold.. You will retain the right to have the sample material destroyed at any time by contacting the Principal Investigator.

2. **Electrocardiogram (ECG).** An ECG is a test of the electrical activity of your heart,; 12 monitoring tabs will be placed on your arms, legs and chest and connected to an ECG machine. Heart specialists at Cornell University in New York will read this ECG test.

3. **Cardiac, Carotid and Popliteal Ultrasound Study**. These are "pictures" of your heart and of the arteries in your neck and legs using sound waves to find out how well your heart works and if fat deposits are in your arteries. These will also be read at Cornell University in New York.

4. **Urine Test.** We will ask you for some urine to find our how your kidneys are working.

5. **Body composition.** A machine will check how much muscle, fat, and water you have in your body by passing a very tiny electrical current through your body. This current is too small to feel, and there is no known risk for this test.

6. **Physical Examination.** Blood pressures in your arms and legs, pulses in you ankles and feet, your height, weight, waist and arm size will be measured.

7. **Health Questions.** Questions will be asked about many things that can change you general health, including exercise, alcohol and tobacco use, where you get health care, what you eat, stress and gambling. Also questions about your family's health, and well being will be asked.

The investigator may decide to take you off this study if it is believed to be in your best interest, you fail to follow instructions, new information becomes known about the safety of the study, or for other reasons the investigator or sponsor believes are important.

You can stop participating at any time. However, if you decide to stop participating in the study, we encourage you to talk to the investigator and your regular doctor first so they can help you decide what other options may be best for your medical care once you are off study.

If you suddenly withdraw from the study, we may not be able to use any of the information gathered from your participation.

FOLLOW-UP

You will be told as soon as possible, if any life-threatening health problems are found. Your signed consent form will help the SHS staff to make appointments at the hospital or clinic for you about these conditions. The parts of your exam that are medically useful will be sent to you, when they are available. You will also be sent Strong Heart Study newsletters now and then, to tell you about results of the study, SHS researchers may contact you for more information about your health in the future, or to tell you about test results that are important for your health.

WHAT ARE THE RISKS AND SIDE EFFECTS OF THIS STUDY?

Most of the tests are part of a standard medical check-up and have a very low risk of side effects. Taking blood from your arm and finger can be a little painful and may give you a bruise. You may feel some pressure in your legs, when blood pressure is taken. If your test results from the study are put in your medical record, and if you apply for insurance, the results may make it harder for you to get insurance. We will normally put the results of the tests done during the exam and the results of the blood tests in your Indian Health Service record so that our clinic can use them, but we wont do that if you don't want this done. Results from genetic tests will not be placed in your medical record.

Please tell the investigator about all medications including over the counter drugs or herbal supplement you are taking, even if you don't think they are important.

WHY GENETIC TESTS ARE BEING DONE

The study does testing on your genes, or genetic material (DNA) in your white blood cells to find genes that may cause or protect people from cardiovascular and lung diseases, or their risk factors. Genes may determine who will and who won't get cardiovascular disease; and how we might be able to prevent these diseases in people who are more likely to get them. This research will mostly help future generations. These genetic tests are not likely to help you personally.

In Phase V we will be mainly looking for the location of genes that might cause cardiovascular and lung diseases. We think it is very unlikely that the actual genes themselves will be found during this 5 year period. Also, in a study like this, what we find usually needs to be repeated by other researchers before we can say "for sure" that something new is discovered. For these reasons you will probably NOT be contacted about results of your genetic tests. If a gene is found that would be important to predict your risk for (or help you avoid) heart disease we will contact you and ask, whether you would like to have the results of this gene testing explained to you.

Also, even though we try to be as exact as possible, early research tests like this may not be as dependable as the blood tests you have done at your regular clinic. For this reason, it might be necessary to have a particular gene test done again in clinical laboratory. The Strong Heart Study would not be able to pay for this extra testing.

If we learn something important from this study, further research on cardiovascular and/or lung disease may be done after Phase V is over. The researchers may contact you then, if we discover something new that would be important for you to know about. The DNA studies will be done at the Southwest Foundation for Biomedical Research, San Antonio, Texas by Dr. Jean MacCluer and her staff.

ARE THERE ANY BENEFITS TO TAKING PART IN THE STUDY?

There are not expected to be any immediate benefits to you for taking part in this study. We expect the findings to be helpful to people in the future. If we find a medical problem, you will be asked to check with your clinic or doctor for the tests and treatment they feel you need. The Strong Heart Study can help you make appointments, but will not pay for tests or treatment. You will be told how to cut down your chances of cardiovascular and lung diseases. This study should not take the place of regular medical check-ups. You should go to your regular clinic for physical exams, and treatment of any health problems.

WHAT OTHER OPTIONS ARE THERE?

You always have the option to not be in this study.

WHAT ABOUT CONFIDENTIALITY?

Efforts will be made to protect your personal information to the extent allowed by law. Medical records of research study participants are securely stored and maintained according to legal requirements. You will not be identified in any reports or publications resulting from this study. Organizations that may request, inspect, and/or copy your research and medical records for quality assurance and data analysis include groups such as the NHLBI which oversees this project, Indian Health Service Institutional Review Board, and the MedStar Research Institute Institutional Review Board (IRB).

Only these institutions will be able to see results that could be connected with your name. Shortly after we get your samples, your name is replaced by a number so that even most of the staff who run the tests will not connect your name with your sample. The results of the exam and any information in your medical record will be used for statistics to learn about these diseases without letting anyone know your name. Names of people who join the study will never be reported in medical journals or at medical meetings.

An Observational Data Safety and Monitoring Board, which is a group of experts not connected to the study, will be reviewing the data from this research throughout the study. We will tell you about the new information from this or other studies that may affect your health, welfare, or willingness to stay in this study.

WILL I BE PAID FOR PARTICIPATING IN THIS STUDY?

This exam will not cost you anything. You will be paid $40.00 for participating in the examination. If you need to have the exam in two visits, we will divide this into two $20 payments. The payments are to help with your travel expenses, and to give you something for you time helping this study.

WHAT ARE THE COSTS?

You do not have to pay anything to be in this study. However, if taking part in this study leads to procedures or care not included in the study, it may lead to added costs for you or your insurance company. You will not be charged for the tests and procedures that are part of this research study.

WHAT IF I'M INJURED OR BECOME ILL DURING THE STUDY?

It is very unlikely that you will be injured or harmed from joining in this research, but if that happens medical care will be provided by the Indian Health Service or the Gila River Health Care Corporation, if you are eligible for such services.

NHLBI, the sponsor of this study, does not intend to provide reimbursement for costs of medical treatment for injury or illness if such costs are not covered by the Indian Health Service, the Gila River Health Care Corporation or by your medical insurance.
No funds have been set aside, by the NHLBI, the MedStar Research Institute, MedStar Health, or its affiliated entities to repay you in case of injury, illness, or other harm occurring during, or resulting from the study and their current policies do not provide for payments for lost wages, cost of pain and suffering, or additional expenses. By agreeing to this you do not give up your rights to seek compensation in the courts.

WHAT ARE MY RIGHTS AS A PARTICIPANT?

- You have the right to be told about the nature and purpose of the study;
- You have the right to be given an explanation of the exactly what will be done in the study and given a description of potential risks, discomforts, or benefits that can reasonably be expected;
- You have the right to be informed of any appropriate alternatives to the study, including, if appropriate, any drugs or devices that might help you, along with their potential risks, discomforts and benefits;
- You have the right to ask any questions you may have about the study;
- You have the right to decide whether or not to be in the study without anyone misleading or deceiving you; and
- You have the right to receive a copy of this consent form.

By signing this form, you will not give up any legal rights you may have as a research participant. You may choose not to take part in or leave the study at any time. If you choose to not take part in or to leave the study, your regular care will not be affected and you will not lose any of the benefits you would have received normally. We will tell you about new information that may affect your health, welfare, or willingness to be in this study.

WHO DO I CALL IF I HAVE QUESTIONS OR PROBLEMS?

For questions about the study or a research-related injury, contact the investigator, Dr. Barbara V. Howard (301) 560-7302 or the Project Coordinator, Marie Russell, MD. Address: Strong Heart Study – Arizona Center, 1616 E. Indian School Rd. #250, Phoenix, AZ. 85016 Phone: 602-277-0488.

If you are having a medical emergency, you should call 911 or go directly to the nearest emergency room.

You may contact Kenneth Simpson, DBA, RN, Chair of the Phoenix Area INDIAN HEALTH SERVICE Institutional Review Board, Phoenix Area Indian Health Service, Two Renaissance Square, 40 N. Central Avenue, Phoenix, AZ 85004. Telephone: (602) 364-5045, about your rights as a research participant.
For questions about your rights as a research participant, you may also contact the MedStar Research Institute. Direct your questions to the Office of Regulatory Integrity at:

Address:	MedStar Research Institute 6495 New Hampshire Avenue Suite 201 Hyattsville, MD 20783	Telephone: Toll Free: Fax	(301) 560-7339 (800) 793-7175 (301) 560-7336

SIGNATURES

As a representative of this study, I have explained the purpose, the procedures, the possible benefits and risks that are involved in this research study. Any questions that have been raised have been answered to the individual's satisfaction.

Signature of Person Obtaining Consent **Date of Signature**

I, the undersigned have been informed about this study's purpose, procedures, possible benefits and risks, and I have received a copy of this consent. I have been given the opportunity to ask questions before I sign, and I have been told that I can ask other questions at any time. I voluntarily agree to be in this study. I am free to stop being in the study at any time without need to justify my decision and if I stop being in the study I understand it will not in any way affect my future treatment or medical management. I agree to cooperate with Barbara V. Howard, PhD and the research staff and to tell them immediately if I experience any unexpected or unusual symptoms.

Participant's Signature **Date of Signature**

Signature of Witness **Date of Signature**

INFORMATION AND CONSENT FORM

STUDY TITLE: Cardiovascular Disease in Sioux Indians. The Strong Heart Study – Phase V

PRINCIPAL INVESTIGATOR: Lyle G. Best, M.D.

GRANT RECIPIENT: Missouri Breaks Industries Research, Inc.

INTRODUCTION: We invite you to take part in the Strong Heart Study (SHS), a research study of cardiovascular and lung diseases and their risk factors in American Indians. Cardiovascular disease includes heart disease, stroke, and diseases of the blood vessels. Known risk factors for cardiovascular disease include diabetes, unhealthy diet, fats in the blood, obesity, smoking, high blood pressure, alcohol misuse, and physical inactivity. New risk factors may be investigated by this study. Please read the following material to make sure that you understand this research study. If you have trouble reading this form, one of the staff will read it to you. You should know that: 1) taking part in the study is entirely your choice; 2) you might, or might not be personally helped by joining this study, but knowledge will be gained that may help others; 3) you may withdraw from the study at any time without losing any benefits which you usually have. The kind of study, the benefits, risks, discomforts and other information are found below. If you want to join the study, signing this form shows that you have read this Information and Consent Form (or had it read to you), understand what it says, and agree to take part in this research project. We will have an interpreter help you, if you want one. We want you to discuss any questions you have with the staff members before you sign this form.

PURPOSE: This research is to learn more about heart/blood vessel diseases, risk factors for these conditions and how they change over time. We will also continue to study genetics or things you inherit from your parents, to help explain why cardiovascular and lung diseases happen. This will be done by testing genetic material (DNA) in blood cells for genes that may cause or protect against cardiovascular, or lung diseases or their risk factors.

HOW YOU WERE PICKED: You were asked to take part in the fifth phase of the Strong Heart Study, because you agreed to be part of the fourth phase of SHS. About 3600 people from the Dakotas, Oklahoma and Arizona will take part in Phase V of SHS.

PROCEDURE: By joining this study, you agree to have a physical examination to study cardiovascular and lung diseases and risk factors that go along with these diseases. The examination and questions will take about 3 to 4 hours and will be done in 1 or 2 visits.

The physical examination will include:

1. **Blood Tests.** Twelve or more hours after you last ate anything, we will take a drop of blood from your finger and 8 tablespoons from your arm to find the level of sugar, cholesterol and other fatty substances. Some of your blood will be saved at Penn Medical Research Laboratories in Washington, D.C. and Southwest Foundation of Biomedical Research in San Antonio, Texas for future tests, including gene testing, to learn about cardiovascular and lung diseases, and risk factors for those diseases. Other laboratories may do some of these tests. We will not test your blood for other things without your permission. The blood will be stored until it has no more scientific value for

studying these problems, then it will be disposed of in the standard way. Your blood cells will not be kept growing or cloned, and your blood will not be used for making a profit.

2. **Electrocardiogram (ECG).** An ECG is a test of whether your heart is working normally; 12 monitoring tabs will be placed on your arms, legs and chest and connected to an ECG machine. Heart specialists at Cornell University in New York will read this ECG test.

3. **Heart, neck and leg artery ultrasound study.** These are "pictures" of your heart and of the arteries in your neck and legs using sound waves to find out how well your heart works and if fat deposits are in your arteries. These will also be read at Cornell University in New York.

4. **Urine Test.** We will ask you for some urine to find out how your kidneys are working.

5. **Body fat.** A machine will check how much fat you have by passing a very tiny electrical current through your body. This current is too small to feel, and there is no known risk for this test.

5. **Physical Examination.** Blood pressures in your arms and legs, your height, weight, waist and arm size will be measured. Measurements of your height, weight and waist will be made. The pulses and condition of the skin on your legs will be checked. Blood pressures and stiffness of blood vessels will be tested over your wrist, using a machine and computer program that have not currently been approved by the Food and Drug Administration. We know of no risks to you (or your child) from this test of blood vessel stiffness.

6. **Health and Family Questions.** Questions will be asked about many things that can change your general health, including exercise, alcohol and tobacco use, where you get health care, what you eat, and stress. Also questions about who your family members are, how they are related to you, their health, and well being will be asked. You will also be asked to carry a pedometer around with you for a few days. This is a small machine, about the size of a watch, which can count the number of steps that you take each day.

OTHER INFORMATION

1. **POSSIBLE RISKS OF THIS STUDY**

Most of the tests are part of a standard medical check-up and have a very low risk of side effects. Taking blood from your arm and finger can be a little painful and may give you a bruise. You may have some discomfort in your arms and/or legs, when blood pressure is taken. If your test results from the study are put in your medical record, and if you apply for insurance, the results may make it harder for you to get insurance. We will normally put your results of the tests done by Strong Heart Study in your IHS record, so that your clinic can use them, but we won't do that, if you don't want this done.

2. **BENEFITS**

If we find a medical problem, you will be asked to check with your clinic or doctor for the tests and treatment they feel you need. The Strong Heart Study can help you make appointments, but will not pay for tests or treatment. You will be told how to cut down your chances of cardiovascular and lung diseases. This study should not take the place of regular medical check ups. You should go to your regular clinic for physical exams, and treatment of any health problems.

3. **WHY GENETIC TESTS ARE BEING DONE**

The study does testing on your genes, or genetic material (DNA) in your white blood cells to find genes that may cause or protect people from cardiovascular and lung diseases, or their risk factors. Someday genes may help determine who is at extra risk for cardiovascular disease, and how we might be able to prevent these diseases in people who are more likely to get them. This research will mostly help future generations. These genetic tests are not likely to help you personally.

In Phase V we will be looking for the location of genes that might cause cardiovascular and lung diseases; and beginning to test particular genes to see if they have changes that seem to be important for predicting cardiovascular disease. What we find will usually need to be repeated by other researchers before we can say "for sure" that something new is discovered. For these reasons you will probably NOT be contacted about results of your genetic tests. If a gene is found that would be important to predict your risk for (or help you avoid) heart disease, we will contact you and ask whether you would like to have the results of this gene testing explained to you.

Also, even though we try to be as exact as possible, early research tests like this may not be as dependable as the blood tests you have done at your regular clinic. For this reason, it might be necessary to have a particular gene test done again in a clinical laboratory. The Strong Heart Study would not be able to pay for this extra testing.

If we learn something important from this study, further research may be done after Phase V is over in 2011. The researchers may contact you then, if we discover something new that would be important for you to know about. The DNA studies will be done at the Southwest Foundation for Biomedical Research, San Antonio, Texas or at other laboratories with the approval of the Strong Heart Study researchers.

4. **CONFIDENTIALITY**

Only study researchers and (by law) some people from the Food and Drug Administration, Indian Health Service Institutional Review Board, and/or the National Heart Lung and Blood Institute, which oversee this project, may need to see results that could be connected with your name. Shortly after we get your samples, your name is replaced by a number, so that even most of the staff that run the tests will not have any name connected with your sample. The results of the exam and any information in your medical records will be used for statistics to learn about these diseases without letting anyone know your name. These statistics will be reported in medical journals, at medical and research meetings and to your Tribe, but the names of people who join the study will never be reported. Medically important results will be put in your medical record, unless you tell us not to place them there. If you sign a release, we will send your medical results to other clinics. A "Certificate of Confidentiality" will be provided by the Department of Health and Human Services, this helps prevent courts and others from

obtaining your confidential research information, but there is no way to guarantee that a court could not force our study to reveal some information.

5. **RESEARCH-RELATED INJURIES**

It is very unlikely that you will be injured by joining in this research, but if that should happen the Indian Health Service will provide medical care, if you are eligible for such services. Neither Missouri Breaks Industries Research, Inc., nor the Indian Health Service, nor any person involved with this research project has provisions for financial compensation in the event of such injury.

6. **PAYMENT**

This exam will not cost you anything. You will be paid $25 for answering the questions and having blood drawn, and $20 when you have the ultrasound tests done. This will probably take two visits. The payments are to help with your travel expenses, and to give you something for your time helping this study. You will also be given a health promotion gift.

7. **PROBLEMS OR QUESTIONS**

Should any problems or questions come up about this study or any research-related injury, including questions about your test results, you should contact the Principal Investigator, Dr. Lyle Best or the Project Coordinator, Marcia O'Leary, RN. Address: Strong Heart Study - Dakota Center, P.O. Box 9010, Rapid City, SD 57709. Telephone: 605.355.2377 or 605.964.3418.

8. **RESEARCH PARTICIPANTS' RIGHTS**

You may contact Dr. Elaine Miller (605.226.7341) or Dr. Dewey Ertz (605.341.8647) co-chairs of the Aberdeen Area IHS Institutional Review Board, Aberdeen Area Indian Health Service, Federal Building, 115 Fourth Ave SE, Aberdeen, SD 57401, Toll Free# 866.331.5794, about your rights as a research participant.

9. **STOPPING THE STUDY**

You may stop at any time or refuse any part of the exam without losing your right to health care or any other benefit that you normally have. However, we hope you will finish as many of the tests as possible. During the study, the researchers may ask you to drop out of the study, if the staff feels it is not in your best interest to go on.

10. **FOLLOW-UP**

You will be told as soon as possible, if any life-threatening health problems are found. Your signed consent form will help the SHS staff to make appointments at the hospital or clinic for you about these conditions. The results of your exam that we think are medically useful will be sent you, when they are available. You will also be sent Strong Heart Study newsletters now and then, to tell you about results of the study. SHS researchers may contact you for more information about your health in the future, or to tell you about test results that are important for your health. You may also be contacted in the future by SHS researchers for information about new family members or to clarify family relationships.

11. **RESPONSIBILITY FOR THE STUDY**

The Aberdeen Area Indian Health Service was responsible for Phases I and II, and the Aberdeen Area Tribal Chairmen's Health Board was responsible for Phase III. The Missouri Breaks Research, Inc has taken responsibility for the Strong Heart Family Study (Phase IV and the current Phase V) including keeping the research records. Signing this consent form will let Missouri Breaks Research Inc. staff, with professional supervision of the principal investigator, look at the information collected in earlier phases of the study.

12. **CONSENT TO PARTICIPATE**

I have read, or had read to me, this Information and Consent Form, and I have been able to talk about it and to ask questions. I understand what it says and that I can ask questions at any time. After thinking about the risks and benefits that I learned about in this Information and Consent Form, I want to join in this research. A copy of this Information and Consent Form will be given to me to keep and look back on.

I WANT TO JOIN THE STRONG HEART STUDY-PHASE V RESEARCH STUDY.

I do ____ do not ____ want the medical test results that may be important to my future health or the health of my family filed in my IHS chart.

I would ____ would not ____ like the medical test results that may be important to my future health or the health of my family filed in my chart at a different health care provider. Please send to:

_____
_____
_____
_____

I would____ would not____ like important genetic test results reported to myself.

I would____ would not____ like important genetic test results reported to my clinic providers.

If you need to contact me about results of tests that may be important to my health, please use this address (I will let you know if I have a change of address):

_____
_____
_____
_____

_____ _____
PRINTED NAME OF PARTICIPANT DATE

_____ _____

SIGNATURE OF PARTICIPANT DATE

In my opinion, the participant understands what is involved in the Strong Heart Study exam and is able to give informed consent.

_____ _____

SIGNATURE OF PERSON OBTAINING CONSENT DATE

Consent Form
University of Oklahoma Health Sciences Center
THE STRONG HEART STUDY, PHASE V
National Heart, Lung, and Blood Institute
Elisa T. Lee, PhD, Principal Investigator

This is a research study. Research studies involve only individuals who choose to participate. Please take your time to make your decision. Discuss this with your family and friends.

Why Have I Been Asked To Participate In This Study?
You are being asked to take part in this study because you participated previously in the family study part of the Strong Heart Study (SHS) (pilot family study portion of SHS Phase III and/or in SHS Phase IV).

Why Is This Study Being Done?
This research is being done to learn how heart disease and its risk factors change over time. We also want to learn more about genetics, or things you inherit from your parents, to help explain why cardiovascular and lung diseases happen. This will be done by comparing the results of this exam to your previous one and by continuing to test the genetic material (DNA) in the blood sample you gave previously for genes that may cause (or protect against) cardiovascular, or lung diseases or their risk factors.

How Many People Will Take Part In The Study?
About **3800** people will take part in this study nationwide. About **1300** of these individuals will participate at this location.

What Is Involved In The Study?
By joining this study, you agree to have a physical examination to study cardiovascular and lung diseases and risk factors that go along with these diseases. The results of your exam and related information in your medical records (Indian Health Service or other relevant medical records) will be used for research purposes. The examination and questions will take about 3 to 4 hours and will be done in 1 or 2 visits.

PROCEDURES:

The physical examination will include:
1. **Blood Tests.** Twelve or more hours after you last ate anything, we will take a drop of blood from your finger and four ounces (8 tablespoons) from your arm by a needle to find the level of sugar, cholesterol and other fatty substances. Some of your blood will be saved at Penn Medical Research Laboratories in Washington, DC and at the Southwest Foundation for Biomedical Research in San Antonio, TX for future tests, including gene testing, to learn about cardiovascular and lung diseases, and risk factors for those diseases. Other laboratories may do some of these tests. Your blood will be stored by SHS until Phase V ends in 2010; then all Study samples will be returned to the tribes or given to the National

Heart, Lung, and Blood Institute (the Study sponsor) depending on the wishes of the tribes at that time. Your blood cells will not be cloned or kept growing, and your blood will not be used to develop commercial products. You will retain the right to have the sample material destroyed at any time by contacting the Principal Investigator.

2. **Electrocardiogram (ECG).** An ECG is a test of whether your heart is working normally; 12 monitoring tabs will be placed on your arms, legs and chest and connected to an ECG machine. This ECG test will be read by heart specialists at Cornell University in New York.
3. **Cardiac, Carotid, and Popliteal Ultrasound Study.** These are "pictures" of your heart and of the arteries in your neck and legs using sound waves to find out how well your heart works and if fat deposits are in your arteries. These will also be read at Cornell University in New York.
4. **Urine Test.** We will ask you for some urine to find out how your kidneys are working.
5. **Body fat.** A machine will check how much fat you have by passing a very tiny electrical current through your body.
7. **Physical Examination.** Blood pressures in your arms and legs, pulses in your ankles and feet, your height, weight, waist and arm size will be measured.
8. **Health and Family Questions.** Questions will be asked about many things that can change your general health, including exercise, alcohol and tobacco use, where you get health care, what you eat, stress and gambling. Also, questions about your family's health and well being will be asked.

FOLLOW-UP: You will be told immediately, if any life-threatening health problems are found. Your signed consent form will help the SHS staff to make appointments at the hospital or clinic for you about these conditions. After your exam, SHS researchers will contact you as soon as medically useful results become available (e.g., results of your blood tests and your cardiovascular tests such as the ECG) in order to tell you about these results and any implications for your health care needs. You may obtain a copy of any of your other results by asking the Study staff or phoning the Principal Investigator at 405-271-3090. You will also be sent Strong Heart Study newsletters now and then to tell you about results of the study. We will contact you annually (until the Study ends in 2010) to ask you about the current state of your health. This contact will likely be by phone, letter, or home visit and will be brief (about 10 minutes or less) in order to find out if you have had any sort of cardiovascular test (e.g., a treadmill test) or a cardiovascular episode (e.g., a heart attack or stroke).

OTHER INFORMATION: This study does testing on your genes, or genetic material (DNA) in your white blood cells to find genes that may cause (or protect people from) cardiovascular and lung diseases, or their risk factors. Genes may determine who will and who won't get cardiovascular disease, and how we might be able to prevent these diseases in people who are more likely to get them. This research will mostly help future generations. These genetic tests are not likely to help you personally. We think it is very unlikely that the actual genes themselves will be found during this 5-year period. Also, in a study like this, what we find usually needs to be repeated by other researchers before we can say "for sure" that something new is discovered. For these reasons you will NOT be contacted about results of your genetic tests. If we learn something important from this study, further research may be done after Phase

V is over. The DNA studies will be done at the Southwest Foundation for Biomedical Research, San Antonio, TX or at other laboratories with the approval of the Strong Heart Study researchers.

How Long Will I Be In The Study?
The examination and questions will take about 3 to 4 hours and will be done in 1 or 2 visits. You will be in the Study for an additional 5 years (until the end of the Study in 2010). You may withdraw from the study at any time without losing any benefits, which you usually have.

What Are The Risks of The Study?
Most of the tests are part of a standard medical check-up and have a very low risk of side effects. Taking blood from your arm and finger can be a little painful, may give you a bruise, cause you to feel faint, and has a slight risk of infection. You may have some discomfort in your arms and/or legs, when blood pressure is taken. The machine that measures body fat passes a tiny current through your body, but it is too small to feel, and there is no known risk for this test. If your test results from the study are put in your medical record, and if you apply for insurance, the results may make it harder for you to get insurance. We will normally put your results of the tests done by Strong Heart Study in your IHS record, so that your clinic can use them, but we won't do that, if you don't want this done.

Risks of genetic testing: If the genetic tests being done in this study determined that your disease is caused by genetic abnormalities, your family members could face problems in obtaining insurance coverage for this disease, even if they have no symptoms. However, in order to do everything possible to keep this from happening, the results of this test will NOT be given to anyone outside the study staff. This means that it will not be made available to you, your family members, your private physician, your employer, your insurance company, or any other party as allowed by law.

Are There Benefits to Taking Part in The Study?
There are not expected to be any immediate benefits to you for taking part in this study. We expect the findings to be helpful to people in the future. If we find a medical problem, you will be asked to check with your clinic or doctor for the tests and treatment they feel you need. The Strong Heart Study can help you make appointments, but will not pay for tests or treatment. You will be told how to cut down your chances of cardiovascular and lung diseases. This study should not take the place of regular medical check ups. You should go to your regular clinic for physical exams and treatment of any health problems.

What Other Options Are There?
This is a research study. Research studies involve only individuals who choose to participate, and you are free to choose not to participate.

What About Confidentiality?
Only study researchers and (by law) some people from the Food and Drug Administration, the Institutional Review Boards, and/or the National Heart, Lung and Blood Institute, which oversee this project, may need to see results that could be connected with your name. Shortly after we get your samples, your name will be replaced by a number, so that even most of the staff who run the tests will not have any name connected with your sample. The results of the exam and

any information in your medical records will be used for statistics to learn about these diseases without letting anyone know your name. Names of people who join the study will never be reported in medical journals or at medical meetings. Medically important results will be put in your medical record, unless you tell us not to place them there. If you sign a release, we will send your medical results to other clinics. You will be asked to sign a separate authorization form for use or sharing of your protected health information.

What Are the Costs?
This exam will not cost you anything.

Will I Be Paid For Participating in This Study?
You will be given a $25 Wal-Mart gift card for answering the questions and having blood drawn, and another $25 Wal-Mart gift card when you have the ultrasound tests done. This may take two visits. The payments are to help with your travel expenses and to give you something for your time helping this study. You will also be given a health promotion gift.

What Are My Rights As a Participant?
Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. If you agree to take part and then decide against it, you can withdraw for any reason. Leaving the study will not result in any penalty or loss of benefits that you would otherwise receive. We will tell you about any new information that may affect your health, welfare or willingness to stay in this study.

You understand that you have the right to access the medical information that has been collected about you as a part of this research study. However, you agree that you may not have access to this medical information until the entire research study has completely finished and you consent to this temporary restriction.

Whom Do I Call If I have Questions or Problems?
If you have questions about the study, contact Dr. Elisa Lee or her colleagues at 405-271-3090**.** For questions about your rights as a research participant, contact the OUHSC Director, Human Research Participant Protection Program at 405-271-2045 or the Chairperson, Oklahoma City Area IHS Institutional Review Board, Indian Health Service, Five Corporate Plaza, 3625 NW 56th Street, Oklahoma City, OK, 73112, telephone number (405) 951-3829.

Signature:
By signing this form, you are agreeing to participate in this research study under the conditions described. You have not given up any of your legal rights or released any individual or institution from liability for negligence. You have been given an opportunity to ask questions. You will be given a copy of this consent document.

I agree to participate in the Strong Heart Study-Phase V research study:

I do ____ do not ____ want the medical test results that may be important to my future health or the health of my family filed in my IHS chart.

If you need to contact me about results of tests that may be important to my health, please use this address (I will let you know if I have a change of address):

_____

_____

_____

_____

I would ____ would not ____ like the medical test results that may be important to my future health or the health of my family filed in my chart at a different health care provider. Please send to:

_____

_____

_____

_____

If you need to contact me about results of tests that may be important to my health, please use this address (I will let you know if I have a change of address):

_____

_____

_____

_____

Research Participant: _____ Date:_____

Subject's Printed Name _____

Person Obtaining Informed Consent:_____ Date:_____

IRB Office Version Date: 08/11/05

Appendix A – 2(a)

THE STRONG HEART STUDY V
Clinical Examination – Checklist

Participant's name: _____

ID Number: _____ Date: _____
mo day yr

	Items	If done, date and initial	
1.	Consent Form Signed	_____	_____
2.	HIPAA Form Signed	_____	_____
3.	Personal interview forms	_____	_____
4.	Medical history form	_____	_____
5.	Reproduction and hormone use (women)	_____	_____
6.	Rose questionnaire	_____	_____
7.	Physical examination	_____	_____
8.	Sample collection checklist	_____	_____
9.	CBC Results (when results returned from local lab)	_____	_____
10.	Quality of Life form	_____	_____
11.	CES-D Scale form	_____	_____
12.	Social Support form	_____	_____
13.	Other Questions About Your Life form	_____	_____
14.	Psychosocial questionnaires checklist	_____	_____
15.	Seven-Day Pedometer Record form	_____	_____
16.	Medication checklist	_____	_____

17.	ECG	_____	_____
18.	Impedance measurement	_____	_____
19.	Height and weight	_____	_____
20.	Abdominal, hip, and arm circumference	_____	_____
21.	Sitting blood pressure	_____	_____
22.	Doppler blood pressure	_____	_____
23.	Physical examination QC (if appropriate)	_____	_____
24.	Food Frequency Questionnaire	_____	_____
25.	Carotid ultrasound	_____	_____
26.	Popliteal ultrasound	_____	_____
27.	Echocardiogram	_____	_____
28.	Payment or payment form	_____	_____

Appendix A – 2(b)

THE STRONG HEART STUDY V
Post Exam Activities

Same Day:

Process blood specimens
Review morbidity (chart review at clinic site)
Stamp participant's clinic chart with SHS exam information (if so indicated on consent form)
Add codes: Community, Tribe, clinic/hospital, medicines
Edit for missing data
Transmit ECGs to New York
Make all but routine referrals
Complete carotid and popliteal ultrasound and echocardiography measurements

Later:

Send ultrasound tapes to reading center
Make routine referrals
File confirmed ECG and ultrasound/echo reports
Mail letters to participants
File laboratory findings in participant's medical records (if so indicated on consent form)
Mail laboratory specimens

Appendix A – 3

THE STRONG HEART STUDY V
Checklist for Blood Pressure

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed ____/____/____ **(Month/Day/Year)**

YES ( ) NO ( )	**Provide subject instruction, allowing opportunity for questions.**
YES ( ) NO ( )	**Measure right arm for correct cuff size.**
YES ( ) NO ( )	**Palpates brachial artery, medial to and above antecubital fossa.**
YES ( ) NO ( )	**Marks pulse point.**
YES ( ) NO ( )	**Places cuff correctly.**
YES ( ) NO ( )	**Leaves subject for 5 minutes rest.**
YES ( ) NO ( )	**Subject positioned correctly.**
YES ( ) NO ( )	**Provides environment free of excessive noise.**
YES ( ) NO ( )	**Finds pulse obliteration point.**
YES ( ) NO ( )	**Calculates peak inflation.**
YES ( ) NO ( )	**Places stethoscope in ears.**
YES ( ) NO ( )	**Inflates cuff rapidly to calculated peak.**
YES ( ) NO ( )	**Holds pressure steady for full 5 seconds.**
YES ( ) NO ( )	**Places bell on brachial pulse**
YES ( ) NO ( )	**Deflates cuff slowly, 2 mmHg per second.**
YES ( ) NO ( )	**Deflates cuff rapidly after 2 absent sounds.**
YES ( ) NO ( )	**Records readings.**
YES ( ) NO ( )	**Disconnects tubes.**
YES ( ) NO ( )	**Instructs subject to hold right arm vertical for full five seconds.**
YES ( ) NO ( )	**Waits at least 30 seconds before proceeding to 2^{nd} and 3^{rd} readings.**
YES ( ) NO ( )	**Average 2^{nd} and 3^{rd} readings, informs subject of average BP.**

Comments**:** _____

_____

_____

_____

Appendix A – 4
THE STRONG HEART STUDY V
Simultaneous Blood Pressure Observation Form

Quarterly, each technician should be part of a pair of techs who simultaneously measure blood pressure using a Y-tube stethoscope on a volunteer. Each tech should record their readings separately. A third tech should then transfer the readings to this form and should calculate the differences between the two sets of measurements. The acceptable margin of error is 4 mmHg for each individual measurement and 3 mmHg for the average of the three readings.

Technician #1 Code # / Initials _____

Technician #2 Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

	Tech #1	**Tech #2**	**Difference**
Arm circumference	_____	_____	_____
Cuff size	_____	_____	_____
Pulse obliteration pressure	_____	_____	_____
SBP #1	_____	_____	_____
DBP #1	_____	_____	_____
SBP #2	_____	_____	_____
DBP #2	_____	_____	_____
SBP #3	_____	_____	_____
DBP #3	_____	_____	_____
Average SBP	_____	_____	_____
Average DBP	_____	_____	_____

Comments**:** _____

_____

Appendix A – 5(a)
THE STRONG HEART STUDY V
Quality Control

SPHYGMOMANOMETERS

MONTH	DATE	INIT.	MERCURY LEVEL IS AT ZERO WITH NO PRESSURE	CHECK FOR AIR LEAKS WITH MERCURY AT 200 mmHg	CHECK CAP FOR TIGHTNESS	CHECK TUBE FOR OXIDE DUST	COMMENT ON ANY PROBLEMS FOUND AND CORRECTIVE ACTION TAKEN.
JAN							
FEB							
MAR							
APR							
MAY							
JUN							
JUL							
AUG							
SEP							
OCT							
NOV							
DEC							

Appendix A – 5(b)
THE STRONG HEART STUDY V
Quality Control

SCALE & MEASUREMENT TAPES

MONTH	DATE	INIT.	PORTABLE SCALE	CALIBRATED WEIGHTS	MEASURING TAPE, to 30 cm METAL TAPE
JAN					
FEB					
MAR					
APR					
MAY					
JUN					
JUL					
AUG					
SEP					
OCT					
NOV					
DEC					

Appendix A – 6
THE STRONG HEART STUDY V

MAINTENANCE PROCEDURES FOR STANDARD SPHYGMOMANOMETERS

The following checks should be conducted at least every month, and a log kept of the dates and the people carrying out the troubleshooting.

1. With the instrument placed flat on the table, and the inflation system disconnected, the level of mercury should read zero in the standard instrument. The top of the meniscus is on the zero line when the eyes are level with this line and the mercury is correctly adjusted. If the reading is either above or below the zero mark, the system should be returned to the manufacturer or replaced.

2. The inflation system should then be reconnected, and the cuff rolled around a bottle and secured. The valve should be closed on the Air Flo system, and the instrument inflated until the mercury rises to 240 mmHg. The Air Flo valve should then be slowly opened and the mercury allowed to fall to 200 mmHg. The valve should then be closed, at which time the mercury column should remain stable. If the column continues to fall, there is an air leak, and the following steps should be taken:
   a) The system should be re-inflated until the column rises to 200 mmHg.
   b) The tubing should be pinched at various locations to localize the area of the leak.
   c) Appropriate replacement of the tubing, cuff, or valve should be performed.

3. With the instrument inflated above full calibration, the screw cap should be examined for mercury leaks. If this happens, the screw cap should be tightened. If the leak persists or the mercury is seen at the bottom of the tube, the system should be returned to the manufacturer or replaced.

4. With time, the mercury will become dirty and an oxide layer will be deposited on the inside of the glass tube. Check with the manufacturer to determine where the system should be sent for maintenance.

5. Since mercury is a toxic substance, all maintenance procedures must be performed carefully and with attention to safety. Mercury should not be allowed to get in contact with rings and other jewelry. All clinics should have a mercury spill kit available, and staff should be trained in how to use the kit.

Appendix A – 7(a)

NOTE: THIS LETTER IS TO BE USED ONLY FOR NORMAL RESULTS OR ROUTINE REFERRALS.

(EMERGENT, IMMEDIATE AND URGENT REFERRALS SHOULD FOLLOW THE GUIDELINES IN SECTION 1.8.)

THE STRONG HEART STUDY V
Sample Letter to Participant after Physical Examination

Dear _____:

Thank you very much for taking part in the Strong Heart Study today.

Blood Pressure

When your blood pressure is too high, it causes extra "wear and tear" on your heart and blood vessels. Over the years this can lead to hardening of the arteries and then stroke, heart attacks and kidney damage. Doctors have known for many years now that properly controlling blood pressure helps to prevent these medical problems.

Your blood pressure was _____ (less than 130/80 and you do not take medication for your blood pressure). This is within the normal range. It should be checked at least once a year.

Your blood pressure was _____ (greater than 130/80). This is in a range that may be high enough to cause complications if you are a diabetic, or may indicate that you need to do some things that will reduce your chances of developing high blood pressure. You should make an appointment for follow-up with your medical care provider, since this level may cause trouble in the future.

Your blood pressure was _____ (equal to or greater than 140/90). This is above the normal range. You should make an appointment for follow-up with your medical care provider, since high blood pressure may cause heart problems and stroke.

Your blood pressure was _____ (less than 140/90, and you take blood pressure medicine). This is usually considered acceptable; but especially if you are diabetic and your blood pressure is equal to or greater than 130/80 you may wish to discuss this with your doctor at your next visit. Continue taking your blood pressure medicine as directed by your medical care provider.

Glucometer test for Diabetes.

Diabetes causes the blood sugar to be too high. Over a long period of time this seems to cause damage to the blood vessels, eyes, kidneys and nerves. We are now quite sure that

lowering the blood sugar into the normal range helps to prevent these problems. This glucometer test is very accurate but not as exact as the laboratory test that will be done on the blood sample from your arm. The results from that test will be sent to you later.

Your fasting blood sugar was _____ (less than 100 mg/dl). This is within the desirable range.

Your fasting blood sugar was _____ (equal to or more than 100 but less than 126). This is within a range that doctors now diagnose as "pre-diabetes". There are good studies now proving that people with blood sugars at this level can prevent the development of diabetes by increasing their daily exercise and decreasing their weight (if overweight). We suggest that you contact your medical provider in the coming month to have this result checked and get further advice.

Your fasting blood sugar was _____ (known diabetic, less than 150). On the day of the exam, your fasting blood sugar was probably under adequate control. Be sure to follow the advice of your medical care provider for control of your diabetes.

Your fasting blood sugar was_____ (known diabetic greater than 150 but less than 300). Your fasting blood sugar was not as good as it should be for diabetic patients. We suggest that you see your medical care provider in the coming week or so for advice on how to get better control.

Body Weight and "Body Mass Index" or "BMI"

We have measured your body weight and height. We have done a calculation from these two numbers that give us another number called the "BMI". This can be compared to the BMI of other people and gives you information about your health risk from obesity.

Your BMI was_____(less than 25), which is considered normal. We hope you will continue to balance your diet and exercise to maintain this healthy level.

Your BMI was_____(more than 25 but less than 30), which is higher than normal. We suggest that you think carefully about ways that you can reduce the foods that have a lot of calories and increase the amount of exercise that you do each day. If you want help with planning these changes, we can assist you.

Your BMI was_____(more than 30), which is definitely higher than normal. We suggest that you let us help you make an appointment to see a dietician who can advise you about ways to change you eating habits. We would also suggest that you discuss with your medical provider ways to increase your exercise.

Smoking

One of the areas that we have asked some questions about today is smoking. While occasionally smoking tobacco as a religious practice probably causes no harm; smoking cigarettes or using other tobacco as a daily habit carries many health risks. Most people think of the risk of lung and other cancers, which is very important; but actually the risk of death and

illness from heart disease is a much greater risk from smoking. If you currently smoke, we would like to tell you about some methods that could help you quit.

We hope this information has been helpful. There will be results from your blood tests, ultrasound of the neck and leg blood vessels and ultrasound heart pictures coming back in the next days and weeks. You will be contacted and advised if these tests are normal or abnormal. If there are problems with your results, we will tell you how to get help from your medical providers to take care of your health.

In the meantime, remember these 7 important ways to keep your heart healthy:

1) Eat sensibly, keep your weight normal, watch the amount of fat in your diet
2) Exercise sensibly and regularly
3) Know that your blood pressure is normal, or work with your provider to control it
4) Know that your blood sugar is normal, or work to control it
5) If you use tobacco as a habit, please stop
6) Abstain from alcohol, or drink in moderation with only one or two drinks per day
7) Try to get the rest and relaxation that you need, and enjoy life!

We look forward to working with you to learn more about your health.

Sincerely,

The Strong Heart Staff

Appendix A – 7(b)

TO BE USED FOR EMERGENT, IMMEDIATE, AND URGENT REFERRALS

THE STRONG HEART STUDY V
Sample Letter

Date:_____

Dear Clinic staff and Strong Heart Study participant_____(name),

Normally we would have contacted you in person about this problem; but we were just not able to reach you, and so have needed to send this in the mail. If we had been able to talk with you in person, there would have been other details we would have told you about; we hope you will bring this with you to your clinic so they will be able to help you better.

If you would like help making an appointment with your clinic, please contact us at the SHS office in **[Eagle Butte at 605-964-1260, or Pine Ridge at 605-455-1395].** If this problem involves an EKG or ultrasound test we can get copies of the actual pictures for your clinic to use or send to their consultants, if they wish.

We are suggesting that you contact your regular medical care provider because of the following abnormalities that we have found during your testing:

_____

_____

_____

_____

_____

We think it is best for you to talk with your doctor or clinic about this problem:
right now or within the next: 24 hours week.

Thank you again for participating in the Strong Heart Study, and we hope that this information has helped you and your doctors improve your health.

Sincerely,

[Lyle Best, MD
701-246-3884
Marcia O'Leary, RN
605-865-3327]

Appendix A – 7(c)

NOTE: THIS LETTER IS TO BE USED ONLY FOR NORMAL RESULTS OR ROUTINE REFERRALS FOLLOWING THE RETURN OF LAB, ECG OR ULTRASOUND RESULTS.

EMERGENT, IMMEDIATE AND URGENT REFERRALS SHOULD FOLLOW THE GUIDELINES IN SECTION 1.8.

THE STRONG HEART STUDY V
Sample Letter to Participant Concerning Test Results

Dear Strong Heart Study participant:

Attached are results of your **[blood tests, or carotid/popliteal artery ultrasound, or echocardiogram, etc]** study that were done as part of the Strong Heart Study. These results have also been sent to _____as you requested when you came in for your exam. It would be a good idea to talk about any abnormal results with your doctor within the next month or at your next visit. Bringing this letter to the clinic will help them answer your questions.

ON THE NEXT PAGE YOU WILL FIND A SUMMARY OF THE ABNORMAL RESULTS FROM YOUR TESTS, AND RECOMMENDATIONS ABOUT WHAT SHOULD BE DONE.

If we have suggested that you see your medical provider in the coming week or sooner, we will have also tried to reach you by phone. We would like to help you make arrangements for an appointment or for a ride to the clinic, if that is needed.

If you have any questions about these results, contact your health care provider or the staff at the SHS office in **[Eagle Butte, or Pine Ridge..... at (605) 964-1177etc]**. The attached sheet describes the purpose of each test.

Thank you for your participation in the Strong Heart Study and for helping us learn more about heart disease and strokes in Indian people.

Sincerely,

Principal Investigator
Strong Heart Study

XXXXXXXXXXXXX OR XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
substituting the following for the first paragraph above:

"Honoring your request as stated in your consent form, the attached lab results were not sent to the IHS or any other medical facility or healthcare provider. It may be in your best interest for you to show your healthcare provider these results during your next visit."

SUMMARY OF ABNORMAL RESULTS

FOR EXAMPLE:

Cholesterol 229 mg/dl

This is a fatty substance in your blood that may clog arteries if it is too high. Everyone should know his/her cholesterol level. It is best to have your cholesterol below 200 mg/dl. Levels 200-239 mg/dl are moderate risk. Levels 240 mg/dl or higher are high risk. Persons with high levels should eat fewer fatty foods and more foods high in fiber such as cereals, fruits, and vegetables. They may also need medicine to lower their cholesterol.

LDL Cholesterol 166 mg/dl

This is the bad cholesterol that clogs the arteries. It is best to have levels below 100 mg/dl. Levels of 130-159 mg/dl are moderate risk. Levels 160 mg/dl or higher are high risk. For people who have had a heart attack (or are diabetic), it is especially important to get their LDL level well below 100 mg/dl, so that further clogging of arteries is prevented.

CAROTID ULTRASOUND RESULTS

Narrowing less than 50%

These results show that you have a certain amount of hardening of the arteries in the large blood vessels in your neck. These blood vessels supply circulation to the brain, and sometimes clots that form in the neck can travel up into the head to cause stroke. Usually surgery is NOT recommended for people with your level of narrowing, but we do suggest that you are careful to **do things that will prevent this hardening** from getting **worse**. We recommend that you talk with your medical provider about this at your next appointment in the coming month.

Appendix A – 8

THE STRONG HEART STUDY V
INTERPRETATION OF BLOOD TESTS

Cholesterol	This is a fatty substance in your blood that may clog arteries if it is too high. Everyone should know his/her cholesterol level. It is best to have your cholesterol below 200 mg/dl. Levels 200-239 mg/dl are moderate risk. Levels 240 mg/dl or higher are high risk. Persons with high levels should eat fewer fatty foods and more foods high in fiber such as cereals, fruits and vegetables. They may also need medicine to lower their cholesterol.
Triglycerides	This is another type of fat in the blood that may cause problems in the pancreas if it is too high. Levels should be below 150 mg/dl. Triglyceride levels tend to be higher in people with diabetes, and if they are, improving the control of blood sugar and avoiding alcohol often can lower the level.
HDL Cholesterol	This form of cholesterol is good in that it may prevent clogging of arteries. Levels below 35 mg/dl are high risk and can be increased by exercise.
LDL Cholesterol	This is the bad cholesterol that clogs the arteries. It is best to have levels below 100 mg/dl. Levels of 130-159 mg/dl are moderate risk. Levels 160 mg/dl or higher are high risk. For people who have had a heart attack (or are diabetic), it is especially important to get their levels well below 100 mg/dl, so that further clogging of arteries is prevented.
Calcium (Ca)	High values (above 10.5 mg/dl) or low values (below 9.1 mg/dl) may indicate problems with diet or how your body handles calcium.
Phosphorus (PO_4)	High values (above 3.7 mg/dl) or low values (below 2.3 mg/dl) may indicate problems with how your body handles phosphorus.
Uric Acid	High levels (above 7.2 mg/dl) are seen in people with gout, a form of arthritis, or other medical problems.
Fasting Glucose	Levels of 126 mg/dl or higher may indicate that you have diabetes and further follow up is needed if you do. A level of 100-125 mg/dl indicates that you probably have "pre-diabetes" and should discuss with your medical provider ways of preventing or delaying the development of diabetes
Total Protein	High levels (above 8.0 mg/dl) or low levels (below 6.0 mg/dl) may indicate problems that need further follow up.

BUN — High levels (above 20 mg/dl) may indicate kidney problems or dehydration and should be followed up.

Albumin — This is a protein in the blood. Low levels (below 3.5 mg/dl) may occur when people have health problems that affect the production of protein in the liver.

Total Bilirubin — High levels (above 1.2 mg/dl) occur in people with liver problems and cause people to turn yellow and itch.

Liver Function Tests	High values:
ALK Phos	above 100 U/L
AST (SGOT)	above 42 U/L
ALT (SGPT)	above 42 U/L

These test values are high when people have liver disease or other health problems. Sometimes they can go up just by having three or more alcoholic drinks in a day.

Electrolytes	Low Values	High Values
Sodium (Na)	below 135 meq/dl	above 147 meq/L
Potassium (K)	below 3.3 meq/L	above 5.5 meq/L
Chloride (Cl)	below 95 meq/L	above 110 meq/L
CO_2	below 22 meq/L	above 29 meq/L

These tests measure how well your body is handling salt. Sometimes blood pressure medicines cause electrolytes to become too high or too low, especially potassium.

Creatinine — High levels (above 1.2 mg/dl) indicate kidney problems and should be followed up.

CBC — Complete Blood Count. This test measures the types of cells you have in your blood. If hemoglobin is less than 14.0 grams (gm) for men or 12.0 grams for women or hematocrit is less than 42% for men or 37% for women, it indicates you are anemic and may need further tests to find out why. If your white blood cells are less than 4.8 thousand or more than 10.8 thousand, you may have an infection or other health problem that affects the white blood cells. If your platelets are below 130 thousand or above 424 thousand, you may need further tests to find out why.

Hemoglobin A1C	This shows what level your blood sugar has been at for the past 6 weeks or so. It is not as changeable as your blood sugar, and it is handier for your doctor and you to use to figure out how well your diabetes is controlled. The normal range is between 4.4 and 6.4%, and people with diabetes should try to get their level as close to normal as possible.

URINE ALBUMIN/CREATININE RESULTS

Less than 30 mg/g	When you have less than 30 mg/g (milligrams per gram) of albumin/creatinine in your urine, this indicates that your kidneys are not leaking protein.
30 to 299 mg/g	When you have greater than 29 mg/g, but less than 300 mg/g of albumin/creatinine in your urine, your kidneys are leaking small amounts of protein. During your next visit to a medical provider, inform them of this lab value. Taking the appropriate medication, changing your diet, exercising on a regular basis, or changing your lifestyle to reduce stress can help maintain normal blood pressure and blood sugar, which in turn protect the kidneys from further damage.
Equal to or greater than 300 mg/g	When you have equal to or greater than 300 mg/g of albumin/creatinine in your urine, this indicates your kidneys are leaking large amounts of protein. If you have not already done so, you should receive a medical evaluation for this problem. Strict adherence to your medical provider's orders concerning the use of medication, change in diet, amount of exercise and/or changes in lifestyle to maintain normal blood pressure and blood sugar values can help protect the kidneys from further damage.

CAROTID/POPLITEAL ULTRASOUND RESULTS

Carotid Ultrasound Results:

Narrowing less than 50%	These results show that you have a certain amount of hardening of the arteries in the large blood vessels in your neck. The carotid arteries supply circulation to the brain. Sometimes clots that form in these neck blood vessels can travel up into the head to cause stroke. Usually surgery is NOT recommended for people with your level of narrowing of the neck arteries, but we do suggest that you are careful to do the things that make hardening of the arteries less likely. We recommend that you talk with your medical provider about this at your next appointment in the coming month.

Narrowing more than 50% — This can cause slowing of the circulation to your brain and sometimes strokes. Occasionally surgery is needed to improve this situation. We strongly suggest that you see your medical provider sometime soon, preferably in the coming week.

Narrowing more than 75% — This can cause a serious slowing of the circulation to your brain and sometimes strokes. Not always, but sometimes surgery is needed to improve this situation. We strongly suggest that you see your medical provider in the next 24 hours.

Only your Doctor can make the determination of what you need for follow up care. It is important for you to follow up with your physician so that he/she can consider your history and determine what, if any, follow-up care is needed.

Popliteal Ultrasound Results:

Narrowing less than 50% — These results show that you have a certain amount of hardening of the arteries in large blood vessels in your legs (popliteal arteries), which supply blood to your legs. This narrowing found during the ultrasound exams indicates some hardening of your arteries. Usually surgery is NOT recommended for people with your level of narrowing of these leg arteries; but we do suggest that you are careful to do the things that make hardening of the arteries less likely. We recommend that you talk with your medical provider about this at your next appointment in the coming month.

Narrowing more than 50% — This can cause some slowing of the circulation to your legs and sometimes pain during walking or sores or gangrene. Occasionally surgery is needed to improve this situation. We strongly suggest that you see your medical provider sometime soon, preferably in the coming week.

Narrowing more than 75% — This can cause a serious slowing of the circulation to your legs and sometimes pain during walking or sores or gangrene. Not always, but sometimes surgery is needed to improve this situation. We strongly suggest that you see your medical provider in the next 24 hours.

Only your Doctor can make the determination of what you need for follow up care. It is important for you to follow up with your physician so that he/she can consider your history and determine what, if any, follow-up care is needed.

ECHOCARDIOGRAM RESULTS

Abnormal valve conditions	Sometimes one or more of the valves in your heart becomes too narrowed, or starts to leak. When this happens, the heart has to work harder to circulate the blood. Blood clots and infections can also form in the heart and cause problems in other parts of the body. Many of these problems can be corrected by surgery or helped by proper medicines. We suggest that you see your medical provider sometime in the next week to discuss this problem and talk about ways to deal with it.

Only your Doctor can make the determination of what you need for follow up care. It is important for you to follow up with your physician so that he/she can consider your history and determine what, if any, follow-up care is needed.

Appendix A – 9

THE STRONG HEART STUDY V
INFECTION CONTROL POLICY

Human Immunodeficiency Virus (HIV) and Hepatitis B

INTRODUCTION:

The virus that causes AIDS is a human retro virus that has been named HIV (human immuno- deficiency virus). The virus primarily infects cells of the T-lymphocyte system, but is also able to infect other cells such as macrophages and those of the central nervous system. The virus destroys the cellular immunity of infected people, leaving them susceptible to a variety of opportunistic diseases.

It has been established that the virus can be transmitted: (1) through sexual contact; (2) through parenteral exposure, including sharing needles and syringes when injecting illicit drugs, transfusion of blood or its components, and infusion of clotting factors concentrates; and (3) through perinatal exposure, probably both transplacental and intra-partum transmission and postpartum transmission.

To date, there is no evidence that the HIV virus can be transmitted by casual social contact, not even among people living in the same household. Recent reports by the CDC suggest that exposure of skin or mucous membranes to contaminated blood may rarely result in transmission of HIV. The magnitude of the risk is not known.

Hepatitis B virus (HBV) is transmitted in ways similar to HIV.

PURPOSE:

To stress the importance of following recommended precautions to prevent exposure to the AIDS and HBV virus.

PREVENTION:

1. Before initiating work, all bench areas should be cleaned and sanitized daily with an appropriate disinfectant.

2. All laboratory specimens should be treated as if they were contaminated with either HIV or HBV. Any specimens specifically taken from known AIDS or hepatitis patients should be clearly marked as requiring isolation and transported in a leak proof container.

3. Specimens leaking from their containers should be discarded after requesting a replacement. In those cases in which the specimen is not replaceable, the outside of the soiled container should be disinfected with either a 1: 10 sodium hypochlorite solution (household bleach) or

Lysol spray and left standing for at least ten minutes before performing any laboratory procedures).

4. Every laboratorian should wear gloves and be dressed in a laboratory gown or uniform when handling and processing specimens. This will minimize the risk of contamination to exposed body parts or street clothing. Gloves should be worn and disposed of in accordance with the "Gloves (Proper Use and Disposal)" policy. Hands and other skin surfaces should be washed thoroughly and immediately after coming into contact with blood or body fluids.

5. Wear masks, gowns (or aprons), and goggles (or glasses) when there is a possibility that blood or body fluids may splash or splatter on you.

6. All laboratory specimens that must be manipulated before processing (i.e., body fluids to be diluted, caps on tubes of blood to be opened, specimens to be split or transferred, etc.) should be handled cautiously.

7. Centrifuge carriages should be sanitized daily (or after each use if possible HBVs or AIDS specimen is being centrifuged) with a germicide. After weekly use, centrifuge interiors should be sprayed with an appropriate disinfectant.

8. To prevent needle stick injuries, needles should never be recapped, separated from syringes, or otherwise manipulated. Instead, used needles should be placed intact into puncture-resistant containers. The same criteria should be applied to used scalpel blades and any other sharp device that may be contaminated by a patient.

9. To prevent transmission of HIV or HBV, the platform on the finger prick device (Autoclik, etc.) should be changed between patients.

10. Reusable devices, such as tissue grinders, pipettes, etc, should be placed into vesicles containing an appropriate germicide prior to being autoclaved and cleaned.

11. Mouth pipetting of blood or serum or plasma is forbidden for any clinical laboratory procedure. Mechanical pipetting devices are available and must be routinely used.

12. All laboratory specimens and disposables should be discarded in biohazard bags and autoclaved prior to final disposition by either incineration or sanitary carting.

13. Accidental spillage of a specimen should be promptly cleaned up with any of the previously mentioned disinfectants. This solution should be freshly prepared and kept in its diluted form no longer than one week.

14. If accidental contamination occurs to an exposed area of the skin, wash first with a good liquid antimicrobial detergent soap (i.e., hibiclens, chlorhexidine gluconate, etc.). Rinse well with water, then apply a 1: 10 dilution of household bleach or 50% isopropyl or ethyl alcohol. Leave preparation on skin surface for at least one minute before final washing with the liquid soap and water.

15. All work bench areas should be cleaned and sanitized with an appropriate germicidal agent at the end of each work shift.

16. Before workers leave the laboratory, all protective clothing should be removed. In addition, all laboratory personnel should wash their hands and arms with an appropriate germicidal detergent soap (i.e., chlorhexidine gluconate with alcohol).

FIRST AID AFTER CONTAMINATION OR LIKELY CONTAMINATION

1. SKIN: Wash the skin well with soap and water.

2. EYES: Flush eyes with water by using the safety eye wash.

3. NEEDLE STICK: Squeeze the affected part gently to somewhat cleanse the wound by bleeding. Cleanse with soap and water.

4. MOUTH: Immediately rinse out the mouth with large amounts of clean water. Do not swallow the water. (mouth pipetting is strictly forbidden)

5. For all incidents:

    a. Notify the supervisor and report to the Employee Health Unit, or in the event Employee Health is closed, go to the Emergency Room.

    b. An incident report form must be filed.

    c. The decision to administer hepatitis immune globulin is made by the Employee Health Unit.

    d. The hepatitis B surface antigen (HBsag) vaccine HAS BEEN AND IS AVAILABLE to high risk personnel (laboratory, ICU, etc.) All Strong Heart Study personnel who handle blood should receive three dose of hepatitis B vaccine.

REFERENCES:

Tiemo, PM: Preventing Acquisition of Human Immunodeficiency Virus in the Laboratory: Safe Handling of AIDS Specimens. Laboratory Medicine 1986; 11: 696-698.

Standard Procedure for the Collection of Diagnostic Blood Specimens by Venipuncture. National Committee for Clinical Laboratory Standards March 1980.

So You're Going to Collect a Blood Specimen. College of American Pathologists, 1980. Rose SL: Clinical Laboratory Safety Philadelphia, J.B. Lippincott Company, 1984

APPENDIX B

Instructions for Questionnaires

and

Data Forms

Appendix B -- 1

THE STRONG HEART STUDY V
Instructions for the Personal Interview Forms I and II

Subject should be seated comfortably and made to feel welcome during this interview because it is the first form collected and will set the scene for later data collection.

ITEM # DESCRIPTIONS

Personal Interview Form I (NO DATA ENTRY for this form - to be filed in the field center folder only)

Study Identification Number (previously assigned in Phase III or Phase IV) and SHS Family ID should be completely filled in after the consent form is completed and subject is enrolled in Phase V.

1st digit represents the center number (1=SD, 2=OK, 3=AZ).
2nd digit is "0" for all interviewees.
3-6 digits for the consecutive number of the subject when previously interviewed.

Write in social security number.

Write in community name and code from list.

A. Demographic Information

1 Enter last name, left justified.
Enter first name, left justified.
Enter middle name, left justified. If no middle name, leave blank.
Enter nickname or other name being used by friends.

2 If a female participant has ever married, write down her maiden name.

3 Write down the name of a married participant's spouse.

4 Write down the name of IHS and the non-IHS hospital usually used by the participant. Write in facility number is associated.

5a Current mailing address. Enter left justified with blank separating number from street name and street name from unit number. If post office box, enter after street address.

b Enter left justified, city/town or reservation of residence.

c Enter left justified, county of residence.

d Enter state of residence as two digit postal abbreviation and 5-digit postal zip code.
AZ= Arizona SD= South Dakota
OK= Oklahoma ND= North Dakota

6. If residential address is different from the mailing address, write in the residential address following the rules given in item 5a-d.

7. Enter complete telephone number of home phone or phone at which participant can be reached during the evenings.

8. Enter complete telephone number of work phone or phone at which participant can be reached during the day.

Personal Interview Form II

A. BASIC INFORMATION:

1. Check the gender of the participant.

2. Fill in the birthday of the participant.

3. Write down the participant's current marital status.

4. Enter number of years of education the participant has received.

B. WEIGHT SATISFACTION: questions about efforts to lose weight

5. Ask whether the participant is satisfied with her/his current weight?

6-7. Ask participant whether she/he want to gain or lose weight, and how is she/he doing it.

C. ARTIFICIAL SWEETENERS

8. Number of diet drinks ingested in last 7 days.

9. Use of artificial sweeteners.

10. If used, type of artificial sweeteners used.

D. FAMILY INCOME

Questions 11-14 assess the family income so that the subject's socioeconomic status can be determined. Ask the questions as stated in the questionnaire. Prepare a sheet of income levels to show the participant.

11. Ask participant whether her/his household income meets her/his family's needs?

12. Ask whether the participant is attending a school.

13. Ask participant, on the average, how many hours per week he/she work in a paid job(s).

14. Ask participant to choose the correct annual household income level for her/his household.

E. TOBACCO: These questions are very important to assess accurately because smoking is a major risk factor for cardiovascular disease.

15. This question will determine whether the participant is a smoker or not. A person who has smoked less than 100 cigarettes in her/his lifetime is not considered a smoker since the damage caused by smoking is negligible.

16. Determine when participant started smoking regularly. Record age in years.

17. Ask participant whether she/he quit smoking in the past.

17a-b If participant reported she/he quitted smoking, ask when and why.

18. Determine average cigarettes smoked per day, which may have a significant effect on heart diseases and other health problems.

19. Ask the participant about the occasions when she/he is most likely to smoke or increase smoking. Check ALL the appropriate boxes.

20. Ask the participant, regarding occasions she/he increased smoking, how many cigarettes she/he smoked per day.

21. Ask the participant whether she/he is smoking currently.

22. Ask the participant, if currently smoking, whether she/he wants to change her/his smoking habit and how.

23. Ask the participant whether she/he uses chewing tobacco or snuff now.

24. If yes, how often per day does the participant use chewing tobacco or snuff.

F. PASSIVE SMOKING: This section asks about second-hand smoke exposure.

25. Ask participant, regardless of her/his smoking status, on the average, how many hours is she/he exposed to the smoke of others.

G. ALCOHOL: Questions related to alcohol consumption are frequently not answered accurately in surveys. Questions included in this questionnaire have been widely used and validated in several national studies.

26. Question 26 determines when the individual last had an alcoholic beverage. If the last drink was less than 30 days ago, fill in the box labeled number of days. If the last drink was within the last year, but more than 30 days ago, fill in the number of months. If the last drink was over one year ago, fill in the number of years. If the last drink was one or more years ago, skip to Q33.

27. Question 27 assesses the average number of drinks consumed in a typical week. Frequently individuals with severe drinking problems, especially binge drinkers, do not consume alcoholic

beverages by the can, glass or shot, but rather drink wine or hard liquor out of a bottle. Remind the participant to use the drinks chart to estimate the number of drinks in a typical week.

28. Question 28 will tell you the frequency of alcoholic consumption. Many individuals with severe alcohol problems will only drink on the weekends (i.e., 8 days per month) or at the time of the month when they receive income. Assume 30 days in a month.

29. Question 29 assesses the quantity of alcohol consumed in a day when participant drinks.

30. Ask the participant when she/he drinks more than the usual consumption, how much and how often in a month.

31-32. Questions 31 & 32 assess the frequency of binge drinking in the past month and the past year, respectively.

H. PERCEIVED STRESS:

33-39. Stress has been associated with the occurrence of CVD in many population studies. Questions 33-39 assess the participant's personal feelings about the degree of stress the SHS participant had in a general sense during the **PAST MONTH**.

40. Ask the participant, on the average, how much time she/he watches TV per day.

41-44. Question 41 assesses the reliability of the answers given by the participant. Question 42 asks if the participant completed all or only part of the interview. Write down your personnel code number and the date of completion of the interview.

Appendix B -- 2
TRIBAL CODES

Tribe	Code
Absentee-Shawnee tribe of Indians of Oklahoma	141
Agua-Caliente Band of Cahuilla Indians of the Agua-Caliente Indian Reservaton, Palm Springs, CA	263
Ak Chin Indian Comm. of Papago Indians of Maricopa, Ak Chin Reservation, Arizona	360
Alabama and Coushatta Tribes of Texas	223
Alabama-Quassarte Tribal Town of the Creek Nation of Ind. of Oklahoma	266
Alturas Indian Rancheria of Pit River Indians of California	385
Apache Tribe of Oklahoma	231
Arapahoe Tribe of the Wind River Reservation, Wyoming	011
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana - Assiniboine	235
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana - Sioux	276
Augustine Band of Cahuilla Mission Indians of the Augustine Reservation, California	255
Bad River Band of the Lake Superior Tribe of Chippewa Indian of the Bad River Res, WI	243
Barona Capitan Grande Band of Diegueno Mission Indians, Barona Reservation, California	330
Barona Group of Capitan Grande Band of Mission Indians of the Barona Reservation, CA	412
Bay Mills Indian Comm of the Sault Ste. Marie Band of Chippewa Indian, Bay Mills Reservation, MI	244
Berry Creek Rancheria of Maidu Indians of California	312
Big Bend Rancheria of Pit River Indians of California	380
Big Lagoon Rancheria of Smith River Indians of California	415
Big Pine Band of Owens Valley Paiute Shoshone Indian of the	

Ft. McDowell Mohave-Apache Indian Community, Ft McDowell Band of Mohave Apache Indian of the Ft. McDowell Indian Reservation, Arizona	234
Fort Mojave Indian Tribe of Arizona	081
Fort Sill Apache Tribe-of-Oklahoma	005
Gay Head Wampanoag Indians of Massachusetts	202
Gila River Pima Maricopa Indian Community of the Gila River Indian Reservation of Arizona	293
Grand Traverse Band of Ottawa and Chippewa Indians of Michigan	196
Greenville Rancheria of Maidu Indians of California	314
Grindstone Indian Rancheria of Wintun-Waitaki Indians of California	435
Hannahville Indian Community Wisconsin Potawatomie Indians of Michigan	379
Havasupai Tribe of the Havasupai Reservation, Arizona	051
Hoh Indian Tribe of the Hoh Indian Reservation, Washington	052
Hoopa Valley Tribe of the Hoopa Valley Reservation, California	053
Hopi Tribe of Arizona	054
Hopland Band of Pomo Indians of the Hopland Rancheria, California	404
Houlton Band of Maliseet Indians of Maine	204
Hualapai Tribe of the Hualapai Indian Reservation, Arizona	055
Inaja Band of Cosmit Mission Indians of the Inaja and Cosmit Reservation, CA	434
Iowa Tribe of Kansas and Nebraska	057
Iowa Tribe of Oklahoma	056
Isleta-del-Sur Pueblo Indians of Texas	222
Jackson Rancheria of MeWuk Indians of California	322
Jamestown Klallam Tribe of Washington	034
Jamul Indian Village of California	424
Jicarilla Apache Tribe of the Jicarilla Apache Indian Reservation, New Mexico	006

Kaibab Band of Paiute Indians, Kaibab Indian Reservation, Arizona	352
Kalispel Indian Community of the Kalispel Indian Reservation, Washington	179
Karuk Tribe of California	216
Kashia Band of Pomo Indians of the Stewarts Points Rancheria, California	394
Kaw lndian Tribe of Oklahoma	058
Keeweenaw Bay Indian Community of the L'Anse, Lac Vieux Desert and Ontonagon Bands of Chippewa Indian of the L'Anse Reservation, Michigan	240
Kialegee Tribal Town of the Creek Indian Nation of Oklahoma	267
Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas	060
Kickapoo Tribe of OK (includes TX Band of Kickapoo Indian)-Oklahoma	059
Kickapoo Tribe of OK (includes TX Band of Kickapoo Indian)-Texas	199
Kiowa Indian Tribe of Oklahoma	062
Klamath Indian Tribe of Oregon	221
Kootenai Tribe of Idaho	063
La Jolla Band of Luiseno Mission Indians of the La Jolla Reservation, California	303
La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation, California	334
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of the Lac Courte Oreilles Reservation of Michigan	241
Lac du Flambeau Band of Lake Superior Chippewa Indian of the Lac du Flambeau Reservation of WI	246
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada	353
Lookout Rancheria of Pit River Indians, California	381
Los Coyotes Band of Cahuilla Mission Indians of the Los Coyotes Reservation, CA	258
Lovelock Paiute Tribe of the Lovelock Indian Colony, Nevada	354
Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota	280

Lower Elwha Tribal Community of the Lower Elwha Reservation, Washington	213
Lower Sioux Indian Community of the MA Mdewakanton Sioux Indian of the Lower Sioux Reservation in MN	281
Lummi Tribe of the Lummi Reservation, Washington	069
Makah Indian Tribe of the Makah Indian Reservation, Washington	071
Manchester Band of Pomo Indians of the Manchester, Pt Arena Rancheria, California	395
Manzanita Band of Diegueno Mission Indians of the Manzanita Reservation, California	335
Maricopa	888
Mashantucket Peguot Tribe of Connecticut	206
Menominee Indian Tribe of Wisconsin Menominee Indian Reservation, Wisconsin	074
Mesa Grande Band of Diegueno Mission Indians of the Mesa Grande Reservation, California	336
Mescalero Apache Tribe of the Mescalero Reservation, New Mexico	008
Miami Tribe of Oklahoma	076
Miccosukee Tribe of Indians of Florida	077
Middletown Rancheria of Pomo Indians of California	396
MN Chippewa Tribe, MN (six Component Res: Boise Ft Band Nett Lake, Fond du Lac Band, Grand Portage Band, Leech Lake Band, Mille Lac Band, White Earth Band)	242
Mississippi Band of Choctaw Indians, Mississippi	032
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada	355
Modoc Tribe of Oklahoma	080
Montgomery Creek Rancheria of Pit River Indians of California	382
Mooretown Rancheria of Maidu Indians of California	315
Morongo Band of Cahuilla Mission Indians of the Morongo Reservation, California	259
Muckleshoot Indian Tribe of the Muckleshoot Reservation, Washington	082
Narragansett Indian Tribe of Rhode Island	191

Navajo Tribe of Arizona, New Mexico and Utah	084
Nez Perce Tribe of Idaho, Nez Perce Reservation, Idaho	085
Nisqually Indian Community of the Nisqually Reservation, Washington	086
Nooksack Indian Tribe of Washington	088
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana	026
Northfork Rancheria of Mono Indians of California	419
Northwestern Band of Shoshone Indians of Utah (Washakie)	220
Oglala Sioux Tribe of the Pine Ridge Reservation, South Dakota	282
Omaha Tribe of Nebraska	089
Oneida Nation of New York	090
Oneida Tribe of Indians of WI, Oneida Reservation, Wisconsin	294
Onondaga Nation of New York	217
Osage Tribe of Oklahoma	091
Otoe-Missouria Tribe of Oklahoma	079
Ottawa Tribe of Oklahoma	093
Paiute Indian Tribe of Utah	194
Paiute-Shoshone Indians of the Bishop Comm. of the Bishop Colony, California	365
Paiute-Shoshone Indians of the Fallon Reservation and Colony, Nevada	366
Paiute-Shoshone Indians of the Lone Pine Community of the Lone Pine Reservation, California	367
Pala Band of Luiseno Mission Indians of the Pala Reservation, California	304
Pascua Yaqui Tribe of Arizona	187
Passamaquoddy Tribe of Maine - Pleasant Point	188
Passamaquoddy Tribe of Maine - Indian Township	189
Pauma Band of Luiseno Mission Indians of the Pauma and Tuima Reservation, CA	305

Pawnee Indian Tribe of Oklahoma	097
Pechanga Band of Luiseno Mission Indians of the Pechanga Reservation, California	306
Penobscot Tribe of Maine	190
Peoria Tribe of Oklahoma	184
Picayune Rancheria of Chukchansi Indians of California	425
Pinoleville Rancheria of Pomo Indians of California	397
Pit River Indian Tribe, X-L Ranch Reservation, California	383
Poarch Band of Creek Indians of Alabama	207
Ponca Tribe of Indians Oklahoma	102
Port Gamble Indian Community of the Port Gamble Reservation, Washington	214
Potter Valley Rancheria of Pomo Indians of California	403
Prairie Band of Potawatomi Indians of Kansas	105
Prairie Island Indian Community of MN Mdewakanton Sioux Indian of the Prairie Island Reservation, MN	273
Pueblo of Acoma, New Mexico	107
Pueblo of Cochiti, New Mexico	108
Pueblo of Jemez, New Mexico	110
Pueblo of Isleta, New Mexico	109
Pueblo of Laguna, New Mexico	111
Pueblo of Nambe, New Mexico	112
Pueblo of Picuris, New Mexico	113
Pueblo of Pojoaque, New Mexico	100
Pueblo of San Felipe, New Mexico	115
Pueblo of San Juan, New Mexico	117
Pueblo of San Ildefonso, New Mexico	116

Utu Utu Gwaiti Paiute Tribe of the Benton Paiute Reservation, California	350
Viejas Baron Long Captain Grande Band of Diegueno Mission Indians, Viejas Reservation.	340
Viejas Group of Capitan Grande Band of Mission Indians of the Viejas Res, CA	413
Walker River Paiute Tribe of the Walker River Reservation, Nevada	358
Washoe Tribe of NV and CA (Carson Colony, Dresslerville and Washoe Ranches)	169
White Mountain Apache Tribe of the Fort Apache Indian Reservation, Arizona	233
Wichita Indian Tribe of Oklahoma	170
Winnebago Tribe of the Winnebago Reservation of Nebraska	171
Winnemucca Indian Colony of Nevada	375
Wisconsin Winnebago Indian Tribe of Wisconsin	295
Wyandotte Tribe of Oklahoma	173
Yankton Sioux Tribe of South Dakota	275
Yavapai-Apache Indian Community of the Camp Verde Reservation, Arizona	009
Yavapai-Prescott Tribe of the Yavapai Reservation, Arizona	175
Yerington Paiute Tribe of the Yerington Colony and Campbell Ranch, Nevada	359
Yomba Shoshone Tribe of the Yomba Reservation, Nevada	373
Yurok Tribe of the Hoopa Valley Reservation, California	410
Zuni Tribe of the Zuni Reservation, New Mexico	124
Alaska Villages	
Ahtna, Inc.	500
Akhiok, Native Village of Akhiok	501
Akiachak, Native Village of Akiachak	502
Akiak Native Community	503
Akutan, Native Village of Akutan	504
Alakanuk, Village of Alakanuk	505
Alatna Village	506
Alegnagik, Village of Alegnagik	507
Aleut Corporation	508
Allakaket Village	509

Appendix B -- 3
THE STRONG HEART STUDY V
Instructions for Medical History Interview

Before beginning, make certain that the correct study identification number of the participant is entered at the top of the form. Explain to the participant that some questions need to be asked about her/his medical history so that we can better evaluate whether or not she/he has heart disease or a tendency for heart disease. Stress that the information will be confidential and that his/her name will never be used in any publication.

A. We would appreciate it if you can give us information about your past medical history.

I am going to ask about a number of medical conditions. Did you ever see a doctor or other health care professional for any of the problems that I am going to mention. (Note to Interviewer: When inquiring about how many years ago, if the patient has trouble remembering, try to ask in what year or how old they were when they had the condition; we can then calculate from their current age or from the current year, the number of years ago and enter it in the appropriate box).

1. High Blood Pressure. For high blood pressure, the interviewer should be alert for those individuals who answer no, who might in fact have been prescribed or taking medication for hypertension. If the patient does not know when the hypertension first began, ask when they first began taking medication for high blood pressure and record that date.

2. Arthritis. The interviewer should also inquire about arthritis.

3. Fractures associated with osteoporosis should be explained as fractures caused by bones getting weak. Such fractures often occur in older people with minor trauma or sometimes with no history of trauma. Back bones (vertebrae) can sometimes collapse (compression fractures), and such fractures are usually caused by osteoporosis when they occur in older people. Record the location of each fracture that you feel is related to osteoporosis.

4. Rheumatic heart disease is a sequela of rheumatic fever and typically stenosis or insufficiency (tightness or leakiness) of the valves of the heart.

5. Gallstones. If participants say they have had their gall bladder removed, check "yes" because almost all cholecystectomies are done for gallstones.

6. Cancer. The interviewer, when inquiring about cancer, should ask about cancer and diseases such as leukemia, lymphoma and tumors of the skin. If they answer yes, record the type of cancer.

7. Diabetes and type of treatment. The interviewer should be alert to individuals who reply no, who are in fact taking oral hypoglycemic agents or insulin. If they have diabetes, ask if they still have it and when they were first told they had diabetes. Also record the type of treatment they are taking. Check "yes" for "do nothing" if they are not taking any medication nor exercising, nor controlling their diet for their diabetes.

8. Kidney Failure. The interviewer should describe this as kidney failure if she/he has been told that their kidneys are not working.

9-10. Renal dialysis and transplantation. When inquiring about renal dialysis, the interviewer should also ask if the patient must go two or three times a week to have a machine cleanse his/her blood. If they have not had a transplant, ask them if they are on the waiting list for a transplant.

11. Cirrhosis of the Liver or Yellow Jaundice. The interviewer should stress that this can occur both because of alcohol and for other reasons as well.

HEART PROBLEMS:

12. Heart catheterization. Ask if patient had any kind of heart catheterization. If "yes", determine whether they had an angioplasty or other procedure, the date of the procedure and also the hospital where it was done. This should not include use of a treadmill for exercise purposes. Show the participant a picture of a diagnostic treadmill exercise test.

13. Angioplasty (balloon, PCTA, or stent procedure). Ask if the participant ever had an angioplasty procedure. If yes, record when and where.

14. Treadmill test, exercise test, or Chemical Stress test to examine the heart. If "yes", determine the date of the procedure and the hospital where it was done.

15. Heart failure. "That is, did the doctor or health care provider ever tell you that your heart was not working properly?" The necessity to sleep with several pillows (orthopnea) suggests heart failure.

16. Heart Attack. When inquiring about heart attack, this would usually have involved hospitalization, but in some instances, the patient could have been told they had a heart attack in the past on the basis of an electrocardiogram. If the patient indicates that she/he had a heart attack, ask if there were more than one. Obtain information for the most recent ones.

17. If the patient indicates that she/he has had other heart trouble, the interviewer should ask about the symptoms.

18. Stroke. If the participant indicates that she/he has not had a stroke, ask also whether she/he has had any episode where she/he suddenly could not move a part of her/his body for a prolonged period of time.

19. Surgery on chest. Question 19a is designed to ensure that we get accurate information on cardiac surgery so that medical records can be obtained. Use anatomical diagrams if available to help the participants recall the type of surgery they had.

20. Ask if participant is taking aspirin everyday to prevent a heart attack or stroke.

Appendix B -- 4
THE STRONG HEART STUDY V
Instructions for Reproduction and Hormone Use: Women Only

If the patient is a female, explain that we know that in many cases, women appear to be protected from heart disease. Therefore it is necessary for us to ask some questions about their reproductive history, because we are trying to better understand why women appear to have less heart disease.

1-4. After inquiring about the number of times pregnant and the number of live births and abortions, the number of live births plus the number of pregnancies lost, should equal the number of times pregnant. (Unless one or more births of twins, etc. occurred).

6. Ask if hypertension developed during first pregnancy.

7. Ask if told she had Preeclampsia during that pregnancy.

8. Ask about number of cigarettes smoked while pregnant.

9. Ask if participant had Preeclampsia in one or more subsequent pregnancies (if any).

10. Ask if participant had ever had eclampsia during a pregnancy.

11. Ask if the participant's mother or a sister ever had Preeclampsia.

12. Ask about use of birth control pills and be sure they are recorded on the medication history if they are currently taking them. Ask the participant when she first used birth control pills and for how long.

13. Ask about use of birth control implant. Ask the participant when she first used a birth control implant and for how long.

14. Ask about use of birth control shots, such as Depo Provera. Ask the participant when she first used birth control shots and for how long.

15. Ask when the participant started to have regular menstrual cycles (periods). Record the age in years.

16. Ask the participant whether her menstrual cycles have stopped. If "Yes", ask her whether the periods stopped more than 12 months. If "Yes", ask participant her age when her periods stopped completely and the reason menstruation stopped. The interviewer should ask whether the menopause or the cessation of periods occurred naturally or whether it occurred after an operation to remove the womb or uterus.

ESTROGEN AND PROGESTERONE

Use the questionnaire as written. If participant is currently taking estrogen pills other than birth control pills, be sure they are recorded on the medication history.

17-22. Use questionnaire as written to obtain information about estrogen use. Record when the participant started to use estrogen, for how long altogether, reason(s) for using estrogen, and if progesterone was also used in combination with or in addition to estrogen.

23-24. Ask the participant whether she is still using estrogen at the time of interview. If not, why?

25-28. Ask the participant whether she ever has ever used progesterone alone. If yes, when started and for how long and whether still taking progesterone.

Appendix B -- 5
THE STRONG HEART STUDY V
Instructions for Use of the Rose Questionnaire
for Angina and Intermittent Claudication

This questionnaire, originally developed by Rose & Blackburn, has been the mainstay of cardiovascular disease surveys for a number of years. The primary feature of this questionnaire is to have a standardized assessment for the pain associated with angina and intermittent claudication. Since it is well recognized that there can be many other causes for both chest and leg pain, the main objective of the questionnaire is to ask a series of questions so that certain patterns of pain will be assigned positively and others will not be assigned. For this reason, it is important that the questions be asked in the order stated. In addition, during several points of the questionnaire, there is an asterisk if a certain answer is received. The purpose of this asterisk is to assure that the questioner then proceeds to the next section. If an answer is received that has an asterisk, it has been determined that this answer indicates that the pain is not characteristic of either angina or intermittent claudication and thus, it is not necessary to proceed with that section.

The questions are essentially self-explanatory. It is permissible, and in fact advisable, when referring to pain or discomfort in the chest to elaborate to describe this pain as a tightening or crushing feeling that may or may not radiate onto the left arm.

In addition, since this is a standardized questionnaire developed in Britain, phrases such as "carry-on" can also be described as "keep on going" or "continue to walk or climb".

Note that participants who are unable to walk should skip from Question 2 (section A) to Section B. Non-ambulatory participants also can skip to section C.

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

DIRECTIONS TO PARTICPANTS FOR USING THE PEDOMETER

The ACCUSPLIT Pedometer measures movement. You are being asked to wear this pedometer EVERY DAY for a seven-day period from _____ to _____. The pedometer is worn on the hip and should be clipped to the waistband of your pants/skirt, underwear, or belt. Most importantly, the pedometer must be worn in an upright position. Please keep the pedometer firmly against your body so it does not move around freely. **DO NOT LET THE PEDOMETER GET WET** by wearing it in the rain or while bathing or swimming. Please remember to reset the pedometer to "0" (zero) when you put it on in the morning and to record the number of steps from the pedometer in your activity record when you take it off at night.

If you have any questions, please contact _____ at _____.

Front View 

Side View 

SPECIFIC INSTRUCTIONS

1. Every morning, just before you put the pedometer on, push the *YELLOW* reset button so that the pedometer resets to "0".
2. Record the time that you attached the pedometer in your pedometer record. Make sure to indicate am or pm.
3. Wear the pedometer on your hip (please see pictures above), make sure to keep it upright, and make sure that it remains firmly in place against your body.
4. **Wear the pedometer ALL DAY except when bathing, swimming, or in the rain (unless the pedometer is protected by clothing and will not get wet). If you take off the pedometer for longer than 30 minutes, record the length of time it was off (minutes or hours) in your pedometer record.**
5. At bedtime, take off the pedometer. Record in your pedometer record (a) the number of steps taken on the pedometer, and (b) the time you removed your pedometer. Make sure to indicate am or pm.
6. Please do not touch the *YELLOW* reset button during the day or you will erase your activity numbers.
7. **Keep the cover closed or the pedometer will not record your activity.**
8. Do not wear the pedometer in a pants, coat, or shirt pocket. The pedometer will not work correctly.
9. Please bring back or mail to us, in the self-addressed stamped envelope, the pedometer record after you have completed your week.
10. Please keep the pedometer as a token of our appreciation for your participation in the Strong Heart Family Study.

Thank you very much for your time and effort.

APPENDIX C

STRONG HEART STUDY

PHASE V

Questionnaires and Data Forms

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PERSONAL INTERVIEW I

SHS I.D.: |___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

Social Security Number: |___|___|___|—|___|___|—|___|___|___|___|

Community Name: ______________________________ Community Code: |___|___|___|

DEMOGRAPHIC INFORMATION:

1. Your Name:

a. Last: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

b. First: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

c. Middle: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

d. Nickname/Other Name: |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

2. If ever married, what was your maiden name?

|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|

3. If married, what is your spouse's name? ***(if not married, go to Q4)***

____

Last First Middle

4. To which IHS and non-IHS Hospital/Clinic do you usually go? *List the one they go to most often first*. *Give names and codes.*

	Hospital	Chart number	IHS 1=yes, 2=no	Hospital Code
a.				
b.				
c.				
d.				

5. What is your current mailing address?

a. |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
Street/P.O. Box

b. |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
City/town

c. |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
County

d. State and zip code: |___|___|—|___|___|___|___|___|

6. Is your residential address the same as above?

Yes |___|1 No |___|2 ***If no, what is your current residential address?***

a. |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
Street

b. |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
City/town

c. |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
County

d. State and zip code: |___|___|—|___|___|___|___|___|

7. What is your home telephone number or at what telephone number can we reach you or leave a message?
0 = If unlisted
|___|___|___|—|___|___|___|—|___|___|___|___|
area code
9 = If no phone

8. What is your work or other contact telephone number?
0 = If same as home phone
|___|___|___|—|___|___|___|—|___|___|___|___|
area code
9 = If not applicable or unknown

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PERSONAL INTERVIEW II

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

BASIC INFORMATION:

1. Gender: Male |___| 1 Female |___| 2

2. Date of Birth: |___|___|/|___|___|/|___|___|___|___|
month day year

3. What is your marital status? |___|
Current

1 = Never married
2 = Currently married
3 = Divorced
4 = Separated
5 = Widowed
6 = Adult roommate/partner/significant other

Since we know the years of education may be a risk factor for some diseases, we need to ask about the years of education you have completed.

4. How many years of education have you completed? |___|___|___|
0-12 = Vo-tech or years of school (Vo-tech/GED = 12)
14 = Junior college 16 = Bachelors
18 = Masters 19 = Law Degree
20 = Doctorate 999 = Unknown

WEIGHT SATISFACTION:

5. Are you satisfied with your present weight?

Yes |___| 1 ***(go to Q8)*** No |___| 2 Unknown/unsure |___| 9

6. Do you want to lose or gain weight: Lose |___| 1 Gain |___| 2

7. How do you plan to do this?

		Less	More	No change
a)	Eating	|___| 1	|___| 2	|___| 3
b)	Physical activity	|___| 1	|___| 2	|___| 3
c)	Medication		Yes |___| 1	No |___| 2
d)	Other, specify: _____		Yes |___| 1	No |___| 2

8. How often did you drink diet drinks, like diet Coke, diet Pepsi, diet Dr. Pepper, diet lemonade or diet iced tea, etc., in the PAST WEEK? **(Please check only one.)**

|___|

0 = Never
1 = Once a week
2 = Twice a week
3 = Three to four times a week
4 = Five to six times a week
5 = Everyday
6 = More than once a day
9 = Don't know or can't remember

9. How often do you use artificial sweeteners to sweeten your drinks, such as coffee or tea? **(Please check only one.)** |___|

0 = Never ***(go to Q11)*** 1 = Occasionally 2 = Often 3 = Always

10. If you ever use artificial sweeteners, what type do you use? If uncertain of type, ask for packet color. **(Please check all that apply.)**

a) Saccharin, such as Sweet 'N Low (usually in a pink packet) Yes |___| 1 No |___| 2

b) Sucralose, such as Splenda (usually in a yellow packet) Yes |___| 1 No |___| 2

c) Aspartame, such as Equal or NutraSweet (usually in a blue packet) Yes |___| 1 No |___| 2

d) Other, such as Cyclamate, Weight Watchers or Acesuflame Potassium, like Sunett Yes |___| 1 No |___| 2

e) Don't know, don't care Yes |___| 1 No |___| 2

FAMILY INCOME:

11. Does your household income meet your family's needs?

Yes |___| 1 No |___| 2 Unsure |___| 9

12. Are you going to school? Yes |___| 1 No |___| 2

13. How many hours per week do you work at a job or jobs that pay you a salary or wage? *(Fill in number of hours)* |___|___|___|

14. Which of the following categories best describes your annual **household** income from all sources? *Please show a list.*

Less than 5,000 |___| 1
5,000 to 10,000 |___| 2
10,000 to 15,000 |___| 3
15,000 to 20,000 |___| 4
20,000 to 25,000 |___| 5
25,000 to 35,000 |___| 6
35,000 to 50,000 |___| 7
Over 50,000 |___| 8
Don't know/not sure |___| 9
Refused |___| 0

TOBACCO:

15. During your lifetime have you smoked 100 cigarettes or more total?

Yes |___| 1 No |___| 2 ***(go to Q23)***

16. How old were you when you first started smoking regularly? |___|___|___|
(Indicate age at which you started smoking)
0 = Never smoked regularly 999 = Unknown

17. Did you quit smoking? Yes |___| 1 No |___| 2 ***(go to Q18)***

a) If you quit, when did you last smoke?
(Just the year, please) |___|___|___|___|

b) What reason(s) did you have for quitting?
Please check *all that apply:*

		Yes	No
i)	Doctor's advice	|___| 1	|___| 2
ii)	Health concerns	|___| 1	|___| 2
iii)	Expenses	|___| 1	|___| 2
iv)	Family pressure	|___| 1	|___| 2
v)	Peer pressure	|___| 1	|___| 2
vi)	Other	|___| 1	|___| 2

specify: _____

18. On the average, how many cigarettes do/did you usually smoke per day? |___|___|___|
(Please give an average for a typical week)
0 = Less than one cigarette per day

a) If the average is less than one cigarette per day,
number of cigarettes per month? |___|___|___|

19 . On which occasions are/were you most likely to smoke or increase your smoking?
Please read the list and check the appropriate response.

		Yes	No
a)	stressful times	|___| 1	|___| 2
b)	casinos	|___| 1	|___| 2
c)	wakes/funerals	|___| 1	|___| 2
d)	when drinking alcohol	|___| 1	|___| 2
e)	social meetings	|___| 1	|___| 2
f)	when you have extra money	|___| 1	|___| 2
g)	bingo	|___| 1	|___| 2
h)	school	|___| 1	|___| 2
i)	other, specify: _____	|___| 1	|___| 2

20. On the occasions that your smoking increased, how many total cigarettes do/did you smoke per day? |___|___|___|

21. Do you smoke cigarettes now? Yes |___| 1 No |___| 2
(If No, go to Q23)

22. If you currently smoke, would you like to change your smoking habit?

Yes |___| 1 No |___| 2
(If No, go to Q23)

a) If yes, would you prefer to…		Yes	No
i)	Reduce the number of cigarettes per day	|___| 1	|___| 2
ii)	Switch to lower “tar” or “nicotine” cigarettes	|___| 1	|___| 2
iii)	Use nicotine patch/chewing gum/medications	|___| 1	|___| 2
iv)	Quit	|___| 1	|___| 2
v)	Other, specify: _____	|___| 1	|___| 2

23. Do you use chewing tobacco/snuff now? Yes |___| 1 No |___| 2
(If No, go to Q25)

24. If yes, how many times a day do you use it? _____ times/day. (Enter 0 if less than once a day or used sporadically.)

PASSIVE SMOKING:

25. Whether or not you smoke, on the average, how many hours a day are you exposed to the smoke of others? |___|___|___|
(If none fill in 0; enter 1 for 30 minutes or more, enter 0 if less than 30 minutes.)

ALCOHOL:

PLEASE READ THE FOLLOWING TO THE PARTICIPANT:
ALCOHOL QUESTIONS

The next few questions are about the use of wine, beer or liquor, including all kinds of alcoholic beverages. We are asking these questions about alcohol because we think alcohol consumption may be related to heart disease. We assure you that this information is strictly confidential and that we are not judging your drinking habits and do not intend to report them to anyone. GIVE DRINKS CHART TO PARTICIPANT. Sometimes it's hard to count drinks, so here is a chart to show you what we mean. REVIEW CHART WITH PARTICIPANT: READ IF NECESSARY.

One whole 12 ounces can of beer = 1 drink
A whole six-pack of beer = 6 drinks
One case of beer = 24 drinks
One quart of beer = 2.5 drinks
One pint of beer = 1.3 drinks
One 40 ounces of beer = 3.3 drinks
A glass (4 ounces) of wine = 1 drink
One pint (16 ounces) of wine = 4 drinks
One quart (32 ounces) of wine = 8 drinks
A shot or gulp of straight hard liquor, like whiskey = 1 drink
One pint (16 ounces) of hard liquor = 12 drinks
One quart (32 ounces) of hard liquor = 24 drinks
A full glass of a mixed drink, like everclear in punch = 1 drink

26. Have you ever consumed alcoholic beverages?

Yes |___| 1 No |___| 2 ***(go to Q33)***

a) If "YES," when was your last drink? *(Choose only one)*

|___| 1 Within the last week

|___| 2 Within the last month

|___| 3 Within the last year. Number of months |___|___|___|

|___| 4 More than a year ago ***(go to Q33)***

27. How many alcoholic drinks do you have in a typical week? |___|___|___|

28. How many days in a typical month do you have at least one drink? |___|___|___|
(Indicate the number of days per month.)

29. On the days when you drink any liquor, beer or wine, about how many drinks do you have, on average? *(Indicate number of drinks per day.)* |___|___|___| (# of Drinks)

30. When you drink more than your usual amount, how many **total** drinks do you have? |___|___|___| (# of Drinks)

a) How many times in a month? |___|___|___| (# Times/Month)

31. How many times during the **PAST MONTH** did you have 5 or more drinks on an occasion? Indicate times per month. *(Enter zero if subject has quit drinking more than one month ago.)* |___|___|___|

32. How many times during the **PAST YEAR** did you have 5 or more drinks on an occasion? |___|___|___|

PERCEIVED STRESS

In the past month, how often have you (Q33-39):

		Not at all	Rarely	Sometimes	Often	Most of the time	Not Sure
33.	been upset because of something that happened unexpectedly?	|___| 1	|___| 2	|___| 3	|___| 4	|___| 5	|___| 9
34.	felt nervous or "stressed"?	|___| 1	|___| 2	|___| 3	|___| 4	|___| 5	|___| 9
35.	dealt with irritating life hassles?	|___| 1	|___| 2	|___| 3	|___| 4	|___| 5	|___| 9
36.	felt that things were going your way?	|___| 1	|___| 2	|___| 3	|___| 4	|___| 5	|___| 9
37.	felt unable to control irritations in your life?	|___| 1	|___| 2	|___| 3	|___| 4	|___| 5	|___| 9
38.	felt that you were on the top of things?	|___| 1	|___| 2	|___| 3	|___| 4	|___| 5	|___| 9
39.	felt difficulties or problems were piling up so high that you could not handle them?	|___| 1	|___| 2	|___| 3	|___| 4	|___| 5	|___| 9

40. On the average, how much time per day do you watch TV? |___|___|:|___|___|
hours minutes

ADMINISTRATIVE INFORMATION:

41. How reliable was the participant in completing the questionnaire?

Very reliable |___| 1 Reliable |___| 2 Unreliable |___| 3

Very unreliable |___| 4 Uncertain |___| 5

42. Did the participant complete **ALL** or **PART** of the interview?

Yes, completed **ALL** or **PART** of the interview |___| 1

No, refused **ALL** questions |___| 2

43. Interviewer code: |___|___|___|

44. Interview date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MEDICAL HISTORY

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

IS THE PARTICIPANT FEMALE? Yes |___| 1 No |___| 2

MEDICAL CONDITIONS:

"Now I'd like to ask you some questions about medical problems. Has a medical person **EVER** told you that you had any of the following conditions?"

1. a) High blood pressure?

   Yes |___| 1 No |___| 2 Only during pregnancy |___| 3 Unknown |___| 9

   b) If "YES," how old were you when you were first told by a medical person that you had high blood pressure (for women, not during pregnancy)? Indicate the actual age. Don't know = 999 |___|___|___|

   c) If "YES," are you taking any medication to control your blood pressure?

   Yes |___| 1 No |___| 2 Unknown |___| 9

		YES	NO	UNKNOWN
2.	Arthritis?	|___| 1	|___| 2	|___| 9
3.	Any fractures associated with brittle bone disease or osteoporosis?	|___| 1	|___| 2	|___| 9
	a) If "YES," where? _____			
4.	Rheumatic heart disease?	|___| 1	|___| 2	|___| 9
5.	Gallstones?	|___| 1	|___| 2	|___| 9
6.	Cancer, including leukemia and lymphoma?	|___| 1	|___| 2	|___| 9
	a) If "YES," specify type of cancer: _____			

7. Diabetes? Yes |___| 1 No |___| 2 Only during pregnancy |___| 3 Unknown |___| 9
(If No or Unknown, go to Q8)

a) How old were you when you were first told by a medical person that you had diabetes? *Indicate the actual age.* Don't know = 999 |___|___|___|

b) What type of treatment are you taking for your diabetes? *(Check appropriate answer.)*

		YES	NO
i)	insulin	|___| 1	|___| 2
ii)	oral hypoglycemic agent	|___| 1	|___| 2
iii)	by dietary control	|___| 1	|___| 2
iv)	by exercise	|___| 1	|___| 2
v)	do nothing	|___| 1	|___| 2
vi)	other: _____	|___| 1	|___| 2

	YES	NO	UNKNOWN
8. Has a medical person ever told you that you had kidney failure?	|___| 1	|___| 2	|___| 9

(If No or Unknown, go to Q11)

a) If "YES," are one or both working well now? |___| 1 |___| 2 |___| 9

b) How old were you when you were first told by a medical person that you had kidney failure? *Indicate the actual age.* Don't know = 999 |___|___|___|

	YES	NO	UNKNOWN
9. Are you currently on renal dialysis?	|___| 1	|___| 2	|___| 9
10. Have you ever had a kidney transplant?	|___| 1	|___| 2	|___| 9
a) If "YES," is the new kidney working well?	|___| 1	|___| 2	|___| 9
b) If "NO," are you waiting for a kidney transplant?	|___| 1	|___| 2	|___| 9
11. Cirrhosis of the liver?	|___| 1	|___| 2	|___| 9

HEART PROBLEMS:

12. Have you had a heart catheterization? Yes |___| 1 No |___| 2 Unknown |___| 9

(A heart catheterization is a study in which a tube is inserted into the heart through the groin or arm to see how the heart works.)

a) If "YES," when and where *(most recent)*? |___|___|/|___|___|/|___|___|___|___|
month day year

i) hospital/clinic: _____

13. Have you ever had an angioplasty (balloon, PCTA or Stent procedure)?

Yes |___| 1 No |___| 2 Unknown |___| 9

a) If "YES," when and where *(most recent)*? |___|___|/|___|___|/|___|___|___|___|
month day year

i) hospital/clinic: _____

14. Have you ever had a diagnostic exercise test or Chemical Stress test to check your heart?

Yes |___| 1 No |___| 2 Unknown |___| 9

a) If "YES," when and where? |___|___|/|___|___|/|___|___|___|___|
month day year

i) hospital/clinic: _____

Has a doctor ever told you that you had any of the following conditions?
*(If more than one episode, enter information for the **MOST RECENT.**)*

15. Congestive heart failure? Yes |___| 1 No |___| 2 Unknown |___| 9

a) If "YES," when and where? |___|___|/|___|___|/|___|___|___|___|
month day year

i) hospital/clinic: _____

b) If "YES," do you still have heart failure now? Yes |___| 1 No |___| 2 Unknown |___| 9

16. Heart attack? Yes |___| 1 No |___| 2 Unknown |___| 9

a) If "YES," when and where? |___|___|/|___|___|/|___|___|___|___|
month day year

i) hospital/clinic: _____

17. Any other heart trouble? Yes |___| 1 No |___| 2 Unknown |___| 9

a) If "YES," please specify type: _____

b) If "YES," when and where? |___|___|/|___|___|/|___|___|___|___|
month day year

i) hospital/clinic: _____

18. Stroke? Yes |___| 1 No |___| 2 Unknown |___| 9

a) If "YES," when and where? |___|___|/|___|___|/|___|___|___|___|
month day year

i) hospital/clinic: _____

19. Have you ever had surgery on your chest? Yes |___| 1 No |___| 2
(go to Q20)

a) Was it heart surgery? Yes |___| 1 No |___| 2 Unknown |___| 9
(go to Q20)

If "YES," which surgery have you had?

i) Bypass? Yes |___| 1 No |___| 2 Unknown |___| 9

If "YES," when and where *(most recent)*? |___|___|/|___|___|/|___|___|___|___|
month day year

hospital/clinic: _____

ii) Valvular repair/replacement? Yes |___| 1 No |___| 2 Unknown |___| 9

If "YES," when and where *(most recent)*? |___|___|/|___|___|/|___|___|___|___|
month day year

hospital/clinic: _____

iii) Pacemaker? Yes |___| 1 No |___| 2 Unknown |___| 9

If "YES," when and where *(most recent)*? |___|___|/|___|___|/|___|___|___|___|
month day year

hospital/clinic: _____

iv) Other? Yes |___| 1 No |___| 2

If "YES," when and where *(most recent)*? |___|___|/|___|___|/|___|___|___|___|
month day year

Please specify: _____

hospital/clinic: _____

20. Are you taking aspirin daily to prevent a heart attack or a stroke?

Yes |___| 1 No |___| 2 Unknown |___| 9

ADMINISTRATIVE INFORMATION:

21. Did the participant complete **ALL** or **PART** of the interview?

Yes, completed **ALL** or **PART** of the interview |___| 1

No, refused **ALL** questions |___| 2

22. Interviewer code: |___|___|___|

23. Interview date: |___|___|/|___|___|/|___|___|___|___|
month day year

IF THE PARTICIPANT IS FEMALE GO TO REPRODUCTION AND HORMONE USE.

IF THE PARTICIPANT IS MALE GO TO ROSE QUESTIONNAIRE.

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

REPRODUCTION AND HORMONE USE (WOMEN ONLY)

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

"The following questions are related to your childbearing history and childbearing organs."
(For Q1 – Q4, use 999 for Unknown.)

1. How many times have you been pregnant (gravidity)? |___|___|___|
(If never pregnant, go to Q12.)

2. How many of your pregnancies resulted in a live birth (parity)? |___|___|___|

3. How many living children do you have? |___|___|___|

4. How many pregnancies did you lose (including miscarriage or stillbirth)? |___|___|___|

Preeclampsia (pree-i-CLAMP-see-ah), also called toxemia, is a condition that typically starts after the 20th week of pregnancy and is related to increased blood pressure and protein in the mother's urine.

5. Did you develop hypertension during your first pregnancy?

Yes |___| 1 No |___| 2 Not sure |___| 3

6. During that (first) pregnancy, were you told you had preeclampsia, toxemia or protein in your urine? **(If BOTH Q5 and Q6 are NO go to Q8.)**

Yes |___| 1 No |___| 2

7. How many weeks pregnant were you when you were first diagnosed with hypertension or preeclampsia (*full term pregnancy is about 40 weeks, use 999 for unknown)*?

|___|___|___|

8. Approximately how many cigarettes/day did you smoke during your pregnancy *(enter "0" if you did not smoke, use 999 for unknown)*?

|___|___|___|

9. Did you have preeclampsia, toxemia, or both hypertension and protein in your urine in one or more subsequent pregnancies?

Yes |___| 1 No |___| 2 Not sure |___| 3

10. Did you ever have eclampsia, i.e. a seizure (convulsion or "fit") along with hypertension during a pregnancy or around the time of delivery?

Yes |___| 1 No |___| 2 Not sure |___| 3

11. Did your mother or sister ever have preeclampsia?

Yes |___| 1 No |___| 2 Not sure |___| 3

12. Have you ever used birth control pills? Yes |___| 1 No |___| 2 Not sure |___| 3
(If NO or NOT SURE, go to Q13.)

a) Are you still using birth control pills? Yes |___| 1 No |___| 2

b) How old were you when you started to use birth control pills?
Indicate the age in years. 999 = unknown |___|___|___|

c) How many years altogether did you use them? |___|___|
*Specify the duration **in years**. 0 = less than 6 months, 1 = 6–12 months, 999 = unknown.*

13. Have you ever had a birth control implant (such as Norplant)?

Yes |___| 1 No |___| 2 Not sure |___| 3
(If NO or NOT SURE, go to Q14.)

a) Are you still using a birth control implant? Yes |___| 1 No |___| 2

b) How old were you when you started to use a birth control implant?
Indicate the age in years. 999 = unknown, can't remember |___|___|___|

c) How many years altogether did you use it? |___|___|___|
*Specify the duration **in years**. 0 = less than 6 months, 1 = 6-12 months, 999 = unknown.*

14. Have you ever used birth control shots (such as Depo Provera)?

Yes |___| 1 No |___| 2 Not sure |___| 3
(If NO or NOT SURE, go to Q15.)

a) Are you still using birth control shots? Yes |___| 1 No |___| 2

b) How old were you when you started to use birth control shots?
Indicate the age in years. 999 = unknown, can't remember |___|___|___|

c) How many years altogether did you use them? |___|___|___|
*Specify the duration **in years**. 0 = less than 6 months, 1 = 6-12 months, 999 = unknown.*

15. How old were you when you started to have regular menstrual cycles (periods)?
Indicate the age in years. 999 = unknown |___|___|___|

16. Have your menstrual cycles (periods) stopped? Yes |___| 1 No |___| 2***(go to Q17)***

a) If "YES," have they stopped for 12 months or more? Yes |___| 1 No |___| 2***(go to Q17)***

i) How old were you when your periods stopped completely?
Indicate the age in years. 999 = unknown, can't remember |___|___|___|

ii) Did your periods stop naturally, or because of surgery or hormone use, or for some other reason?

Natural |___| 1 ***(go to Q17)***

Surgery |___| 2

Hormonal |___| 3 ***(go to Q17)***

Other, specify: _____ |___| 4 ***(go to Q17)***

iii) If **SURGERY**, were <u>both</u> of your ovaries removed?

Yes |___| 1 No |___| 2 Unknown |___| 9

"ESTROGEN and PROGESTERONE are types of female hormones that may be taken for many reasons, including after a hysterectomy or menopause, to regulate your periods or for any other reasons."

17. Except for birth control pills, have you ever taken estrogen – either pills, as a patch or by shot – for any reason?

Yes |___| 1 No |___| 2 Not sure |___| 3

(If NO or NOT SURE, go to Q25.)

18. How old were you when you started using estrogen? *Indicate age in years.* |___|___|___|

19. How many years altogether did you take estrogen? *Specify duration in years.* |___|___|___|
(If less than 3 months, record 0. If more than 3 months but less than 1 year, record 1.)

20. Do/Did you use estrogen for (answer all applicable)

		YES	NO	NOT SURE
a)	post surgery (hysterectomy and removal of ovaries)	|___| 1	|___| 2	|___| 3
b)	relief of menopause symptoms	|___| 1	|___| 2	|___| 3
c)	prevent bone loss	|___| 1	|___| 2	|___| 3
d)	protect against heart disease	|___| 1	|___| 2	|___| 3
e)	doctor's advice	|___| 1	|___| 2	|___| 3
f)	other: _____	|___| 1	|___| 2	|___| 3

21. Do/Did you take progesterone in addition to, or in combination with, your estrogen treatment?

Yes |___| 1 No |___| 2 Not sure |___| 3

22. What form of estrogen are you taking? Is it a pill, patch, shot or other type?

pill |___| 1 patch |___| 2 shot |___| 3 other |___| 4 Not sure |___| 5

23. Are you still taking estrogen? Yes |___| 1 ***(go to Q25)*** No |___| 2 ***(go to Q24)***

24. Why did you stop taking estrogen?

		YES	NO	UNKNOWN
a)	Caused bleeding	|___| 1	|___| 2	|___| 9
b)	Made breasts tender	|___| 1	|___| 2	|___| 9
c)	Made you feel bloated	|___| 1	|___| 2	|___| 9
d)	Made you feel "funny," didn't like the way you felt	|___| 1	|___| 2	|___| 9
e)	Do not like taking any medicines	|___| 1	|___| 2	|___| 9
f)	Too expensive	|___| 1	|___| 2	|___| 9
g)	Doctor's advice	|___| 1	|___| 2	|___| 9
h)	Concerned about long-term side effects	|___| 1	|___| 2	|___| 9
i)	Other:_____	|___| 1	|___| 2	|___| 9

25. Other than in combination with estrogens, have you ever taken progesterone by itself for any reason?

Yes |___| 1 No |___| 2 Not sure |___| 3

(If NO or NOT SURE, go to Q29.)

26. How old were you when you started using progesterone? *Indicate age in years.* |___|___|___|

27. How many years altogether did you take progesterone? *Specify duration in years.* |___|___|___|
(If less than 3 months, record 0. If more than 3 months, but less than 1 year, record 1.)

28. Are you still taking progesterone? Yes |___| 1 No |___| 2

ADMINISTRATIVE INFORMATION:

29. Did the participant complete **ALL** or **PART** of the interview?

Yes, completed **ALL** or **PART** of the interview |___| 1

No, refused **ALL** questions |___| 2

30. Interviewer Code: |___|___|___|

31. Interview date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

ROSE QUESTIONNAIRE FOR ANGINA AND INTERMITTENT CLAUDICATION

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

Chest Pain on Effort

1. Have you ever had any pain or discomfort in your chest? Yes |___|1

   No |___|2 ***(go to Q10)***

2. Do you get it when you walk uphill, upstairs or hurry? Yes |___|1

   No |___|2 ***(go to Q9)***

   Never hurries or walks uphill or upstairs |___|3

   Unable to walk |___|4 ***(go to Q9)***

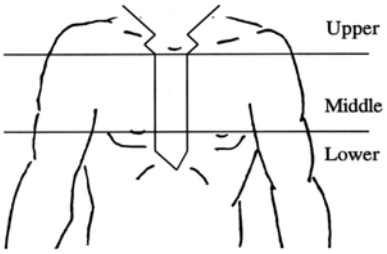
3. Do you get it when you walk at an ordinary pace on the level? Yes |___|1 No |___|2

4. What do you do if you get it while you are walking? Stop or slow down |___|1
   (*Record "stop or slow down" if subject carries on after taking nitroglycerine.*)
   Carry on |___|2 ***(go to Q9)***

5. If you stand still, what happens to it? Relieved |___|1 Not relieved |___|2 ***(go to Q9)***

6. How soon? 10 minutes or less |___|1 More than 10 minutes |___|2 ***(go to Q9)***

7. Will you show me where it was ?
   (*Record all areas mentioned. Use the diagram below to show the location if participant cannot tell exactly.)*



	YES	NO
Sternum (upper or middle)	|___|1	|___|2
Sternum (lower)	|___|1	|___|2
Left anterior chest	|___|1	|___|2
Left arm	|___|1	|___|2
Other: _____	|___|1	|___|2

8. Do you feel it anywhere else? Yes |___|1 No |___|2

   a) If "YES," record additional information: _____

Possible Infarction

9. Have you ever had a severe pain across the front of your chest lasting for half an hour or more?

Yes |___|1 No |___|2

Intermittent Claudication

10. Do you get pain in either leg on walking?
Yes |___|1
No |___|2 ***(go to Q19)***
Unable to walk |___|3 ***(go to Q19)***

11. Does this pain ever begin when you are standing still or sitting?
Yes |___|1 ***(go to Q19)***
No |___|2

12. In what part of your leg did you feel it?
Pain includes calf/calves |___|1
Pain does not include calf/calves |___|2

a) If calves not mentioned, ask: "Anywhere else?" *Please specify*: _____

_____ ***(go to Q19)***

13. Do you get it if you walk uphill or hurry?
Yes |___|1
No |___|2 ***(go to Q19)***
Never hurries or walks uphill |___|3

14. Do you get it if you walk at an ordinary pace on the level? Yes |___|1 No |___|2

15. Does the pain ever disappear while you are walking? Yes |___|1 ***(go to Q19)*** No |___|2

16. What do you do if you get it when you are walking? Stop or slow down |___|1

Carry on |___|2 ***(go to Q19)***

17. What happens to it if you stand still? Relieved |___|1

Not Relieved |___|2 ***(go to Q19)***

18. How soon? 10 minutes or less |___|1 More than 10 minutes |___|2

ADMINISTRATIVE INFORMATION:

19. Did the participant complete **ALL** or **PART** of the interview?

Yes, completed ALL **or** PART **of the interview** |___|1
No, refused **ALL** questions |___|2

20. Interviewer code: |___|___|___|

21. Interview date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PHYSICAL EXAMINATION

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

EXAMINATION OF EXTREMITIES FOR AMPUTATIONS

1. Are any extremities missing? Yes |___|1 No |___|2 ***(go to Q2)***

If "YES" to amputation, please code the cause of amputation:
1 = Diabetes 4 = Other, please specify
2 = Trauma 9 = Unknown
3 = Congenital

	Extremities	Check if Missing		Cause	If Other, please specify
a)	Right arm	|___|		|___|	_____
b)	Right hand	|___|		|___|	_____
c)	Right finger(s)	|___|	_____ # missing	|___|	_____
d)	Left arm	|___|		|___|	_____
e)	Left hand	|___|		|___|	_____
f)	Left finger(s)	|___|	_____ # missing	|___|	_____
g)	Right leg above knee	|___|		|___|	_____
h)	Right leg below knee	|___|		|___|	_____
i)	Right foot	|___|		|___|	_____
j)	Right toe(s)	|___|	_____ # missing	|___|	_____
k)	Left leg above knee	|___|		|___|	_____
l)	Left leg below knee	|___|		|___|	_____
m)	Left foot	|___|		|___|	_____
n)	Left toe(s)	|___|	_____ # missing	|___|	_____

BLOOD PRESSURE

2. Right arm circumference, measured in centimeters (cm) |___|___|___|
Midway between acromion and olecranon.

3. Cuff size (arm circumference in brackets)

Pediatric (under 24cm) |___|1
Regular arm (24 – 32cm) |___|2
Large arm (33 – 41cm) |___|3
Thigh (>41cm) |___|4

4. Pulse obliteration pressure |___|___|___|

5. Seated Blood Pressure:

	Systolic BP	***Diastolic BP***
a) **First** Blood Pressure Measurement	|___|___|___|	|___|___|___|
b) **Second** Blood Pressure Measurement	|___|___|___|	|___|___|___|
c) **Third** Blood Pressure Measurement	|___|___|___|	|___|___|___|

6. Were the above blood pressures taken from RIGHT arm?

Yes |___|1
No |___|2

Specify: _____

7. Recorder ID (For the SHS staff who took BP): |___|___|___|

ANTHROPOMETRIC MEASUREMENTS:
(Take off shoes and remove heavy objects from pockets.)

		METRIC SYSTEM (centimeters/kilograms)	***ENGLISH SYSTEM*** (inches/pounds)
8.	Height (Standing)	**|**___**|**___**|**___**|** centimeters	|___|___|___| inches
9.	Weight (Standing)	**|**___**|**___**|**___**|** kilograms	|___|___|___| pounds
10.	Hip circumference (Standing).....	**|**___**|**___**|**___**|** centimeters	|___|___|___| inches
11.	Waist measurement at umbilicus (Supine)...	**|**___**|**___**|**___**|** centimeters	|___|___|___| inches

PEDAL PULSES AND EDEMA

		PRESENT	ABSENT	MISSING LIMBS	UNABLE TO ASSESS
12.	Right posterior tibial pulse	|___|1	|___|2	|___|3	|___|9
13.	Right dorsalis pedis pulse	|___|1	|___|2	|___|3	|___|9
14.	Left posterior tibial pulse	|___|1	|___|2	|___|3	|___|9
15.	Left dorsalis pedis pulse	|___|1	|___|2	|___|3	|___|9

16. Pedal edema Absent |___|1 Mild |___|2 Marked |___|3

IMPEDANCE MEASUREMENT

17. a) Was impedance taken? Yes |___|1 ***(go to b)*** No |___|2

if No, due to:
(go to Q18)

Amputation |___|1
Wound/dressing |___|2
Cast |___|3
Dialysis shunt |___|4
Refusal |___|8

b) Taken on right side? Yes |___|1 ***(go to c)*** No |___|2

if No, due to:

Amputation |___|1
Wound/dressing |___|2
Cast |___|3
Dialysis shunt |___|4
Refusal |___|8

c) Resistance..... |___|___|___|

d) Reactance ..... |___|___|___|

DOPPLER BLOOD PRESSURE

Doppler blood pressure is measured in the posterior tibial artery. If not audible, use dorsalis pedis. Use left arm if left arm was used for standard blood pressure reading.

0 = neither posterior tibial artery nor dorsalis pedis artery was audible.
888 = participant refuses or if blood pressure is not taken for a medical reason or amputation.
999 = unable to obliterate (over 250 mmHg).

			Right arm	Right ankle	Left ankle
18.	a)	First systolic B.P.	|___|___|___|	|___|___|___|	|___|___|___|
	b)	Second systolic B.P.	|___|___|___|	|___|___|___|	|___|___|___|
	c)	Location	Posterior tibial |___|1	Posterior tibial |___|1	
			Dorsalis pedis |___|2	Dorsalis pedis |___|2	

ADMINISTRATIVE INFORMATION

19. Did the participant complete **ALL** or **PART** of this examination?

Yes, completed **ALL** or **PART** of the interview |___|1
No, refused **ALL** questions |___|2

20. Examiner code: |___|___|___|

21. Examination date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

SAMPLE COLLECTION CHECKLIST

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

1. Fasting SureStep Flex System glucose result. *999 = not done* |___|___|___|

2. Is ***FASTING*** blood sample taken?

   Yes, and participant has been fasting ..... |___|1

   Yes, but participant has NOT been fasting ..... |___|2

   No, participant has not been fasting ..... |___|3

   Other, specify: _____ |___|4

   No, participant refused ..... |___|8

3. When was the last time you ate? *(use military time)* |___|___|:|___|___|

4. Time of collection of fasting samples. *(use military time)* |___|___|:|___|___|

5. Is urine sample taken? Yes |___| 1 ***(go to Q7)*** No |___| 2

6. If no, why?

   On dialysis ..... |___|1

   Cannot urinate ..... |___|2

   Other, specify: _____ |___|3

7. Time of collection of urine sample *(use military time)* |___|___|:|___|___|

8. Blood Samples/Urine Checklist. Check the box(es) if samples were collected.

Item	Purpose	Type	Check
a) Three 10 ml SST	Chem Profile Lipids, Insulin, CRP, FFA	Serum	|___|
b) Two 2.7 ml Lt Blue (or one 4.5 ml Lt Blue)	Fibrinogen	Plasma	|___|
c) One 4 ml Gray	Fasting glucose	Plasma	|___|
d) Three 10 ml Purple	HbA1c, Leptin, DNA	Whole blood/Plasma/ Buffy coat	|___|
e) One Purple (size site specific)	CBC	Whole blood	|___|
f) Urine (One cup)	Albumin/Creatinine	Urine	|___|

9. Is this participant also a volunteer for blood/urine QC? Yes |___|1 No |___|2 ***(go to Q12)***

10. **QC ID (second digit is "3"):** |___|___|___|___|___|___|

11. QC samples checklist. Check the box(es) if samples were collected.

Item	Purpose	Type	Check
a) One 10 ml SST	Chem Profile Lipids, Insulin, CRP, FFA	Serum	|___|
b) Two 2.7 ml Lt Blue (or one 4.5 ml Lt Blue)	Fibrinogen	Plasma	|___|
c) One 4 ml Gray	Fasting glucose	Plasma	|___|
d) One 10 ml Purple	HbA1c/Leptin	Whole blood/Plasma	|___|
e) Urine (One cup)	Albumin/Creatinine	Urine	|___|

12. Instructions: "We ask you not to use any tobacco, caffeine or alcohol until you have completed your visit with us today. We do this so that your test results are not affected by use of these substances."
If you did, when and what: _____

ADMINISTRATIVE INFORMATION:

13. SHS Code of person completing this form: |___|___|___|

14. Today's Date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

CBC RESULTS

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

Each center's results may appear in different order. Please be careful when entering the results.

1. WBC (10^9/L or K/cmm or K/uL) ..... |___|___|.|___|___|
2. RBC (10^{12}/L or M/cmm or M/uL)..... |___|___|.|___|___|
3. HGB (g/dL) ..... |___|___|.|___|___|
4. HCT (%) ..... |___|___|___|.|___|___|
5. MCV (fL)..... |___|___|___|.|___|___|
6. MCH (pg)..... |___|___|.|___|___|
7. MCHC (g/dL) ..... |___|___|.|___|___|
8. RDW (%) ..... |___|___|.|___|___|
9. Platelet count (PLT. 109/L or K/cmm or K/uL)..... |___|___|___|___|.|___|___|
10. MPV (fL) ..... |___|___|.|___|___|

DIFFERENTIAL

Each center's results may appear in different order. Please be careful when entering the results.

11. NEUT (%)..... |___|___|.|___|___|
12. LYMPH (%) ..... |___|___|.|___|___|
13. MONO (%)..... |___|___|.|___|___|
14. EOS (%) ..... |___|___|.|___|___|
15. BASO (%)..... |___|___|.|___|___|

ADMINISTRATIVE INFORMATION:

16. Did the participant have a CBC? Yes |___|1 No |___|2
17. Completer code: |___|___|___|
18. Completion date: |___|___|/|___|___|/|___|___|___|___|
    month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

QUALITY OF LIFE

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

How is this questionnaire administered? By interviewer |___|1 By self |___|2 Refused |___|8

These next questions ask how you feel about your own health.

1. In general, would you say your health is? **(Please check only one.)**

   Excellent ..... |___|1
   Very good ..... |___|2
   Good ..... |___|3
   Fair ..... |___|4
   Poor ..... |___|5

The following items are about activities you might do during a typical day.
Does your health now limit you in these activities? If so, how much?

(Please check one number per line.)

		Yes, Limited a Lot	Yes, Limited a Little	No, Not Limited at All
2.	**Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	|___|1	|___|2	|___|3
3.	Climbing **several** flights of stairs (or climbing a hill)....	|___|1	|___|2	|___|3

During the PAST 4 WEEKS, have you had any of the following problems with your work or other regular daily activities AS A RESULT OF YOUR PHYSICAL HEALTH?

(Please check one answer per line.)

		Yes	No
4.	**Accomplished less** than you would like	|___|1	|___|2
5.	Were limited in the kind of work or other activities	|___|1	|___|2

During the PAST 4 WEEKS, have you had any of the following problems with your work or other regular daily activities AS A RESULT OF ANY EMOTIONAL PROBLEMS (such as feeling depressed or anxious)? (Please check one answer per line.)

		Yes	No
6.	**Accomplished less** than you would like	|___|1	|___|2
7.	Didn't do work or other activities as carefully as usual.....	|___|1	|___|2

8. **During the PAST 4 WEEKS, how much did pain interfere with your normal work, (including both work outside the home and housework)?**

(Please check one answer.)

Not at all ..... |___|1

Slightly ..... |___|2

Moderately ..... |___|3

Quite a bit ..... |___|4

Extremely ..... |___|5

These questions are about how you feel and how things have been with you during the PAST 4 WEEKS. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the *PAST 4 WEEKS…*
(Please check one number per line.)

		All of the Time	Most of the Time	a Good Bit of the Time	Some of the Time	a Little of the Time	None of the Time
9.	Have you felt calm and peaceful? ..	|___|1	|___|2	|___|3	|___|4	|___|5	|___|6
10.	Did you have a lot of energy?	|___|1	|___|2	|___|3	|___|4	|___|5	|___|6
11.	Did you feel downhearted and blue?	|___|1	|___|2	|___|3	|___|4	|___|5	|___|6

12. **During the PAST 4 WEEKS, how much of the time has your PHYSICAL HEALTH or EMOTIONAL PROBLEMS interfered with your social activities (like visiting with friends, relatives, etc.)?**

(Please check one number.)

All the time ..... |___|1

Most of the time ..... |___|2

Some of the time ..... |___|3

A Little of the time ..... |___|4

None of the time ..... |___|5

ADMINISTRATIVE INFORMATION:

13. Interviewer/reviewer code: |___|___|___|

14. Interview/review date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

CES-D SCALE

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

How is this questionnaire administered? By interviewer |___|1 By self |___|2 Refused |___|8

Here are some questions (Q1-Q20) about your feelings during the <u>past week</u>. For each of the following statements, please respond as to whether you felt that way: Rarely or Not At All, Some of the time, Often, or Most of the time.

During the **past week** . . .	Rarely or Not at ALL < 1 day 1	Some 1-2 days 2	Often 3-4 days 3	Most of the Time 5-7 days 4	Not Applicable 9
1. I was bothered by things that don't usually bother me.	|___|1	|___|2	|___|3	|___|4	|___|9
2. I did not feel like eating; my appetite was poor.	|___|1	|___|2	|___|3	|___|4	|___|9
3. I felt that I could not shake the blues even with help from my family or friends.	|___|1	|___|2	|___|3	|___|4	|___|9
4. I felt that I was just as good as other people.	|___|1	|___|2	|___|3	|___|4	|___|9
5. I had trouble keeping my mind on what I was doing.	|___|1	|___|2	|___|3	|___|4	|___|9
6. I felt depressed	|___|1	|___|2	|___|3	|___|4	|___|9
7. I felt that everything I did was an effort.	|___|1	|___|2	|___|3	|___|4	|___|9
8. I felt hopeful about the future.	|___|1	|___|2	|___|3	|___|4	|___|9
9. I thought my life had been a failure.	|___|1	|___|2	|___|3	|___|4	|___|9
10. I felt fearful.	|___|1	|___|2	|___|3	|___|4	|___|9
11. My sleep was restless.	|___|1	|___|2	|___|3	|___|4	|___|9
12. I was happy.	|___|1	|___|2	|___|3	|___|4	|___|9

For each of the following statements, please respond as to whether you felt that way: Rarely or Not At All, Some of the time, Often, or Most of the time.

During the **past week** . . .	Rarely or Not at ALL < 1 day 1	Some 1-2 days 2	Often 3-4 days 3	Most of the Time 5-7 days 4	Not Applicable 9
13. I talked less than usual.	|___|1	|___|2	|___|3	|___|4	|___|9
14. I felt lonely.	|___|1	|___|2	|___|3	|___|4	|___|9
15. People were unfriendly.	|___|1	|___|2	|___|3	|___|4	|___|9
16. I enjoyed life.	|___|1	|___|2	|___|3	|___|4	|___|9
17. I had crying spells.	|___|1	|___|2	|___|3	|___|4	|___|9
18. I felt sad.	|___|1	|___|2	|___|3	|___|4	|___|9
19. I felt that people disliked me.	|___|1	|___|2	|___|3	|___|4	|___|9
20. I felt like I couldn't do what I needed to do.	|___|1	|___|2	|___|3	|___|4	|___|9

During the **past year** . . .	Rarely or Not at ALL 1	Some 2	Often 3	Most of the Time 4	Not Applicable 9
21. I have felt depressed or sad.	|___|1	|___|2	|___|3	|___|4	|___|9

ADMINISTRATIVE INFORMATION:

22. Interviewer/reviewer code: |___|___|___|

23. Interview/review date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

SOCIAL SUPPORT

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

How is this questionnaire administered? By interviewer |___|1 By self |___|2 Refused |___|8

Next, we ask about how much support you get from your family and friends. Here is a list of statements, which may or may not be true about you. For each statement, check the response that best describes you.

1. How often do you talk on the phone or get together with friends or relatives who do not live with you?

   Every day ..... |___|5
   A few times a week ..... |___|4
   A few times a month ..... |___|3
   Once a month ..... |___|2
   Less than once a month, or ..... |___|1
   Never ..... |___|0

		NOT MUCH AT ALL 1	SOME 2	A LOT 3
2.	How much do your friends or relatives really care about you--**a lot, some,** or **not much at all**?	|___|1	|___|2	|___|3
3.	How much do they understand the way you feel about things?	|___|1	|___|2	|___|3
4.	How much do they appreciate you?	|___|1	|___|2	|___|3
5.	How much can you rely on them for help if you have a serious problem?	|___|1	|___|2	|___|3
6.	How much can you talk to them about your worries?	|___|1	|___|2	|___|3
7.	How much can you relax and be yourself around them?	|___|1	|___|2	|___|3

		RARELY/ NEVER 0	SOMETIMES 1	OFTEN 2
8.	How often do your friends or relatives make too many demands on you--**often, sometimes, or rarely/never?**	|___|0	|___|1	|___|2
9.	How often do they argue with you?	|___|	___|1	|___|2
10.	How often do they criticize you?	|___|0	|___|1	|___|2
11.	How often do they let you down when you are counting on them?	|___|0	|___|1	|___|2
12.	How often do they get on your nerves?	|___|0	|___|1	|___|2
13.	How often do they drink or use drugs too much?	|___|0	|___|1	|___|2

Among the people you know, is there someone . . .

		NO 0	YES 1
14.	you can go with to play cards, or go to bingo, a powwow, or a community meeting?	|___|0	|___|1
15.	who would lend you money if you needed it in an emergency?	|___|0	|___|1
16.	who would lend you a car or drive you somewhere else if you really needed it?	|___|0	|___|1
17.	you could call who would bail you out if you were arrested and put in jail?	|___|0	|___|1
18.	you could count on to check in on you regularly?	|___|0	|___|1

19. How isolated do you feel?

Very isolated	|___|3
Somewhat isolated	|___|2
Not very isolated at all	|___|1

20. How often do you purposefully avoid family gatherings?

A lot ..... |___|3

Sometimes, or ..... |___|2

Not very much at al ..... |___|1

21. Of those family gatherings you go to, how likely are you to leave early?

Very likely ..... |___|3

Somewhat likely, or ..... |___|2

Not at all likely ..... |___|1

ADMINISTRATIVE INFORMATION:

22. Interviewer/reviewer code: |___|___|___|

23. Interview/review date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

OTHER QUESTIONS ABOUT YOUR LIFE

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

How is this questionnaire administered? By interviewer |___|1 By self |___|2 Refused |___|8

A. Many people experience very frightening events sometime during their lives. Sometimes these experiences can upset them so much that their health suffers. The following six questions ask whether you have experienced such an event, and, if so, whether it has led to lasting problems. If you prefer not to answer a question, you can skip it.

1. Have you ever had an extremely frightening, traumatic or horrible experience like being a victim of a violent crime, seriously injured in an accident, being assaulted, seeing someone seriously injured or killed, or being a victim of a natural disaster?

Yes |___|1 No |___|2
(If you answered "NO," go to section B.)

During the past month:

2. Did you relive the traumatic experience through recurrent dreams, preoccupation or flashbacks?

Yes |___|1 No |___|2

3. Did you seem less interested than usual in important things, feel "out of it," or did you have a hard time with your feelings or emotions?

Yes |___|1 No |___|2

4. Did you have problems sleeping, concentrating, or having a short temper?

Yes |___|1 No |___|2

5. Did you avoid any place or anything that reminded you of the original horrible event?

Yes |___|1 No |___|2

6. Did you have some of the above problems for more than one month?

Yes |___|1 No |___|2

B. Sometimes people have worries they cannot control that affect their lives. The next three questions ask about such worries. If you prefer not to answer a question you can skip it.

During the past month:

7. Have you persistently worried about several different things, such as: work, school, family, money, and others?

Yes |___|1 No |___|2

8. Did you find it difficult to control your worrying?

Yes |___|1 No |___|2

9. Did your persistent worrying or nervousness cause problems with your work or your dealings with other people?

Yes |___|1 No |___|

C. Many people find that spirituality or some form of religious practice is important to their health and well-being. Others are less concerned with such things. Next are some general questions about spirituality. If you ever feel that you would prefer not to answer a question, you can skip the question. Please check *one answer*.

10. How important is spirituality in your life?

Very |___|1 Somewhat |___|2 Not very |___|3 Not at all |___|4

11. How often do you spend time on religious or spiritual practices?

Every day or almost every day	Several times a month	From time to time, occasionally	Very rarely or not at all
|___|1	|___|2	|___|3	|___|4

Do you have children?

Yes |___|1 **(If "YES," go to Q12)**

No |___|2 **(If "NO," go to Q13)**

12. How important is it to you that your children participate in some kind of religious or spiritual practices? **After answering, go to Q14.**

Very |___|1 Somewhat |___|2 Not very |___|3 Not at all |___|4

13. If you had children, how important would it be to you that they participate in some kind of religious or spiritual practices?

Very |___|1 Somewhat |___|2 Not very |___|3 Not at all |___|4

14. How often do you seek comfort or guidance through religious or spiritual means?

Often |___|1 Sometimes |___|2 Rarely |___|3 Never |___|4

D. These next questions are about getting and controlling diabetes. If you prefer not to answer a question, you can skip it.

Please note: answer 15a and 15b if you <u>do not have diabetes</u>; answer 16a and 16b if you <u>have diabetes</u>.

<u>Please answer if you DO NOT have diabetes</u>:

15. a) I will probably get diabetes at some time in my life.

Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
|___|1	|___|2	|___|3	|___|4

b) There is nothing I can do to prevent getting diabetes. **After answering, go to Q17.**

Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
|___|1	|___|2	|___|3	|___|4

<u>Please answer if you DO have diabetes</u>:

16. a) I was destined to get diabetes at some time in my life.

Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
|___|1	|___|2	|___|3	|___|4

b) There was nothing I could do to prevent getting diabetes.

Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
|___|1	|___|2	|___|3	|___|4

<u>Everyone, please answer</u>:

17. Once someone develops diabetes, there is nothing that can be done to prevent it from getting worse.

Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
|___|1	|___|2	|___|3	|___|4

ADMINISTRATIVE INFORMATION:

18. Interviewer code: |___|___|___|

19. Interview date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PSYCHOSOCIAL CHECKLIST

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

Psychosocial questionnaires:

1. Did the participant finish **All** or **PART** of the psychosocial questionnaires?

   Yes |___|1 ***(go to Q3)*** No |___|2 ***(go to Q2)***

2. Why were the psychosocial questionnaires not completed? **(check all that apply)**

   Did not understand the questions ..... |___|1

   Did not have time to complete ..... |___|2

   Questions are inappropriate ..... |___|3

   Unable to answer ..... |___|4

   Other ..... |___|5

   List: _____

ADMINISTRATIVE INFORMATION:

3. Interviewer code: |___|___|___|

4. Interview date: |___|___|/|___|___|/|___|___|___|___|
   month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

DIRECTIONS TO PARTICPANTS FOR USING THE PEDOMETER

The ACCUSPLIT Pedometer measures movement. You are being asked to wear this pedometer EVERY DAY for a seven-day period from _____ to _____. The pedometer is worn on the hip and should be clipped to the waistband of your pants/skirt, underwear, or belt. Most importantly, the pedometer must be worn in an upright position. Please keep the pedometer firmly against your body so it does not move around freely. **DO NOT LET THE PEDOMETER GET WET** by wearing it in the rain or while bathing or swimming. Please remember to reset the pedometer to "0" (zero) when you put it on in the morning and to record the number of steps from the pedometer in your activity record when you take it off at night.

If you have any questions, please contact _____ at _____.

Front View

Side View

SPECIFIC INSTRUCTIONS

1. Every morning, just before you put the pedometer on, push the *YELLOW* reset button so that the pedometer resets to "0".
2. Record the time that you attached the pedometer in your pedometer record. Make sure to indicate am or pm.
3. Wear the pedometer on your hip (please see pictures above), make sure to keep it upright, and make sure that it remains firmly in place against your body.
4. **Wear the pedometer ALL DAY except when bathing, swimming, or in the rain (unless the pedometer is protected by clothing and will not get wet). If you take off the pedometer for longer than 30 minutes, record the length of time it was off (minutes or hours) in your pedometer record.**
5. At bedtime, take off the pedometer. Record in your pedometer record (a) the number of steps taken on the pedometer, and (b) the time you removed your pedometer. Make sure to indicate am or pm.
6. Please do not touch the *YELLOW* reset button during the day or you will erase your activity numbers.
7. **Keep the cover closed or the pedometer will not record your activity.**
8. Do not wear the pedometer in a pants, coat, or shirt pocket. The pedometer will not work correctly.
9. Please bring back or mail to us, in the self-addressed stamped envelope, the pedometer record after you have completed your week.
10. Please keep the pedometer as a token of our appreciation for your participation in the Strong Heart Family Study.

Thank you very much for your time and effort.

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

SEVEN-DAY PEDOMETER RECORD

SHS I.D.: |___|___|___|___|___|___|___|

Name: _____ SHS Family I.D.: |___|___|___|___|___|___|___|

REMINDER: RESET THE PEDOMETER TO "0" EVERY MORNING

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Date							
Day of week							
Write time attached **Please circle either am or pm**	am pm	am pm	am pm	am pm	am pm	am pm	am pm
Pedometer steps at bedtime							
Write time removed Please circle either am or pm	am pm	am pm	am pm	am pm	am pm	am pm	am pm
Did you take off the pedometer for any reason for longer than 30 minutes? Please circle "Y" for yes or "N" for no.	Y N	Y N	Y N	Y N	Y N	Y N	Y N
If yes, for how long (indicate minutes or hours)?							

Complete this question after completing the pedometer record.

Have your physical activity levels in the past seven (7) days been typical for you compared to your regular activity level?
Yes____ No____

If no, |___| more active than usual |___| less active than usual

Comments: _____

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

MEDICATION CHECKLIST

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

MEDICATION RECEPTION

As you know, the Strong Heart Study will be describing prescription medications that its participants are using. We are particularly interested in medications your doctor prescribed for you that were filled by a pharmacist. These include pills, dermal patches, eye drops, creams, salves and injections. The letter you received about this appointment included a plastic medications bag for all your current medications and asked you to bring them to the clinic.
Have you brought that bag with you?

Yes |___|1 No |___|2 ***(Make arrangements to obtain)***

Took no meds |___|3 ***(go to Q3)*** Refused |___|4 ***(Cite reasons for refusal in the space below)***

Reasons for refusal: _____ ***Go to Q3***

PRESCRIPTION MEDICATIONS

1. Copy the name of the medication, the strength in milligrams (mg), and the total number of doses prescribed per day, week or month. (Include pills, dermal patches, eye drops, creams, salves and injections.)

2. On the average during the last two weeks, how many of these pills did you take a day/week/month?

	Medication Name *Print the first 20 letters only. Please print clearly.*	**Strength (mg)** *Write the decimal as one of the digits.*	**Number Prescribed** Circle: *day, week, month*	**PRN Medicine?**
1	_____	_____	____ **D W M**	**Y N** ___ **D W M**
2.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
3.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
4.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
5.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
6.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
7.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
8.	_____	_____	____ **D W M**	**Y N** ___ **D W M**

PRESCRIPTION MEDICATIONS (cont.)

	Medication Name *Print the first 20 letters only. Please print clearly.*	**Strength (mg)** *Write the decimal as one of the digits.*	**Number Prescribed** Circle: *day, week, month*	**PRN Medicine?**
9.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
10.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
11.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
12.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
13.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
14.	_____	_____	____ **D W M**	**Y N** ___ **D W M**
15.	_____	_____	____ **D W M**	**Y N** ___ **D W M**

Number unable to transcribe: _____

OVER-THE-COUNTER MEDICATIONS

3. Copy the name of the medication, the strength in milligrams (mg), and the total number of doses prescribed per day, week or month. (Include pills dermal patches, eye drops, creams, salves and injections.)

4. On the average during the last two weeks, how many of these pills did you take a day/week/month?

	Medication Name *Print the first 20 letters. Please print clearly.*	**Strength (mg)** *Write the decimal as one of the digits.*	*Circle: day week, month*
1.	_____	_____	_____ **D W M**
2.	_____	_____	_____ **D W M**
3.	_____	_____	_____ **D W M**
4.	_____	_____	_____ **D W M**
5.	_____	_____	_____ **D W M**
6.	_____	_____	_____ **D W M**
7.	_____	_____	_____ **D W M**
8.	_____	_____	_____ **D W M**
9.	_____	_____	_____ **D W M**

OVER-THE-COUNTER MEDICATIONS (cont.)

	Medication Name *Print the first 20 letters.* *Please print clearly.*	**Strength (mg)** *Write the decimal* *as one of the digits.*	*Circle: day* *week, month*
10.	_____	_____	_____ **D W M**
11.	_____	_____	_____ **D W M**
12.	_____	_____	_____ **D W M**
13.	_____	_____	_____ **D W M**
14.	_____	_____	_____ **D W M**
15.	_____	_____	_____ **D W M**

Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

ADMINISTRATIVE INFORMATION:

5. Interviewer code: |___|___|___|

6. Interview date: |___|___|/|___|___|/|___|___|___|___|
month day year

THE STRONG HEART STUDY V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

PHYSICAL EXAMINATION – QC DUPLICATE MEASUREMENT

SHS I.D.: |___|___|___|___|___|___|___| SHS Family I.D.: |___|___|___|___|___|___|___|

BLOOD PRESSURE:

1. Right arm circumference, measured in CENTIMETERS (cm) |___|___|___|
   Midway between acromion and olecranon

2. Cuff size (arm circumference in brackets)

   Pediatric (under 24cm) |___|1 Large arm (33-41cm) |___|3

   Regular arm (24-32cm) |___|2 Thigh (>41cm) |___|4

3. Pulse obliteration pressure |___|___|___|

4. Seated Blood Pressure Systolic BP Diastolic BP

   a) First Blood Pressure Measurement |___|___|___| |___|___|___|

   b) Second Blood Pressure Measurement |___|___|___| |___|___|___|

   c) Third Blood Pressure Measurement |___|___|___| |___|___|___|

5. Were the above blood pressures taken from RIGHT arm? Yes |___|1 No |___|2

   a) If no, why? Amputation |___|1 Wound/dressing |___|2 Cast |___|3 Refusal |___|8

6. Recorder ID: |___|___|___|

ANTHROPOMETRIC MEASUREMENTS:

		ENGLISH SYSTEM (inches/pounds)	***METRIC SYSTEM*** (centimeters/kilograms)
7.	Weight (Standing)	|___|___|___| pounds	|___|___|___| kilograms
8.	Height (Standing)	|___|___|___| inches	|___|___|___| centimeters
9.	Waist (Supine).....	|___|___|___| inches	|___|___|___| centimeters
10.	Hip circumference (Standing).....	|___|___|___| inches	|___|___|___| centimeters

IMPEDANCE MEASUREMENT:

11. a) Was impedance taken? Yes |___|1 ***(go to b)*** No |___|2

i) If "NO," due to: Amputation |___|1 Wound/dressing |___|2 Cast |___|3 Refusal |___|8

b) Taken on RIGHT side? Yes |___|1 No |___|2

i) If "NO," due to: Amputation |___|1 Wound/dressing |___|2 Cast |___|3 Refusal |___|8

c) Resistance |___|___|___| d) Reactance |___|___|___|

ADMINSTRATIVE INFORMATION:

12. Interviewer code: |___|___|___|

13. Interviewer date: |___|___|/|___|___|/|___|___|___|___|
month day year

FOOD QUESTIONNAIRE

RESPONDENT ID #

TODAY'S DATE

	DAY	YEAR
Jan		
Feb		
Mar		2006
Apr		2007
May		2008
Jun		2009
Jul		2010
Aug		2011
Sep		2012
Oct		2013
Nov		2014
Dec		2015

ABOUT THIS SURVEY

This form is about the foods you usually eat.
It will take about 30 - 40 minutes to complete.
Please answer each question as best you can.
Estimate if you aren't sure.

- **USE ONLY A NO. 2 PENCIL.**
- **Fill in the circles completely, and erase completely if you make any changes.**

Please write your name in this box.

ABOUT YOU

SEX
- Male
- Female

If female, are you pregnant or breast feeding?
- No
- Yes
- Not female

AGE

WEIGHT pounds

HEIGHT ft. in.

INSTRUCTIONS

There are usually two kinds of questions to answer for each food:

1. **HOW OFTEN,** on average, did you eat the food during the past year?
   *Please DO NOT SKIP any foods. Mark "Never" if you didn't eat any of the food in the question.
2. **HOW MUCH** did you usually eat of the food?
   *Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.
   *Sometimes we ask "how much" as A, B, C or D. **LOOK AT THE ENCLOSED PICTURES.**
   For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat. (If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D= 2 cups.)
3. **EXAMPLE:** This person drank apple juice twice a week, and had one glass each time.
   Once a week he ate a "C"-sized serving of rice (about 1 cup).

	HOW OFTEN IN THE PAST YEAR									HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
Apple juice	○	○	○	○	○	●	○	○	○	How many glasses each time	● 1	○ 2	○ 3	○ 4
Rice	○	○	○	○	●	○	○	○	○	How much each time	○ A	○ B	● C	○ D

PLEASE DO NOT WRITE IN THIS AREA

This section is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. We will ask you about different TYPES (low-fat, low-carb) at the end of the survey. Include all types (like low-fat, sugar-free). Later you can tell us which type you usually eat.

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Breakfast sandwiches with eggs, like Egg McMuffins	○	○	○	○	○	○	○	○	○	How many sandwiches in a day: ○ 1 ○ 2
Other eggs like scrambled, boiled or omelets (not egg substitutes)	○	○	○	○	○	○	○	○	○	How many eggs a day: ○ 1 ○ 2 ○ 3
Breakfast sausage, including in sausage biscuits, or in breakfast sandwiches	○	○	○	○	○	○	○	○	○	How many pieces: ○ 1 ○ 2 ○ 3
Bacon	○	○	○	○	○	○	○	○	○	How many pieces: ○ 1 ○ 2 ○ 3 ○ 4
Pancakes, waffles, French toast or Pop Tarts	○	○	○	○	○	○	○	○	○	How many pieces: ○ 1 ○ 2 ○ 3
Cooked cereals like oatmeal, grits or cream of wheat	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C ○ D
Cold cereals, ANY KIND, like corn flakes, fiber cereals, or sweetened cereals	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C ○ D
Milk or milk substitutes on cereal	○	○	○	○	○	○	○	○	○	
Yogurt or frozen yogurt	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C
Cheese, sliced cheese or cheese spread, including on sandwiches	○	○	○	○	○	○	○	○	○	How many slices: ○ 1 ○ 2 ○ 3
How often do you eat the following foods all year round? Estimate your average for the whole year.										
Bananas	○	○	○	○	○	○	○	○	○	How many each time: ○ 1/2 ○ 1
Apples or pears	○	○	○	○	○	○	○	○	○	How many each time: ○ 1/2 ○ 1 ○ 2
Oranges or tangerines	○	○	○	○	○	○	○	○	○	How many each time: ○ 1/2 ○ 1 ○ 2
Grapefruit	○	○	○	○	○	○	○	○	○	How much: ○ A little ○ 1/2 ○ 1
Peaches or nectarines, fresh	○	○	○	○	○	○	○	○	○	How many: ○ 1/2 ○ 1 ○ 2
Other fresh fruits like grapes, plums, honeydew, mango	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Canned fruit like applesauce, fruit cocktail, canned peaches or canned pineapple	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
How often do you eat each of the following 3 fruits, just during the summer months when they are in season?										
Cantaloupe, in season	○	○	○	○	○	○	○	○	○	How much: ○ 1/8 ○ 1/4 ○ 1/2
Strawberries or other berries, in season	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Watermelon, in season	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
How often do you eat each of the following vegetables all year round, including fresh, frozen, canned or in stir-fry, at home or in a restaurant?										
Broccoli	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Carrots, or mixed vegetables with carrots	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Corn	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C

PAGE 2

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Green beans or green peas	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Spinach (cooked)	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Greens like collards, turnip greens, mustard greens	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Sweet potatoes, yams	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
French fries, home fries, hash browns	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Potatoes not fried, including mashed, boiled, baked, or potato salad	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Cole slaw, cabbage, Chinese cabbage	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Green salad, lettuce salad	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Raw tomatoes	○	○	○	○	○	○	○	○	○	How much ○1/4 ○1/2 ○1
Salad dressing, any kind, regular or low-fat	○	○	○	○	○	○	○	○	○	How many tablespoons ○1 ○2 ○3 ○4
Any other vegetable, like squash, cauliflower, okra, cooked peppers	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Refried beans or bean burritos	○	○	○	○	○	○	○	○	○	How much of the beans ○A ○B ○C
Pinto beans, black beans, chili with beans, baked beans	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Vegetable stew (without meat)	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Vegetable soup, vegetable-beef soup, or tomato soup	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Split pea, bean or lentil soup	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Any other soup including chicken noodle, cream soups, Cup-A-Soup, ramen	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Pizza	○	○	○	○	○	○	○	○	○	How many slices ○1 ○2 ○3 ○4
Spaghetti, lasagna or other pasta with tomato sauce	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Macaroni and cheese	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Other noodles like egg noodles, pasta salad, sopa seca	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Tofu or tempeh	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Meat substitutes like veggie burgers, veggie chicken, vegetarian hot dogs or vegetarian lunch meats	○	○	○	○	○	○	○	○	○	How many patties or dogs ○1 ○2
Do you ever eat chicken, meat or fish? ○ Yes ○ No IF NO, SKIP TO BREADS ON NEXT PAGE										
Hamburgers, cheeseburgers, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much ○1 sm ○1 lrg ○2
Hot dogs, or sausage like Polish, Italian or chorizo	○	○	○	○	○	○	○	○	○	How many hotdogs ○1 ○2 ○3

PLEASE DO NOT WRITE IN THIS AREA

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Lunch meat like bologna, sliced ham, turkey bologna, or any other lunch meat	○	○	○	○	○	○	○	○	○	How many slices: ○ 1 ○ 2 ○ 3 ○ 4
Meat loaf, meat balls	○	○	○	○	○	○	○	○	○	How much: ○ B ○ C ○ D
Steak, roast beef, or beef in frozen dinners or sandwiches	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Tacos, burritos, enchiladas, tamales, with meat or chicken	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Ribs, spareribs	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Pork chops, pork roasts, cooked ham (including for breakfast)	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Veal, lamb, deer meat	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Liver, including chicken livers or liverwurst	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Pigs feet, neck bones, oxtails, tongue	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Menudo, pozole, caldo de res, sancocho, ajiaco	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C ○ D
Any other beef or pork dish, like beef stew, beef pot pie, corned beef hash, Hamburger Helper	○	○	○	○	○	○	○	○	○	How much: ○ B ○ C ○ D
Fried chicken, including chicken nuggets, wings, chicken patty	○	○	○	○	○	○	○	○	○	How many medium pieces: ○ 1 ○ 2 pcs/6 nugts ○ 3
Roasted or broiled chicken or turkey	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Any other chicken dish, like chicken stew, chicken with noodles, chicken salad, Chinese chicken dishes	○	○	○	○	○	○	○	○	○	How much: ○ B ○ C ○ D
Oysters	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Shellfish like shrimp, scallops, crabs	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Tuna, tuna salad, tuna casserole	○	○	○	○	○	○	○	○	○	How much of the tuna: ○ A ○ B ○ C
Fried fish or fish sandwich	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Other fish, not fried	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
BREADS										
Biscuits, muffins, croissants (not counting breakfast sandwiches with eggs)	○	○	○	○	○	○	○	○	○	How many: ○ 1 sm ○ 1 med ○ 2
Hamburger buns, hotdog buns, hoagie buns, submarines	○	○	○	○	○	○	○	○	○	How many: ○ 1 ○ 2
Bagels, English muffins, dinner rolls	○	○	○	○	○	○	○	○	○	How many: ○ 1/2 ○ 1
Tortillas (not counting those eaten in tacos or burritos)	○	○	○	○	○	○	○	○	○	How many in a day: ○ 1 ○ 2 ○ 3 ○ 4
Corn bread, corn muffins, hush puppies	○	○	○	○	○	○	○	○	○	How many pieces in a day: ○ 1/2 ○ 1 ○ 2
Any other bread or toast, including white, dark, whole wheat, and what you have in sandwiches	○	○	○	○	○	○	○	○	○	How many slices in a day: ○ 1 ○ 2 ○ 3 ○ 4
Rice, or dishes made with rice	○	○	○	○	○	○	○	○	○	How much in a day: ○ B ○ C ○ D

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Margarine (not butter) on bread or on vegetables	○	○	○	○	○	○	○	○	○	How many pats (tsp) ○ 1 ○ 2 ○ 3 ○ 4
Butter (not margarine) on bread or on vegetables	○	○	○	○	○	○	○	○	○	How many pats (tsp) ○ 1 ○ 2 ○ 3 ○ 4
Energy bars, like Power Bars, Clif bars, Balance, Luna, Atkins bars	○	○	○	○	○	○	○	○	○	How many ○ 1 ○ 2
Breakfast bars, cereal bars, granola bars (not energy bars)	○	○	○	○	○	○	○	○	○	How many ○ 1 ○ 2
Peanuts, sunflower seeds, other nuts or seeds	○	○	○	○	○	○	○	○	○	How much ○ A ○ B ○ C
Peanut butter	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2 ○ 3
Snack chips like potato chips, tortilla chips, Fritos, Doritos, popcorn (not pretzels)	○	○	○	○	○	○	○	○	○	How much ○ A ○ B ○ C ○ D
Crackers, like Saltines, Cheez-Its, or any other snack cracker	○	○	○	○	○	○	○	○	○	How much ○ A ○ B ○ C
Jelly, jam	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2
Mayonnaise, sandwich spreads	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2
Catsup, salsa or chile peppers	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2 ○ 3
Mustard, barbecue sauce, soy sauce, gravy, other sauces	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2 ○ 3
Donuts	○	○	○	○	○	○	○	○	○	How many ○ 1 ○ 2 ○ 3
Cake, or snack cakes like cupcakes, Ho-Hos, Entenmann's, or any other pastry	○	○	○	○	○	○	○	○	○	How many pieces ○ 1 sm ○ 1 med ○ 2 ○ 3
Cookies	○	○	○	○	○	○	○	○	○	How many ○ 1-2 ○ 3-4 ○ 5-6 ○ 7+
Ice cream, ice cream bars	○	○	○	○	○	○	○	○	○	How much ○ B ○ C ○ D
Chocolate syrup or sauce (like in milk or on ice cream)	○	○	○	○	○	○	○	○		
Pumpkin pie, sweet potato pie	○	○	○	○	○	○	○	○	○	How many pieces ○ 1/2 ○ 1 ○ 2
Any other pie including fast food pies or snack pies	○	○	○	○	○	○	○	○	○	How many pieces ○ 1/2 ○ 1 ○ 2
Chocolate candy like candy bars, M&Ms, Reeses	○	○	○	○	○	○	○	○	○	How much ○ 1 mini ○ 1 med ○ 1 lrg ○ 1 king
Any other candy, not chocolate, like hard candy, Lifesavers, Skittles, Starburst	○	○	○	○	○	○	○	○	○	How much in a day ○ 1-2 pcs ○ 1/2 pkg ○ 1 pkg

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH on the days you drink it?
Glasses of milk (any kind, including soy), not counting on cereal or coffee	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1 ○ 2 ○ 3
Drinks like Slim Fast, Sego, Slender, Ensure or Atkins	○	○	○	○	○	○	○	○	○	How many CANS OR GLASSES ○ 1 ○ 2
Tomato juice or V-8 juice	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2
Real 100% orange juice or grapefruit juice. Don't count orange soda or Sunny Delight	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2
Apple juice, grape juice, pineapple juice or fruit smoothies	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2

PAGE 5

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH on the days you drink it?
Hi-C, Cranberry Juice Cocktail, Hawaiian Punch, Tang	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2 ○ 3
Drinks with some juice, like Sunny Delight, Knudsen	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2 ○ 3
Iced tea, homemade, instant, or bottled like Nestea, Lipton, Snapple, Tazo	○	○	○	○	○	○	○	○	○	How many GLASSES OR BOTTLES ○ 1 ○ 2 ○ 3 ○ 4
Kool-Aid, lemonade, sports drinks like Gatorade, or fruit flavored drinks (not including iced teas)	○	○	○	○	○	○	○	○	○	How much IN A DAY ○ 1 glass ○ 1 20-ounce bottle ○ 2 glasses ○ 2 20-ounce bottles
Any kind of soft drink, like cola, Sprite, orange soda, regular or diet	○	○	○	○	○	○	○	○	○	How much IN A DAY ○ 1 can ○ 1 20-ounce bottle ○ 2 cans ○ Big Gulp or 3 cans
Beer or non-alcoholic beer	○	○	○	○	○	○	○	○	○	How much IN A DAY ○ 1 can ○ 2 cans ○ 3-4 cans or small pitcher ○ 5+ cans or large pitcher
Wine or wine coolers	○	○	○	○	○	○	○	○	○	How many GLASSES in a day ○ 1/2 glass ○ 1 glass ○ 2 glasses or half bottle ○ 3 glasses
Liquor or mixed drinks	○	○	○	○	○	○	○	○	○	How many DRINKS ○ 1 ○ 2 ○ 3 ○ 4
Glasses of water, tap or bottled	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1 ○ 2 ○ 3-4 ○ 5+
Coffee, regular or decaf	○	○	○	○	○	○	○	○	○	How many CUPS ○ 1 ○ 2 ○ 3 ○ 4+
Hot tea (not including herbal teas)	○	○	○	○	○	○	○	○	○	How many CUPS ○ 1 ○ 2 ○ 3 ○ 4+

What do you usually add to **coffee?** **MARK ONLY ONE:**
○ Cream or half & half ○ Nondairy creamer ○ Milk ○ None of these ○ Don't drink it

What do you usually add to **tea?** **MARK ONLY ONE:**
○ Cream or half & half ○ Nondairy creamer ○ Milk ○ None of these ○ Don't drink it

Do you usually add sugar (or honey) to **coffee?** ○ No ○ Yes IF YES, how many teaspoons each cup? ○ 1 ○ 2 ○ 3 ○ 4

Do you usually add sugar (or honey) to **tea?** ○ No ○ Yes IF YES, how many teaspoons each cup? ○ 1 ○ 2 ○ 3 ○ 4

	RARELY	1-2 PER WEEK	3-4 PER WEEK	5-6 PER WEEK	1 PER DAY	1 1/2 PER DAY	2 PER DAY	3 PER DAY	4+ PER DAY
About how many servings of vegetables do you eat, per day or per week, not counting salad or potatoes?	○	○	○	○	○	○	○	○	○
About how many servings of fruit do you eat, not counting juices?	○	○	○	○	○	○	○	○	
How often do you use fat or oil in cooking?	○	○	○	○	○	○	○	○	

PLEASE DO NOT WRITE IN THIS AREA

SERIAL # ○○○○○○○○○○○○○○○○○○○○○○○○

If you eat the following foods, what type do you usually eat? MARK ONLY ONE ANSWER FOR EACH QUESTION

Milk	○ Whole milk ○ Reduced-fat 2% milk	○ Low-fat 1% milk ○ Non-fat milk	○ Soy milk ○ Rice milk	○ Don't drink
Slim Fast, Sego, Slender or Ensure		○ Low-Carb like Atkins	○ Regular	○ Don't drink
Orange juice	○ Calcium-fortified	○ Not calcium-fortified	○ I don't know	○ Don't drink
Soda or pop	○ Diet soda, low-calorie	○ Regular	○ Don't drink	
Iced tea	○ Homemade, no sugar	○ Homemade, w/sugar	○ Bottled, no sugar	○ Bottled, regular ○ Don't drink
Beer	○ Regular beer	○ Light beer	○ Low-Carb beer	○ Non-alcoholic beer ○ Don't drink
Hamburgers or cheeseburgers		○ Hamburgers	○ Cheeseburgers	○ Don't eat
Hot dogs	○ Low fat or turkey dogs	○ Regular hot dogs	○ Don't eat	
Lunch meats	○ Low-fat or turkey lunch meats	○ Regular lunch meats	○ Don't eat	
Spaghetti or lasagna	○ Meatless	○ With meat sauce or meatballs		○ Don't eat
Cheese	○ Low Fat	○ Not Low Fat	○ Don't eat	
Salad dressing	○ Low-Carb	○ Low-fat	○ Regular	○ Don't use
Energy bars like Power Bar, Clif, Atkins	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Breakfast bars, cereal bars, or granola bars	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Bread	○ 100% whole wheat	○ Low-Carb	○ Regular	○ Don't eat
Tortillas	○ Corn	○ Flour	○ Don't know or don't eat	
Chocolate candy or chocolate candy bars	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Cookies	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Cake, snack cakes, and other pastries	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Ice cream	○ Low-Carb, low sugar	○ Low-fat or ice milk	○ Regular	○ Don't eat
Jelly or jam	○ Low-Carb, low sugar	○ Regular	○ Don't use	
Beef or pork	○ Avoid eating the fat	○ Sometimes eat the fat	○ Often eat the fat	○ Don't eat
Chicken or Turkey	○ Avoid eating the skin	○ Sometimes eat the skin	○ Often eat the skin	○ Don't eat

What kinds of **fat or oil** do you usually use in cooking? **MARK ONLY ONE OR TWO**

○ Don't know, or Pam	○ Stick margarine	○ Corn oil, vegetable oil	○ Lard, fatback, bacon fat
○ Butter	○ Soft tub margarine	○ Olive oil or canola oil	○ Crisco
○ Butter/margarine blend	○ Low-fat margarine		

If you eat **cold cereals**, what do you eat? Choose one or two that you eat most often. (If you usually just eat one kind, just choose one.)

○ Low-carb cereals like Atkins, Low-Carb Special K	○ Total	○ Other fiber cereals like Raisin Bran, Fruit-n-Fiber
○ Cheerios, Grape Nuts, Shredded Wheat, Wheaties, Wheat Chex	○ Fiber One	○ Sweetened cereals like Frosted Flakes, Froot Loops
	○ Product 19, Complete	○ Other cold cereals, like Corn Flakes, Rice Krispies, Special K
	○ All Bran, Bran Buds	

What vitamin supplements do you take fairly regularly?

Multiple Vitamins. Did you take...	HOW OFTEN: DIDN'T TAKE	A FEW DAYS per MONTH	1-3 DAYS per WEEK	4-6 DAYS per WEEK	EVERY DAY	FOR HOW MANY YEARS?: LESS THAN 1 YEAR	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10+ YEARS
Prenatal vitamins	○	○	○	○	○	○	○	○	○	○	○
Regular Once-A-Day, Centrum, Theragran, "senior" vitamins or house brands of multiple vitamins	○	○	○	○	○	○	○	○	○	○	○
Stress-tabs or B-Complex type	○	○	○	○	○	○	○	○	○	○	○
Single Vitamins, not part of multiple vitamins											
Vitamin A (not beta-carotene)	○	○	○	○	○	○	○	○	○	○	○
Beta-carotene	○	○	○	○	○	○	○	○	○	○	○
Vitamin C	○	○	○	○	○	○	○	○	○	○	○
Vitamin E	○	○	○	○	○	○	○	○	○	○	○
Folic Acid, Folate	○	○	○	○	○	○	○	○	○	○	○
Calcium or Tums	○	○	○	○	○	○	○	○	○	○	○
Vitamin D, alone or combined with calcium	○	○	○	○	○	○	○	○	○	○	○
Zinc	○	○	○	○	○	○	○	○	○	○	○
Iron	○	○	○	○	○	○	○	○	○	○	○
Selenium	○	○	○	○	○	○	○	○	○	○	○
Omega-3, fish oil, flax seed oil	○	○	○	○	○	○	○	○	○	○	○

If you took Once-a-day, Centrum or Thera-type multiple vitamins, did you usually take types that

○ contain minerals, iron, zinc, etc. ○ do not contain minerals ○ Don't know

If you took vitamin C, how many milligrams of **vitamin C** did you usually take, on the days you took it?

○ 100 ○ 250 ○ 500 ○ 750 ○ 1000 ○ 1500 ○ 2000 ○ 3000+ ○ Don't know

If you took vitamin E, how many IUs of **vitamin E** did you usually take, on the days you took it?

○ 100 ○ 200 ○ 300 ○ 400 ○ 600 ○ 800 ○ 1000 ○ 2000+ ○ Don't know

Did you take any of these supplements at least once a week?

○ Ginkgo ○ St. John's Wort ○ Echinacea ○ DHEA ○ Didn't take these
○ Ginseng ○ Kava Kava ○ Melatonin ○ Glucosamine/Chondroitin

How often do you eat each of the following foods?	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Spam	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Menudo	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Pazole	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Guysava	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Red chili stew or green chili stew	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Indian taco	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Frybread	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D

Thank you very much for filling out this questionnaire.
Please take a minute to go back and fill in anything you may have skipped.

PLEASE DO NOT WRITE IN THIS AREA

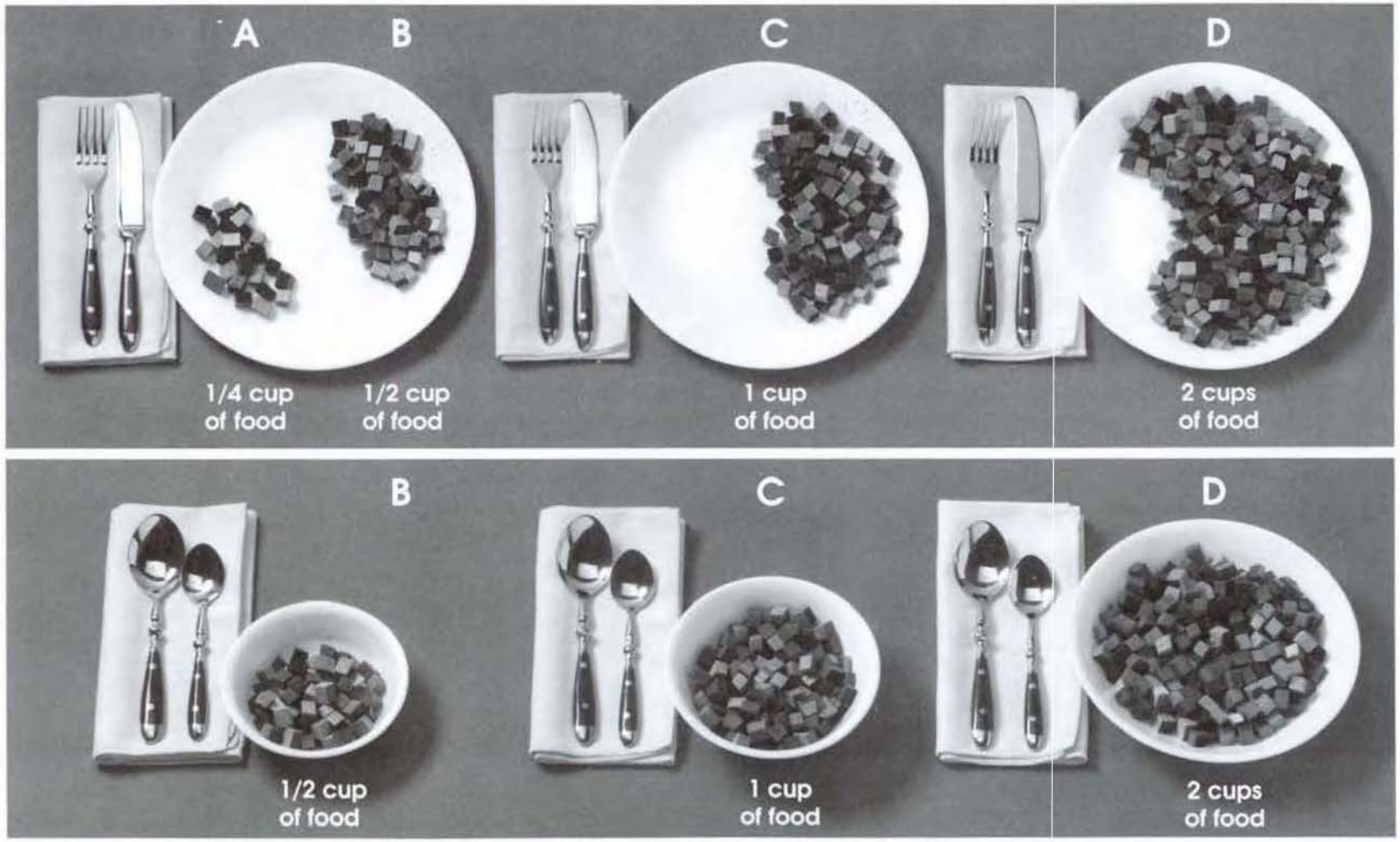
○○○○○○○○○○○○○○○○○○○○○○○○ **SERIAL #**

FOOD QUESTIONNAIRE

Serving Size Choices

Keep this in front of you while you are filling out The Food Questionnaire. You may use either the plates or the bowls to help you choose your serving size.

Choose A, B, C or D: **A** = 1/4 Cup of Food **B** = 1/2 Cup of Food **C** = 1 Cup of Food **D** = 2 Cups of Food



APPENDIX D

STRONG HEART STUDY

PHASE V

Derived Variables

DEFINITION OF STUDY VARIABLES

DEFINITION OF AGE, INDIAN HERITAGE, AND INELIGIBILITY

(All the variable names shown here were the SHS-I variables. To derive the same variables for the later phases of examinations, the original variable names may be different, but the algorithm remain the SAME).

1. SEX: PERSONAL INTERVIEW FORM II, Q12
   2 (FEMALE) INT2_1='2'
   1 (MALE) INT2_1='1'
   0/1 (Female/Male) when use numerical 0/1 for modeling.

2. AGE (IN YEARS), Q14 AND DOC IN PERSONAL INTERVIEW FORM II
   AGE = (DATE OF EXAM/INTERVIEW) - (DATE OF BIRTH)
   = (DOC - INT2_3) / 365.25

3. INDIAN BLOOD QUANTUM (BLOODALL), Q16 AND Q17 IN PERSONAL INTERVIEW II
   BLOODALL = (INT2_5 / INT2_6)
   = (INT2_8/INT2_9) + (INT2_11/INT2_12) + (INT2_14/INT2_15) + (INT2_17/INT2_18) + (INT2_20/INT2_21)

4. TRIBE OF ENROLLMENT, Q18 IN PERSONAL INTERVIEW II, INT2_28

5. RESIDENCE, PERSONAL INTERVIEW FORM II
   Q39, YEARS LIVING IN INDIAN COUNTRY/RESERVATION: INT2_49
   Q41a, YEARS LIVING OUTSIDE INDIAN COUNTRY/RESERVATION:
   INT2_51 = AGE - INT2_49

6. INELIGIBILITY:
   AGE: < 44.5 YEARS OR > 75.5 YEARS
   TRIBE: IF TRIBE OF ENROLLMENT (INT2_28) IS NOT ONE OF THE FOLLOWING
   OKLAHOMA: 231 - APACHE
   016 - CADDO
   039 - COMANCHE
   046 - DELAWARE
   005 - FT SILL APACHE
   062 - KIOWA
   170 - WICHITA
   DAKOTAS: 282 - OGLALA SIOUX
   277 - CHEYENNE RIVER SIOUX
   272 - DEVIL'S LAKE SIOUX
   OR ANY OTHER SIOUX (276, 279, 280, 281, 283, 284, 274, 285, 286, 287, 275, 278 OR 045) LIVED IN PINE RIDGE, EAGLE BUTTE, AND FT. TOTTEN AREA.
   ARIZONA: 293 - PIMA/MARICOPA IN GILA RIVER INDIAN COMMUNITY
   377 - PIMA/MARICOPA IN SALT RIVER INDIAN COMMUNITY
   888 - MARICOPA
   360 - PAPAGO INDIAN OF MARICOPA IN AK CHIN (OLD CODE = '096')

RESIDENCE: Steering Committee decided not to use this criteria (1-10-92).
IF LIVED LESS THAN 6 MONTHS IN INDIAN COUNTRY/RESERVATION IN THE PAST YEAR, Q40 AND Q41b

Define Tribal Affiliation (TRIBE, VALUE 1-13)

OKLAHOMA:	TRIBE OF ENROLLMENT
ARIZONA & DAKOTAS:	TRIBE AND THE COMMUNITY (COMMUNITY CODE, CC) WHERE THE PARTICIPANT RESIDES

TRIBE WILL BE CLASSIFIED AS MISSING IF TRIBE AND COMMUNITY DO NOT MATCH.

ARIZONA:

CC IN ('126', '132', '133', '377')	TRIBE='13'	'SALT RIVER'
CC IN ('096', '96 ', '211', '209', '360')	TRIBE='11'	'AK CHIN-PAPAGO'
The rest of AZ participants:	TRIBE='12'	'GILA RIVER'

EXCEPT FOR:
IF IDNO='302017' THEN TRIBE='11'; /* AK CHIN BUT EXAM IN GRIC */
IF IDNO IN ('303335', '303337', '303338', '303341', '303342', '303346', '303369', '303375', '303379', '303389', '303401', '303413', '303415', '303426', '303429', '303362', '303378', '303406', '303351', '303527', '303433', '303350') THEN TRIBE='13';
IF IDNO IN ('303258', '303388', '303403') THEN TRIBE='12';
(these were instructed by the AZ PI)

DAKOTAS:

CC IN ('607', '612', '613', '614', '619', '623', '867', '868', '872')	TRIBE='01'	'CHEYENNE RIVER'
CC IN ('358', '361', '362', '363', '477')	TRIBE='02'	'02'='SPIRIT LAKE'
CC IN ('526', '528', '849', '772', '778', '781', '782', '783', '784', '790')	TRIBE='03'	'OGALALA SIOUX'

OKLAHOMA (by tribal enrolment, INT2_28):

INT2_28='231'	TRIBE='04'	'APACHE'
INT2_28='016'	TRIBE='05'	'CADDO'
INT2_28='039'	TRIBE='06'	'COMANCHE'
INT2_28='046'	TRIBE='07'	'DELAWARE'
INT2_28='005'	TRIBE='08'	'FT SILL APACHE'
INT2_28='062'	TRIBE='09'	'KIOWA'
INT2_28='170'	TRIBE='10'	'WICHITA'

DEFINITION OF DIABETIC STATUS:

I. DIABETES STATUS ACCORDING TO **1985** WHO CRITERIA:

FOR SHS-I (BASELINE) DATA: (**DM, value '0', '1', '2', '3', '4', and ' '**)

A. KNOWN DIABETES (DM='4'):
   1. IF THE PARTICIPANT WAS NOT GIVEN GTT, GTT CHECKLIST:
      a. ON INSULIN TREATMENT (class code: 682008);
      b. ON HYPOGLYCEMIC AGENT (class code: 682020);
      c. ON RENAL DIALYSIS OR HAD KIDNEY TRANSPLANTATION AND MENTIONED HISTORY OF DIABETES IN MEDICAL HISTORY QUESTIONNAIRE (Q3f, MED25='1');

      OR

   2. EITHER FASTING BLOOD SUGAR (GLUC_0) $\geq$ 140 OR TWO-HOUR BLOOD SUGAR (GLUC_2) $\geq$ 200 AND WITH MENTIONING ANY HISTORY OF DIABETES IN MEDICAL HISTORY (Q3f, MED25='1' OR '3').

B. NEW DIABETES (DM='3'):

   EITHER FASTING BLOOD SUGAR (GLUC_0) $\geq$ 140 OR TWO-HOUR BLOOD SUGAR (GLUC_2) $\geq$ 200 AND WITHOUT MENTIONING ANY HISTORY OF DIABETES IN MEDICAL HISTORY (Q3f, MED25='2' OR '9').

C. IMPAIRED GLUCOSE TOLERANCE (IGT) (DM='2'):
   GLUC_0 < 140 AND GLUC_2 BETWEEN 140 AND 199.

D. NORMAL GLUCOSE TOLERANCE:
   1. NGT WITH HISTORY OF DM (DM='1'):
      GLUC_0 < 140 AND GLUC_2 < 140 AND WITH A HISTORY OF DIABETES (MED25='1').

   2. TRUE NGT (DM='0'):
      GLUC_0 < 140 AND GLUC_2 < 140 AND WITHOUT A HISTORY OF DIABETES (MED25='2').

E. DIABETIC STATUS UNDETERMINED (DM=' '):
   1. ON RENAL DIALYSIS OR HAD KIDNEY TRANSPLANT WITHOUT MENTIONING OF DIABETES IN THE MEDICAL HISTORY (MED25='2')
   2. RESULTS OF GTT WAS NOT RECEIVED, OR
   3. PARTICIPANT REFUSED GTT AND GLUC_0 WAS NOT SUFFICIENT TO DECIDE THE DIABETIC STATUS.

FOR SHS-I to SHS-III: sXdmwho, value 'NGT', "IGT', 'DM', and ' ', where NGT are DM='0' or '1'. IGT is DM='2', and DM are DM='3' or '4'.

II. DIABETES STATUS ACCORDING TO **1997** ADA CRITERIA:

sXdmada=('DM', 'IFG', AND 'NFG')

A. DIABETES:
   1. IF THE PARTICIPANT WAS NOT GIVEN GTT, GTT CHECKLIST:
      a. ON INSULIN TREATMENT;
      b. ON HYPOGLYCEMIC AGENT;
      c. ON RENAL DIALYSIS OR HAD KIDNEY TRANSPLANTATION AND MENTIONED HISTORY OF DIABETES IN MEDICAL HISTORY QUESTIONNAIRE (Q3f, MED25='1');

OR

   2. IF FASTING BLOOD SUGAR (GLUC_0) $\geq$ 126

B. IMPAIRED FASTING GLUCOSE TOLERANCE (IFG):
   $110 \leq$ GLUC_0 < 126

C. NORMAL FASTING GLUCOSE TOLERANCE (NFG):
   1. NGT WITH HISTORY OF DM: NOT IN (I) AND (II), GLUC_0 < 110 AND NO DM TREATMENT.

D. DIABETIC STATUS UNDETERMINED:
   GLUC_0 WAS MISSING.

III. DIABETES STATUS ACCORDING TO **1998** WHO CRITERIA:

A. DIABETES:

1. IF THE PARTICIPANT WAS NOT GIVEN GTT, GTT CHECKLIST:
   a. ON INSULIN TREATMENT;
   b. ON HYPOGLYCEMIC AGENT;
   d. ON RENAL DIALYSIS OR HAD KIDNEY TRANSPLANTATION AND MENTIONED HISTORY OF DIABETES IN MEDICAL HISTORY QUESTIONNAIRE (Q3f, MED25='1');

OR

2. IF FASTING BLOOD SUGAR (GLUC_0) $\geq$ 126

OR

3. 2-HOUR BLOOD SUGAR (GLUC_2) $\geq$ 200

B. IMPAIRED FASTING GLUCOSE TOLERANCE (IFG):
$110 \leq$ GLUC_0 < 126

C. IMPAIRED GLUCOSE TOLERANCE (IGT):
GLUC_0 < 126 AND GLUC_2 BETWEEN 140 AND 199.

D. NORMAL FASTING GLUCOSE TOLERANCE (NFG):
GLUC_0 < 110 AND NO DM TREATMENT

E. DIABETIC STATUS UNDETERMINED:
GLUC_0 WAS MISSING.

DEFINITION OF DIABETIC STATUS -- CONT'D

IV. DURATION OF DIABETES, FOR DIABETIC PATIENTS ONLY:

DURATION OF DM VARIES DEPEND ON WHICH DM CRITERIA WAS USING.

IF AGE OF DIABETES WAS DIAGNOSED (Q3f, MED27) WAS KNOWN,
DURATION OF DM = AGE AT EXAM - MED27

IV. DIABETES CONTROL, FOR DIABETIC PATIENTS ONLY:

POOR CONTROL ---	HbA1c $\geq$ 9.6%	FAIR CONTROL ---	HbA1c: 7.6-9.5%
GOOD CONTROL ---	HbA1c: 6.0-7.5%	NON-DIABETIC ---	HbA1c < 6.0%

V. DIABETES TREATMENT, FOR DIABETIC PATIENTS ONLY, MEDICAL HISTORY:
(B, I, O, N)

A. BOTH INSULIN AND ORAL AGENT:
TAKING BOTH INSULIN (ANY OF THE MEDICATION CODE, MED2, MED4 MED6, MED8, MED10, MED12, MED14, OR MED16, IS '682008') **AND** HYPOGLYCEMIC AGENT (ANY OF THE MEDICATION CODE, MED2, MED4 MED6, MED8, MED10, MED12, MED14, OR MED16, IS '682020') AT THE SAME TIME.

B. INSULIN TREATMENT:
TAKING INSULIN CURRENTLY (ANY OF THE MEDICATION CODE, MED2, MED4 MED6, MED8, MED10, MED12, MED14, OR MED16, IS '682008')

C. ORAL AGENT:
TAKING HYPOGLYCEMIC AGENT CURRENTLY (ANY OF THE MEDICATION CODE, MED2, MED4 MED6, MED8, MED10, MED12, MED14, OR MED16, IS '682020')

DEFINITION OF CORONARY HEART DISEASE:

I. ANGINA PECTORIS - DEFINED BY THE ROSE QUESTIONNAIRE:

ROSEAP=1 (YES): ROSE1='1' AND (ROSE2='1' OR ROSE2='3') AND ROSE4='1' AND ROSE5='1' AND ROSE6='1' AND (ROSE7A='1' OR ROSE7B='1' OR (ROSE7C='1' AND ROSE7D='1')), ELSE

ROSEAP=0 (NO)

II. MYOCARDIAL INFARCTION

A. MEDICAL HISTORY
1. HISTORY OF MI: Q3l IN MEDICAL HISTORY QUESTIONNAIRE MED37='1';
2. POSSIBLE MI FROM ROSE QUESTIONNAIRE: Q9 ROSE9='1'.

B. CLINICAL ABNORMAL ECG: (DR. OOPIK)
1. CLINICAL EVIDENCE OF ECG MI --- PANEL DECISION.
2. UNCODEABLE ECG
   a. MISSING LEADS
   b. BASELINE DRIFT (1 IN 20) IF IT OBSCURES ST-T SEGMENT.
   c. MUSCLE TREMOR GIVING 2 MM. PEAK-TO-PEAK OSCILLATION.
   d. OTHER TECHNICAL ERRORS MAKING Q WAVE MEASUREMENTS IMPOSSIBLE.
   e. MAJOR ABNORMAL QRS CONDUCTION PATTERNS(BBB, PACER, ETC.)

C. ECG CRITERIA BY MINNESOTA CODE

1. MAJOR ISCHEMIC ABNORMALITIES -
   a. MAJOR Q-WAVE ABNORMALITIES: 1.1.1 THROUGH 1.1.7.
   b. STRICT CRITERIA (e.g., THE TECUMSEH STUDY): 1.1.X-1.2.X, 4.1.X, 5.1-5.2, 6.1 OR 7.1.X.
   c. MINNESOTA DEFINITE MI: 1.1.X OR 1.2.X EXCEPT (1.2.6 OR 1.2.8)
   d. MINNESOTA POSSIBLE MI: 1.1.X, 1.2.X, OR 1.3.X

2. MINOR ECG ABNORMALITIES - MINOR ST AND T-WAVE CHANGES.
   a. POOLING PROJECT: 1.1.X-1.2.X, 4.1-4.2, 5.1-5.2, 6.1-6.2, 7.1.X-7.2.X, 7.4, 8.1.X, OR 8.3.X.
   b. WHITEHALL STUDY: 1.1.X, 1.3.X, 4.1.X-4.4, 5.1-5.3, OR 7.X.

MN CODES	ANTERO-LATERAL	POSTERIOR (INFERIOR)	ANTERIOR	PATTERN
1-1-X	1, 2, 3	1, 2, 4, 5	1, 2, 6, 7	Q AND QS
1-2-X	1, 2, 3, 8	1, 2, 3, 4, 5, 6	1, 2, 7, 8	Q AND QS
1-3-X	1, 3	1, 4, 5, 6	1, 2	Q AND QS
2-X	1, 2 3, 4, 5			QRS AXIS
3-X	1, 2, 3, 4			HIGH R
4-1-X	1, 2	1, 2	1, 2	ST JUNCTION (J)
4-X	2, 3, 4	2, 3, 4	2, 3, 4	STJ
5-X	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	T-WAVE
6-X-X	1, 2-1, 2-2, 2-3, 3, 4-1, 4-2, 5, 6, 8			A-V CONDUCTION
7-X-X	1-1, 1-2, 2-1, 2-2, 3, 4, 5, 6, 7, 8			VENTRICULAR CONDUCTION DEF
8-X-X	1-1, 1-2, 1-3, 1-4, 1-5, 2-1, 2-2, 2-3, 2-4, 3-1, 3-2, 3-3, 3-4, 4-1, 4-2, 5-1, 5-2, 6-1, 6-2, 6-3, 6-4, 7, 8, 9			ARRHYTHMIAS
9-X	2	2	2	ST ELEVATION

ECG ABNORMALITIES

(used in Oopik's paper. Oopik, A.J., Dorogy, M., Devereux, R.B., Yeh, J.L., Okin, P.M., Lee, E.T., Cowan, L., Fabsitz, R.R., Howard, B.V., Welty, T.K. Major Electrocardiographic Abnormalities Among American Indians Aged 45-74 Years (The Strong Heart Study). American Journal of Cardiology, 78:1400-1405, 1996.)
Program: ARVOEKG2.PGM

```
/*      ********************************************************************
        **  NEXT SECTION DEFINES ECG ENDPOINTS USED BY DR. OOPIK:         **
        **  DMI_E: DEFINITE MN MI, 111, 112, 121-125 OR 127               **
        **  PMI_E: POSSIBLE MN MI, 13X, 126, 128                          **
        **  VENTRICULAR DEFECT:                                           **
        **  LBBB: LT BUNDLE BRANCH BLOCK, 71X                             **
        **  RBBB: RT BUNDLE BRANCH BLOCK, 72X                             **
        **  IVCD: INTRAVENTRICULAR BLOCK, 74                              **
        **  VCDEFECT: ANY VC DEFECT, ANY OF ABOVE, 71, 72, 74             **
        **  LEFT VENTRICULAR HYPERTROPHY:                                 **
        **     LVH_NOST: LVH VOLTAGE WITHOUT ST, 31, 33                   **
        **     LVH_MN: LVH VOLTAGE WITH ST, 31, 33, AND (51 OR 52)        **
        **     LVH_CHS: LVH WITH ST-T, 31, 33 AND (51,52,41X,42 OR 43)    **
        **  ISOLATED ST-T:                                                **
        **     MAJORSTT: ISOLATED MAJOR ST-T, 41X-42, 51, 52              **
        **                    WITHOUT 11-13 3-1, 3-3                      **
        **     MINORST: ISOLATED MINOR ST, 43, 44                         **
        **                   WITHOUT 11-13 3-1, 3-3                       **
        **     MINOR_T: ISOLATED MINOR T WAVE, 53, 54                     **
        **                   WITHOUT 11-13 3-1, 3-3                       **
        **     ISO_STT: ISOLATED ST-T, ANY OF ABOVE, 41X-44, 51-54,       **
        **                  WITHOUT 11-13 3-1, 3-3                        **
        **  STJ_L: LARGE STJ DEPRESSION, >=2.0mm, 41X                     **
        **  STJ_S: SMALL STJ DEPRESSION, 1 TO 2.0mm, 42                   **
        **  T-WAVE ITEMS:                                                 **
        **     T_NEGL: LARGE NEGATIVE T, < -5mm, 51                       **
        **     T_NEGS: SMALL NEGATIVE T, -1 TO -5mm, 52                   **
        **  A-V BLOCK:                                                    **
        **     FIRSTAVB: 1ST DEGREE AV BLOCK, 63                          **
        **     SECONDAV: 2ND DEGREE AV BLOCK, 62X                         **
        **     AVBLOCK: AV BLOCK, 61, 62X, 63                             **
        **  HEARTRAT: HEART RATE, CONTINUOUS VARIABLE                     **
        **  QRSAXIS: QRS VECTOR, CONTINUOUS VARIABLE                      **
        **                                                                **
        **  SHS DEF ECG MI (DMI_S):                                       **
        **            11X, 12X EXCEPT (126, 128, 71, OR 74)               **
        **                                                                **
        **  SHS POS ECG MI (PMI_S):                                       **
        **            13X, 126, 128 EXCEPT (71, OR 74)                    **
        **                                                                **
        ******************************************************************** */
```

D. MORBIDITY EVENT CRITERIA

1. Definite Myocardial Infarction (MI)

   Minnesota codes 1.1.x or 1.2.x except 1.26. and 1.28 with no 7.1 or 7.4
   History of MI verified by chart review as definite MI

2. Possible Myocardial Infarction

   Minnesota codes 1.3.x, 1.2.6, or 1.2.8 with no 7.1 or 7.4
   History of MI verified by chart review as possible MI

3. Definite Coronary Heart Disease (CHD)

   Definite MI,
   Definite CHD verified by chart review to include cardiac cath, proven coronary artery disease, PTCA, coronary artery bypass grafting, or abnormal stress ECG plus abnormal imaging (i.e., both must be abnormal),
   Angina Pectoris plus LBBB (7.1.1) or
   ST changes (4.1) or
   T wave changes (5.1) or
   verified possible MI,

4. Possible Coronary Heart Disease

   Possible ECG MI (1.3.x, 1.2.6, 1.2.8)
   Angina Pectoris
   Minnesota codes 7.1, 4.1, 4.2, 5.1, 5.2, 7.4
   Unconfirmed history of MI
   Positive functional test of ischemia (such as treadmill) without invasive confirmation
   Possible ECG or imaging in scintigraphic studies (not both).

5. Definite Cardiovascular Disease (CVD)

   Definite CHD
   Congestive Heart Failure
   Cardiomyopathy
   Valvular Heart Disease
   Left ventricular Hypertrophy by Echocardiogram
   Left ventricular Hypertrophy by ECG (3.1 or 3.3 plus 4.1-4.3 or 5.1-5.3)
   Ankle Arm Index <= 0.8
   Atrial Fibrillation
   Minnesota codes 4.1, 5.1, 6.1, 6.2, 6.8, 7.1, 7.2, 7.4
   Noncoronary heart surgery or carotid or other vascular surgery
   Pacemaker implantation
   Bruits by physical examination
   Intermittent Claudication by Rose Questionnaire
   Positive non-coronary angiography

DEFINE COMPOSITE CVD BY USING M&M SURVEILLANCE AND SHS ECG RESULTS

For fatal event, "deadcode" indicate cause of death. User needs to refer to the **Mortality Survey Final Decision Form** for the meaning and the definition of each of the causes (numerical code). This form, along with other M&M forms can be found in SHS-III Manual Volume I, Appendix C. It is also in the SHS-4 Manual Volume II, Appendix C. This form has not been changed since SHS-III. The variable "deaddate" refers to the date of death. The "deadcode" are:

Cause of Death Code	Event
01	Definite fatal MI
02	Definite sudden death due to CHD
03	Definite fatal CHD
04	Possible fatal CHD
05	Definite fatal stroke
06	Possible fatal stroke
07	Definite fatal CHF
08	Possible fatal CHF
09	Other fatal CVD
10 and after	non-CVD death

For nonfatal events, the user needs to refer to the **Morbidity Survey Decision Form** for definition of each single cause. Since morbid events can reoccur, in this data set, I pulled all the events files together for each single event and selected the earliest one to represent the incident case as well as its date of occurrence. Thus, for nonfatal events, I separated the 9 CVD events in the Decision Form into 8 variables and the date of that specific event. They are:

Decision Diagnosis Code	Event	Variable name
01	Definite non-fatal MI	defmi and defmidt
02	Possible nonfatal MI	posmi and posmidt
03	Definite non-fatal stroke	defstk and defstkdt
04	Possible non-fatal stroke	posstk and posstkdt
06	Definite CHD	defchd and defchddt
07	Possible CHD	poschd and poschddt
08	TIA	shstia and shstiadt
09	Other CVD	othcvd and othcvddt

For SHS ECG MI, we were using MN Codes as:

SHS DEFINITE ECG MI: 11X, 12X EXCEPT (126, 128, 71, OR 74)
(SxDMI_S: x indicate phase, values: Y/N, ECGDATE)

SHS POSSIBLE ECG MI: 13X, 126, 128 EXCEPT (71, OR 74)
(SxPMI_S, values: Y/N)

SHS-I ECG date: ecgdate
SHS-II ECG date: ecgdate2
SHS-III ECG date: ecgdate3 (to be added)

NOTE: In Dr. Howard's Rising Tide paper (Circulation, 1999; 99:2389-2395):

Non-fatal CVD: defmi, defchd, defstk (morbidity decision: 1, 3, 6), and definite ECG MI (s2dmi_s='Y').

Fatal CVD: mortality final decision (01-09).

ALL CVD: combined fatal and non-fatal CVD.

DEFINITION OF HYPERTENSION

I. BLOOD PRESSURE: AVERAGE OF THE LAST TWO SITTING BLOOD PRESSURES FROM PHYSICAL EXAM, Q17, Q18, Q19, AND Q20

SYSTOLIC BLOOD PRESSURE - SBP = (EXAM27 + EXAM29) / 2
DIASTOLIC BLOOD PRESSURE - DBP = (EXAM28 + EXAM30) / 2
MEAN BLOOD PRESSURE - MBP = (2/3 SBP) + (1/3 DBP)

SXsbp, sXdbp

II. HYPERTENSION

A. WHO CRITERIA
SXwhohtn=('B', 'N', 'Y').

HYPERTENSION ('Y'):

1. TAKING ANTIHYPERTENSIVE DRUG (MEDICATION CODE='2408')
OR
2. TAKING (DIURETICS ('4028'), OR BETA-BLOCKERS ('1216') OR CARDIAC ('2404') OR VASODILATOR ('2412')) AND HISTORY OF HYPERTENSION (MED19='1')
OR
3. SYSTOLIC BLOOD PRESSURE $\geq$ 160 mmHg
OR
4. DIASTOLIC BLOOD PRESSURE $\geq$ 95 mmHg

BORDERLINE HYPERTENSION ('B'):

140 mmHg $\leq$ SBP < 160 mmHg OR
90 mmHg $\leq$ DBP < 95 mmhg

NORMOTENSIVE ('N'):

SBP < 140 AND DBP < 90 AND NO ANTIHYPERTENSIVE TREATMENT.

B. US CRITERIA: ***sXushtn=('N', 'Y').***
HYPERTENSION: WHO HYPERTENSION OR BORDERLINE HYPERTENSION
NORMOTENSIVE: SAME AS WHO NORMOTENSIVE.

==========

DEFINITION OF ISOLATED HYPERTENSION:

1.	HYPERTENSION:	DBP $\geq$ 90 AND SBP $\geq$ 140
2.	DIASTOLIC HYPERTENSION:	DBP $\geq$ 90 AND SBP < 140
3.	ISOLATED SYSTOLIC HYPERTENSION:	SBP $\geq$ 140 AND DBP < 90
4.	NORMOTENSIVE	SBP < 140 AND DBP < 90

==========

HYPERTENSION CONTROL, FOR HYPERTENSIVE PARTICIPANTS ONLY:
1. UNCONTROLLED HYPERTENSION: DBP $\geq$ 90 OR SBP $\geq$ 140

DEFINITION OF RENAL DISEASE:

I. RENAL FUNCTION, PLASMA CREATININE:

A. CATEGORICAL VARIABLE:

1 (RENAL INSUFFICIENCY)	PLASMA CREATININE $\geq$ 2.0 mg/dl
0 (NORMAL)	PLASMA CREATININE < 2.0 mg/dl

B. CONTINUOUS VARIABLE, ADJUSTED FOR BMI

II. ALBUMINURIA: ***sXacr=('1', '2', '3')***

ESTIMATED BY URINARY ALBUMIN - URINARY CREATININE RATIO

3 (MACROALBUMINURIA)	ACRATIO $\geq$ 300 mg/g
2 (MICROALBUMINURIA)	ACRATIO 30 - 299 mg/g
1 (NORMAL)	ACRATIO < 30 mg/g

III. END STAGE RENAL DISEASE (ESRD)

1 (YES)=	ON RENAL DIALYSIS, MEDICAL HISTORY FORM, Q4a, MED42='1', OR HAD KIDNEY TRANSPLANT, MEDICAL HISTORY, Q4b, MED43='1', OR KIDNEY FAILURE, MEDICAL HISTORY, Q3g, MED29='1'
0 (NO)=	NONE OF ABOVE

DEFINITION OF PERIPHERAL VASCULAR DISEASE (PVD)

I. ANKLE-BRACHIAL RATIO (PVD_ABR), PHYSICAL EXAM, Q44, Q45, AND Q46

sXrt_aar and sXlt_aar

RIGHT ANKLE BP: MEAN OF FIRST AND SECOND DOPPLER SBP OF RT ANKLE.
RANKBP=(EXAM66 + EXAM68) / 2
LEFT ANKLE BP: MEAN OF FIRST AND SECOND DOPPLER SBP OF LT ANKLE.
LANKBP=(EXAM70 + EXAM72) / 2
RIGHT ARMBP: MEAN OF FIRST AND SECOND DOPPLER SBP OF RT ARM.
RARMBP=(EXAM74 + EXAM75) / 2
RPVD_ABR = RANKBP / RARMBP
LPVD_ABR = LANKBP / RARMBP

PVD_ABR: (cut-off value may vary depending on investigator)
1 (YES): IF (RPVD_ABR < 0.8) OR (LPVD_ABR < 0.8) OR THE ANKLE DOPPLER BPs WERE NOT AUDIBLE (EXAM70, EXAM72, EXAM74, OR EXAM75 WAS '0')
0 (NO): IF PVD_ABR $\geq$ 0.8.

(Cut-off point, such as 0.85 or 0.9, may vary according to the investigator).

II. PERIPHERAL OCCLUSION (PERIOCC):
ABSENCE OF DORSALIS PEDIS PULSE **AND** POSTERIOR TIBIAL PULSE ON EITHER FOOT.
(PHYSICAL EXAM Q36-Q39),
PERIOCC=1 (YES): (EXAM58='2' AND EXAM60='2') OR (EXAM59='2' AND EXAM61='2')
PERIOCC=0 (NO): EXAM58='1' AND EXAM59='1' AND EXAM60='1' AND EXAM61='1'

III. PRESENCE OF FEMORAL BRUITS (BRUIT)
(PHYSICAL EXAM Q40-Q41)
BRUIT=1 (YES): EXAM62='1' OR EXAM63='1'
BRUIT=0 (NO): EXAM62='2' AND EXAM63='2'

IV. INTERMITTENT CLAUDICATION (MEDICAL HISTORY - ROSE QUESTIONNAIRE)
ROSEIC=1 (YES): ROSE10='1' AND ROSE11='1' AND ROSE12='1' AND (ROSE13='1' OR ROSE13='3') AND ROSE15='2' AND ROSE16='1' AND ROSE17='1' AND ROSE18='1', ELSE
ROSEIC=0 (NO):

V. COMPOSITE PVD (PVD_COMP)
PVD_COMP 1 (YES): PVD_ABR=1 OR PERIOCC=1 OR BRUIT=1 OR ROSEIC=1
PVD_COMP 0 (NO): PVD_ABR=0 AND PERIOCC=0 AND BRUIT=0 AND ROSEIC=0

DEFINITION OF OBESITY INDICES, PHYSICAL EXAM:

A. BODY MASS INDEX, Q1 AND Q2, (WEIGHT IN KILOGRAM) / (HEIGHT IN METER)^2

sXBMI = (EXAM94) / (EXAM03/100)^2

B. WAIST-HIP RATIO, Q33 AND Q9:

sXWHR = EXAM51 / EXAM13

C. PERCENT BODY FAT (sXPCTFAT):

(i) PCTFAT is calculated by using Rising's underwater equation as following:

fat-free mass:
FFT = 13.74 + 0.25 * (height^2 / resistance) + 0.30 * (weight) - 0.14 * (age) + 6.18 * (sex)
where: height in cm, weight in kg, age in years, sex (0=female, 1=male)

fat mass (FM) = weight - FFT

PCTFAT = (FM / weight) * 100%

RESISTANCE: Q35a IN PHYSICAL EXAM

(ii) following equation was developed by Segal and used by IRAS

```
IF SEX='1' THEN FFM2 =      0.00132*HT*HT - 0.04394*RESIST + 0.30520*WT
                            - 0.1676*AGE + 22.66827; ELSE
IF SEX='0' THEN FFM2 =      0.00108*HT*HT - 0.0209*RESIST + 0.23199*WT
                            - 0.06777*AGE + 14.59453;
```

where FFM2 is fat-free mass

```
PFAT_SG = ROUND(100*(1-(FFM2/WT)),.1);
```

(iii) the following equation was revised RJL for general population

```
IF SEX='1' THEN BODYH2O = EXP(1.1782*LOG(HT) - 0.5968*LOG(RESIST)
                           + 0.3226*LOG(WT)); ELSE
IF SEX='0' THEN BODYH2O = EXP(1.2004*LOG(HT) - 0.5529*LOG(RESIST)
                           + 0.2164*LOG(WT));
FFM3 = BODYH2O / 0.732;
FM3  = WT - FFM3;
PFAT_RJL = ROUND(((FM3/WT)*100),.1);
```

DEFINITION OF RISK FACTORS

1. CIGARETTE SMOKING (PERSONAL INTERVIEW II, Q24-Q29):

A. SMOKING (NEVER, EX-SMOKER, CURRENT)

SXsmoke=('E', 'N', 'Y')

N (NEVER)	IF INT2_34='2' OR INT2_35=0
E (EX)	IF (INT2_34 = '1' AND INT2_35 NE 0) AND INT2_36='2'
Y (CURRENT)	IF (INT2_34 = '1' AND INT2_35 NE 0) AND INT2_36='1'
' ' (UNKNOWN)	NONE OF ABOVE

IF GROUP INTO SMOKER VS NONSMOKER,
(SMOKING=0 OR SMOKING=1) CAN BE COMBINED AS NON-CURRENT SMOKER;

OR

(SMOKING=1 OR SMOKING=2) CAN BE COMBINED AS EVER SMOKED.

B. SMOKING AMOUNT (FOR SMOKER ONLY):

1. DURATION OF SMOKING: Q29 (INT2_39)

2. AGE STARTED SMOKING:
CURRENT SMOKER: AGE AT EXAM - DURATION OF SMOKING
EX-SMOKER: AGE STOPPED SMOKING (Q27) - DURATION OF SMOKING

3. DAILY SMOKING AMOUNT (Q28): INT2_38

4. TOTAL SMOKING AMOUNT (***sXppy***, PER PACK YEAR):
PPY = (DAILY SMOKING AMOUNT * DURATION OF SMOKING) / 20
= (INT2_38 * INT2_39) / 20

C. OTHER TYPE OF SMOKING: INTERVIEW II, Q30-Q32

0 (NO)	IF (INT2_40='2' AND INT2_41='2' AND INT2_42='2')
1 (YES)	IF (INT2_40='1' OR INT2_41='1' OR INT2_42='1')

D. PASSIVE SMOKING

0 (NO)	IF INT2_33=0
1 (YES)	IF INT2_33 > 0

DAILY EXPOSURE TIME (IN HOURS): INT2_33.

E. PARENTAL SMOKING:

0 (NONE)	(INT2_31=2 OR INT2_31=3) AND (INT2_32=2 OR INT2_32=3)
1 (ONE)	INT2_31=1 OR INT2_32=1
2 (BOTH)	INT2_31=1 AND INT2_32=1

2. EDUCATION: PERSONAL INTERVIEW FORM II, Q15 - INT2_4
   A. CONTINUOUS: ***s1edu***=INT2_4 (YEARS)
   B. CATEGORICAL:
      i. THREE CATEGORIES (EDUCAT1):
         1 (LESS THAN HIGH SCHOOL) 0 <= INT2_4 < 12
         2 (HIGH SCHOOL GRADUATE AND/OR SOME COLLEGE) 12 <= INT2_4 < 16
         3 (COLLEGE GRADUATE) INT2_4 >= 16

      ii. FOUR CATEGORIES (EDUCAT2):
         1 (LESS THAN NINE YEARS) 0 <= INT2_4 <= 9
         2 (SOME HIGH SCHOOL) 10 <= INT2_4 <= 12
         3 (SOME COLLEGE) 13 <= INT2_4 <= 16
         4 (COLLEGE GRADUATE) INT2_4 >= 16

3. TOTAL DEGREE OF INDIAN BLOOD: INTERVIEW II, Q16
   A. CONTINUOUS: ***BLOODALL*** = (INT2_5 / INT2_6) * 100%
   B. CATEGORICAL:
      0 (LESS THAN 25%) 0 < BLOODALL < 25%
      1 (LESS THAN 50%) 25 <= BLOODALL < 50%
      2 (50-74.9%) 50 <= BLOODALL < 75%
      3 (75-99.9%) 75 <= BLOODALL < 100%
      4 (FULL BLOODED) BLOODALL = 100%

4. INDIAN TRADITION: INTERVIEW II, Q35-Q38
   A. SPEAK NATIVE LANGUAGE, INDYLANG
      0 (NO) INT2_45='3' OR INT2_46='5'
      1 (YES)INT2_45='1' OR '2' AND (INT2_46='1' OR '2' OR '3' OR '4')

   B. USE TRADITIONAL MEDICINE/HERBS, INDYMED
      0 (NO) INT2_47='5' OR '9'
      1 (YES)INT2_47='1' OR '2' OR '3' OR '4'

   C. TRADITIONAL CEREMONIES, INDYCERE
      0 (NO) INT2_48='5' OR '9'
      1 (YES)INT2_48='1' OR '2' OR '3' OR '4'

5. STRESS: INTERVIEW II, Q42-Q46
   A. SLEEP LOSS, Q42, SLEPLOSS
      0 (NO) INT2_52='1'
      1 (YES)INT2_52='2' OR '3'

   B. STRAIN OR STRESS, Q43, STRAIN
      0 (NO) INT2_53='1'
      1 (YES)INT2_53='2' OR '3'

C. OPEN ARGUMENTS, Q44, QUARREL
0 (NO) INT2_54='1' OR '2'
1 (YES)INT2_54='3' OR '4' OR '5'

D. ALCOHOL PROBLEM OF HOUSEHOLD, Q45, HOUSETOH
0 (NO) INT2_53='1'
1 (YES)INT2_53='2'

E. SIZE OF HOUSEHOLD, Q46, HOUSSIZE
1 (SMALL) INT2_54 $\leq$ 4
2 (MEDIAN) 4 < INT2_54 < 10
3 (LARGE) INT2_54 $\geq$ 10

6. ALCOHOL USE

A. ALCOHOL DRINKING STATUS, ***sXETOH=('0', '1', '2')***, Q47-Q48
0 (NEVER) INT2_57='2'
1 (EX-DRINKER) INT2_57='1' AND (INT2_59 $\geq$ 12 OR INT2_60 $\geq$ 1)
2 (CURRENT) INT2_57='1' AND INT2_60 = 0

B. BINGE DRINK

1. DURING THE PAST MONTH, Q52
0 (NO) 0 $\leq$ INT2_64 < 5
1 (YES) INT2_64 $\geq$ 5

2. DURING THE PAST YEAR, Q53
0 (NO) 0 $\leq$ INT2_65 < 5
1 (YES) INT2_65 $\geq$ 5

C. AMOUNT OF ALCOHOL INTAKE

Average weekly drinking amount: INT2_61 (preferred ETOH variable)

Average daily drinking amount: INT2_63

7. SOCIOECONOMIC STATUS (SES)
   A. RECEIVING FEDERAL ASSISTANCE:
      1. FOOD STAMPS / WIC, Q56
         0 (NO) INT2_68 = 0
         1 (YES)INT2_68 > 0

      2. COMMODITY FOOD, Q57
         0 (NO) INT2_69 = 0
         1 (YES)INT2_69 > 0

      3. FEDERAL ASSISTANCE, FEDHELP
         0 (NO) INT2_68 = 0 AND INT2_69 = 0
         1 (YES)INT2_68 > 0 OR INT2_69 > 0

   B. SES (EDUCATION, FAMILY INCOME, ...)

      1. HOUSEHOLD INCOME, Q58: USE THE CATEGORIES LISTED IN THE QUESTIONNAIRE.

8. FAMILY HISTORY OF DISEASES - PERSONAL INTERVIEW II, FAMILY HISTORY
   A. CLASSIFICATION:
      1. PARENTAL, FOR RELATIONSHIP CODE 1 AND 2 (FH1 AND FH14)
      2. FIRST DEGREE FULL-BLOOD RELATIVES:
         RELATIONSHIP CODE: 1 (MOTHER), 2 (FATHER), 3 (SISTER), 5 (BROTHER), 7 (DAUGHTER), AND 8 (SON).
      3. ALL FIRST DEGREE RELATIVES, ALL CODES.

   B. DISEASE HISTORY
      1. HEART DISEASE: MI AND HD
      2. CARDIOVASCULAR DISEASE: MI, HD, HBP, CVA
      3. DIABETES: DM
      4. KIDNEY FAILURE: KF
      5. ARTHRITIS: AT
      6. CANCER

9. MEDICAL HISTORY, MEDICAL HISTORY FORM

A. PRESCRIBED MEDICATIONS: USE CATEGORIES IN THE MANUAL (p. 282)

1-	ANTIHISTAMINE (400)	2-	ANTIBIOTICS (812)
3-	ANTINEOPLASTIC RX (1000)	4-	BETA-BLOCKERS (1216)
5-	ANTICOAGULANTS (2000)	6-	CARDIAC DRUGS (2404)
7-	HYPOLIPIDEMIC (2406)	8-	HYPOTENSIVE (2408)
9-	ANALGESIC (2808)	10-	ASPIRIN (280892)
11-	ANTICONVULSANTS (2812)	12-	PSYCHOTHERAPY (2816)
13-	ADRENALS (6804)	14-	Oral Contraceptives (6812)
15-	DIURETICS (4028)	16-	GI DRUGS (5600)
17-	MENOPAUSAL ESTROGEN (6816)	18-	INSULIN (682008)
19-	SULFONYLUREAS (682020)	20-	THYROID AGENTS (6836)
21-	OINTMENTS (8400)	22-	VITAMINS (8800)
23-	UNCLASSIFIED (9200)		

B. HISTORY OF:

1. GALLSTONE, Q3c
   0 (NO) MED22='2'
   1 (YES)MED22='1'

2. ARTHRITIS, Q3d
   0 (NO) MED23='2'
   1 (YES)MED23='1'

3. CANCER, Q3e
   0 (NO) MED24='2'
   1 (YES)MED24='1'

4. KIDNEY FAILURE, Q3g
   0 (NO) MED28='2'
   1 (YES)MED28='1'

5. EMPHYSEMA, Q3h
   0 (NO) MED31='2'
   1 (YES)MED31='1'

6. LIVER CIRRHOSIS, Q3i
   0 (NO) MED32='2'
   1 (YES)MED32='1'

7. RENAL DIALYSIS, Q4a
   0 (NO) MED42='2'
   1 (YES)MED42='1'

8. KIDNEY TRANSPLANT, Q4b
   0 (NO) MED43='2'
   1 (YES)MED43='1

10. REPRODUCTION AND HORMONE USE (FEMALE ONLY), MEDICAL HISTORY

A. REPRODUCTION:

1. TIMES PREGNANT, Q7-1, REPRO1

2. NUMBER OF LIVE BIRTH, Q7-2, REPRO2

3. NUMBER OF LOST PREGNANCIES, Q7-3, REPRO3

4. NUMBER OF LIVING CHILDREN, Q7-4, REPRO4

5. MENOPAUSAL, Q8

0 (NO)	REPRO5='2'
1 (YES)	REPRO5='1'

6. AGE AT MENOPAUSE, Q9, REPRO6

B. HORMONE USE

1. ORAL CONTRACEPTIVE, Q11

0 (NO)	REPRO9='2'
1 (YES)	REPRO9='1'

2. AGE STARTED TO USE OC PILLS, Q12, REPRO10

3. TOTAL DURATION OF USING OC PILLS, Q13, REPRO11

4. EVER USE OF ESTROGEN OTHER THAN OC PILLS, Q14

0 (NO)	REPRO12='2'
1 (YES)	REPRO12='1' OR MEDICATION CODE (Q1a-Q1h) CONTAINS '6816' (POST MENOPAUSAL ESTROGEN)

5. AGE STARTED TO USE ESTROGEN, Q15, REPRO13

6. TOTAL DURATION OF USING ESTROGEN, Q16, REPRO14

11. PHYSICAL ACTIVITY

WILL CONSULT WITH DR. ANDREA KRISKA

12. LAB DATA
    - A. LIPID - CONTINUOUS VARIABLE
        1. TOTAL TRIGLYCERIDE, **ln(TRIG)**
        2. TOTAL CHOLESTEROL, CHOLEST
        3. HDL CHOLESTEROL, HDL_CHOL
        4. LDL CHOLESTEROL, LDL_CHOL
        5. VLDL TRIGLYCERIDE, VTRIG
        6. VLDL CHOLESTEROL, VCHOL
        7. RATIOS:
            - i. VCHOL/VTRIG
            - ii. HDL_CHOL/CHOLEST
            - iii. HDL_CHOL/LDL_CHOL
            - iv. APOB/(CHOLEST-HDL_CHOL)
            - v. APOA1/HDL_CHOL
            - vi. APOB/LDL_CHOL
    - B. APOLIPOPROTEINS: APOA1, APOB
    - C. GLUCOSE:
        1. FASTING BLOOD GLUCOSE, GLUC_0
        2. 2-HR BLOOD GLUCOSE, GLUC_2
    - D. FIBRINOGEN
    - E. PLASMA INSULIN
    - F. FIBRINOGEN
    - G. APO E PHENOTYPE
    - H. PLASMA CREATININE
    - I. URINARY ALBUMIN AND CREATININE
    - J. GLYCATED LDL

CUT POINTS FOR CONTINUOUS VARIABLES:

VARIABLES		LOW (0) NO	MEDIUM (1)	HIGH (2) YES
AGEGP		45-54	55-64	65-74
OBESITY: USING NHANES-II CRITERIA				
In SHS-I:	OBESE (95%)	FEMALE: BMI $\geq$ 32.3 MALE: BMI $\geq$ 31.3		
	OVERWT (85%)	FEMALE: 32.3 > BMI $\geq$ 27.8 MALE: 31.1 > BMI $\geq$ 27.3		
SHS-II and later:	Overweight:	BMI 25-29.9		
	Obesity, level 1:	BMI 30-34.9		
	Obesity, level 2:	BMI 35-39.9		
	Obesity, level 3:	BMI 40-44.9		
	Obesity, level 4:	BMI 45 and above		
OBES_FAT	FEMALE:	PCTFAT < 41%		PCTFAT $\geq$ 41%
	MALE:	PCTFAT < 29%		PCTFAT $\geq$ 29%
OBES_WHR (65%)	FEMALE:	WHR $\leq$ 0.98		WHR > 0.98
	MALE:	WHR $\leq$ 0.96		WHR > 0.96
TOTAL CHOLESTEROL (NCEP GUIDELINE)		CHOLEST < 200 (mg/dl)	CHOLEST 200-239	CHOLEST $\geq$ 240
TOTAL TRIGLYCERIDES		TRIG < 250 (mg/dl)		TRIG $\geq$ 250
2001 Guideline		TRIG < 200 mg/dl		TRIG $\geq$ 200
HDL CHOLESTEROL (NCEP GUIDELINE)		HDL_CHOL < 35 (mg/dl)		HDL_CHOL $\geq$ 35
2001 Guideline		HDl_CHOL < 40		HDl_CHOL $\geq$ 40
LDL CHOLESTEROL (NCEP GUIDELINE)		LDL_CHOL < 130 (mg/dl)	LDL_CHOL 130-159	LDL_CHOL $\geq$ 160

THE CONTINUOUS VARIABLES MAY ALSO BE ANALYZED BY QUARTILES.

APPENDIX E

STRONG HEART STUDY

PHASE V

Special Designs and Methods

Nested Case-Control Design:

For the Adiponectin and Thyroid case-control studies

Design: Nested case-control (case-control within an existing longitudinal study) Frequency matching is recommended.

Cases and controls are identified at the same point in time and previous exposure is examined for association with disease. After applying exclusion criteria, cases are selected. From the remaining pool of susceptibles, controls are selected. Controls are matched to cases based on the distribution of diabetes, study center, and gender among randomly selected cases. For instance, if 8% of the cases are women with diabetes from Arizona, then 8% of the controls will also be women with diabetes from Arizona.

Exclusion Criteria:

- prevalent and incident CVD occurring from baseline to phase 2 and CVD cases identified at the phase 2 exam (ECGMI) will be excluded.
  Prevalent and incident CVD, Fatal and Non-Fatal variables:
  - Deadcodes 1, 2, 3, 4, 7 & 8 (Definite MI, Definite Sudden death due to CHD, Definite and Possible CHD, Definite and Possible CHF)
  - ECG MI identified at phase 1 or phase 2 exam
  - Non-fatal CVD events between phases 1 and 2. (DEFMI and DEFCHD).
- Anyone with renal disease - plasma creatinine level >1.2 mg/dL (from phase 2 lab data)
- Anyone taking thyroid medication (at phase 2)
- Anyone taking glucocorticoid (at phase 2)
- Anyone taking troglitazone (at phase 2)
- Prevalent and incident definite stroke, Fatal and Non-Fatal variables: Deadcodes 05 and 06, and DEFSTK

Matching criteria:

- Gender
- Study site
- Diabetes status (2 groups, diabetes and no diabetes), diabetes defined using ADA criteria: self report or taking oral diabetes medication or taking insulin or FG >= 126 (at phase 1 or phase 2 exams)

Selection Process:

1. Apply exclusion criteria to phase 2 participants: (Deadcodes 1, 2, 3, 4, 5, 6, 7 & 8, DEFMI, DEFCHD, ECGMI, DEFSTK, plasma creatinine >1.2, taking thyroid meds, glucocorticoid and/or troglitazone). Remove any participant who meets any exclusion criterion.

2. Identify incident CVD cases occurring after phase 2 exam through ALLCVD99: (Deadcodes 1, 2, 3, 4, 7 & 8, not 5 & 6; DEFMI, DEFCHD, and ECGMI-from-phase 3 exam)

3. Remove all incident cases identified in step 2 from the pool of susceptibles at phase 2.

4. Divide the cases into the following 12 categories:

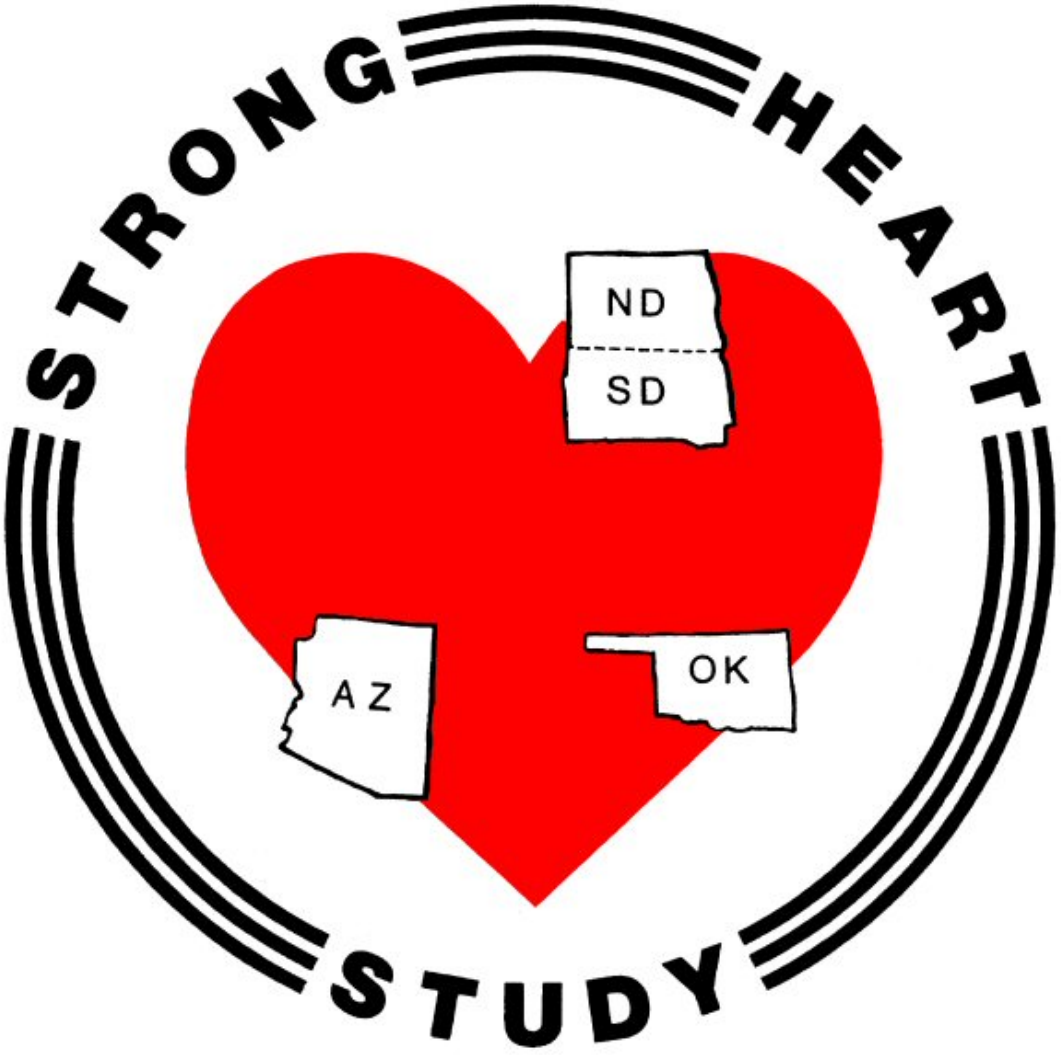
1) Women from AZ with DM	4) Women from AZ no DM
2) Women from OK with DM	5) Women from OK no DM
3) Women from SD with DM	6) Women from SD no DM
7) Men from AZ with DM	10) Men from AZ no DM
8) Men from OK with DM	11) Men from OK no DM
9) Men from SD with DM	12) Men from SD no DM

5. Randomly select 162 cases in as even a distribution as is possible from each of the 12 categories.

6. Select 162 controls from phase 2 participants who remain after the identified cases are removed

7. The distribution of controls should mirror that of the cases.

Proposed and developed by:
Helaine E. Resnick, PhD, MPH
Kristina L. Jones, MPH
05/23/2002



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Four

LABORATORY MANUAL

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Four

Laboratory Manual

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME IV

LABORATORY MANUAL

Table of Contents

STRONG HEART STUDY LABORATORY PROCEDURES

1.0 Safety Precautions, Universal Precautions and Personal Protective Equipment for the Handling of Blood and Working in a Laboratory Setting:

Lab testing in research is important. Your work brings new and important information to the scientific and medical community. The special equipment and skills such as attention to detail, organization and phlebotomy are critical to the success of this project. Your work on this project will probably expose you to a variety of potentially hazardous situations. The following learning modules are designed to help you keep safe on the job.

Each site should have at least one staff member who will be actively involved in this process attend the initial training session. This person, in turn will be responsible for training additional personnel at his/her facility. The training session will cover all procedures related to supplies, equipment, and preparation of log sheets, labeling, collection, processing, storage, packing and shipping of specimens.

Throughout the study, a qualified observer should regularly monitor and evaluate the work of those involved in the collection and processing of blood samples. Specific plans should be made to train new staff members at each facility. Training should include a detailed review of the Strong Heart Study laboratory manual as well as supervised practice in the application of the techniques required by the protocol.

This section will provide knowledge to protect you and others. In addition to these instructions, use commonsense on the job every day.

- Be cautious and follow procedures.
- Take your time and concentrate on what you are doing.
- Avoid contact with hazardous chemicals
- Treat unknown substances as hazardous
- Follow all equipment operating instructions
- Don't take chances
- Don't operate anything if you have not been trained on that equipment
- Follow all instructions
- Report any malfunctioning or suspicious-appearing equipment immediately
- Never pipette samples by mouth.
- Avoid direct contact with blood, sera or plasma. Cover any scratches or cuts on fingers and hands very carefully and use gloves in the handling of specimens.
- All tubes, containers and other materials exposed to blood must be disposed of in appropriately labeled waste receptacles for biohazardous materials.
- When removing stoppers from vacutainers, use a splash shield to prevent

droplets from spraying onto your skin or eyes.
- All samples should be stored in sealed containers or tubes.
- All site personnel should be informed of and guided by current OSHA and CDC guidelines particularly those concerning "Universal Blood and Body Fluid Precautions" published by the CDC.
- Immunization against Hepatitis B is highly recommended for persons drawing blood and handling biological specimens.
- Avoid working alone
- Post important phone numbers and emergency numbers prominently
- Know before an accident where to go and what to do
- Know the location of safety showers, eyewashes and fire extinguishers

Module I: Safety Precautions

This module will include the following:

- Provide knowledge to protect you and others.
- Demonstrate common procedures that will be used on the job every day.

Here are some guidelines:

- Be cautious and follow procedures.
- Take your time and concentrate on what you are doing.
- Avoid contact with hazardous chemicals
- Treat unknown substances as hazardous
- Follow all equipment operating instructions
- Don't take chances
- Don't operate anything if you have not been trained on that equipment
- Follow all instructions
- Report any malfunctioning or suspicious-appearing equipment immediately
- Never pipette samples by mouth.
- Avoid direct contact with blood, sera or plasma. Cover any scratches or cuts on fingers and hands very carefully and use gloves in the handling of specimens.
- All tubes, containers and other materials exposed to blood must be disposed of in appropriately labeled waste receptacles for biohazardous materials.
- When removing stoppers from vacutainers, use a splash shield to prevent droplets from spraying onto your skin or eyes.
- All samples should be stored in sealed containers or tubes.
- All site personnel should be informed of and guided by current OSHA and CDC guidelines particularly those concerning "Universal Blood and Body Fluid Precautions" published by the CDC.

- Immunization against Hepatitis B is highly recommended for persons drawing blood and handling biological specimens.

Emergencies can happen, so be prepared:

- Avoid working alone
- Post important phone numbers and emergency numbers prominently
- Know before an accident where to go and what to do
- Know the location of safety showers, eyewashes and fire extinguishers

Some of the equipment in the areas you will be working is reviewed below:

- **Glassware** like vacutainers can break, causing chemical and cut hazards. Some of the chemicals contained in the vacutainers are EDTA and heparin. Although serious hazards are unlikely if exposed, still follow procedures if an accident occurs. To avoid contact, use the right type of glassware for each job, and discard chipped or cracked vacutainers in an approved receptacle. Don't force anything made of glass.
- **Electrical equipment** always carries the potential of shock or fire. Don't touch it with wet hands or while standing on a wet floor. Report any shocks, and don't attempt to do repairs if you haven't been trained.
- **Centrifuges** and other equipment with moving parts can catch your clothing or open up suddenly, showering you with dangerous material. Keep clothing or long hair away from them. Make sure the load is balanced, the top is locked down, and the equipment has stopped before you open it.

Module II: Personal Protective Equipment

This module will include the following:

- Proper use of protective clothing.
- First-aid instructions

Let protective equipment work for you.

For this aspect of the study, always use assigned protective clothing and equipment. Always check that it is in good condition before putting it on. For this study the following are required:

- **Goggles or side shield safety glasses** to protect against splashes or flying objects are required any time you are working with specimens or

performing phlebotomy.

- **Gloves** must be worn to protect against any chemicals or exposure to samples
- **Long sleeves** are required to the length of your wrist and meet the glove.
- **Lab coats** must be full length and fully buttoned down the front.
- **Sturdy closed toed shoes** are required to cover your feet in case of spills or accidents

If you are exposed to a hazardous substance or samples, take the following actions:

.

For first-aid instructions, here are some general instructions. You should check with your supervisor for specific instructions at your institution prior to an accident.

- **Eyes:** Flush with water for 15 minutes.
- **Ingestion:** Follow labels and MSDS instructions MSDS is an abbreviation for Materials Safety Data Sheet and is available from the manufacturer for every chemical produced.
- **Skin Contact:** If limited to a small area of the body such as the hands, remove any contaminated gloves or clothing and wash with copious amounts of water. If there is greater exposure, stand under emergency shower and remove contaminated clothing immediately.
- **Inhalation:** Get to fresh air and get prompt medical attention.

Module III: Preventing Exposure to Blood Borne Pathogens:

This module will include the following:

- Universal precautions
- Work practices, including the use of protective clothing that eliminates or minimizes exposure to staff and subjects
- Housekeeping procedures to ensure cleanliness and possible spread of infection
- Hepatitis B vaccinations for employees at risk
- Exposure evaluation and follow-up for exposure incidents
- Hazardous material container warnings such as biohazard labels
- Confidential, accurate employee medical records

Your chance of being directly exposed to bloodborne pathogens on the job is small. But keeping exposure minimal can only succeed if staff members use the tools to protect themselves on the job.

- **Universal Precautions** are your best protection against any risk to exposure. This means all staff must treat all blood, urine, and other potentially infectious body fluids as if they are infected.

  All specimens should be regarded as potentially hazardous.

  DO:

  - Wash hands and exposed skin with soap and water immediately after exposure to infectious materials or after taking off gloves or other personal protective equipment.
  - Use antiseptic or cleansers or towelettes only if washing facilities aren't available.
  - Minimize splashing, spraying, or spattering of blood or other potentially infectious materials.
  - Place contaminated sharps in assigned labeled, puncture-resistant, leak-proof containers.

  DON'T:

  - Don't shear or break contaminated needles or other sharps, and don't bend, recap, or remove unless specifically instructed.
  - Don't keep food, drink, medication or makeup in work areas with exposure potential.
  - Don't eat, drink, smoke apply cosmetics or lip balm, or handle contact lenses in work areas with exposure potential.
  - Don't pipette or suction anything by mouth.

- **Protective Clothing:**

  BEFORE you put on protective clothing, make sure it's in good condition. Don't wear anything that's damaged or does not fit properly.

  AFTER tasks in the area are completed, remove all protective clothing before leaving that area. Remove protective clothing in such a manner as to minimize exposure and avoid contamination. Place protective clothing in a specially assigned area or container for decontamination, washing, storage or disposal.

- **Housekeeping:**

  Written procedures and a cleaning schedule help keep the workplace free of infection.

- **Cover** equipment and surfaces with plastic wrap, aluminum foil, or impervious absorbent paper. Remove and replace covering that is, or may be, contaminated.

Module IV: Proper Labeling

This module will include the following:

- Correct identification and labeling of containers with biohazardous labels
- Instructions in case of exposure

Proper labeling of containers for regulated waste must be labeled with fluorescent orange or orange-red biohazard warning labels.

Examples in the clinical area or lab are: refrigerators and freezers containing blood and other potentially infectious materials and other containers used to store, transport or ship blood and other potentially infectious materials

Biohazard labels **ARE** required for the following:

- waste containers used for disposal of contaminated needles
- refrigerator or freezer holding blood or other potentially infectious material
- individual specimen containers for storage or shipment zip-lok biohazard bags

Biohazard labels **ARE NOT** required for the following:

- when red bags or red containers are used
- on individual containers or blood of other potentially infectious materials that are placed in a labeled container during storage, transport, shipment or disposal

The risk of exposure is very small and most encounters with an HIV or HBV carrier pose no risk. AIDS and Hepatitis B can be transmitted through:

- Sexual contact
- Shared needles
- Needlestick injuries from infected needles or sharps
- Direct contact between broken or chaffed skin and infected body fluids.
- Hepatitis B can also be transmitted through dried blood and contaminated surfaces.

Neither AIDS (HIV) nor Hepatitis B are transmitted by:

- Coughing or sneezing
- Touching an infected person
- By using the same equipment, materials, toilets, showers, or water fountains.

Be safe!!! Your employer must make available, free of charge or at a reasonable time and place, the hepatitis B vaccine and vaccination series to all employees at risk. Any booster doses recommended by the US Public Health Service also must be provided. You are not required to participate in a prescreening program to receive the vaccine series. Also, the vaccine can be available at a later time if initially declined. If you choose to not receive the vaccine, your facility will ask you to complete and sign a form stating your refusal. This is required by law.

If you are directly exposed, REPORT IT IMMEDIATELY!!!

An exposure incident is specific to eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties. A common example of exposure would be a puncture from a used needle.

If exposed, you should contact your supervisor immediately. This allows for timely medical evaluation and follow up as well as for timely testing of the source. Your facility will provide immediate, confidential assistance and medical evaluation, including a blood test. All information will be treated with the strictest of confidence.

2.0 Sample Collection Instructions:

Personnel involved in sample collection should be highly experienced with vacutainer and butterfly blood collections, and be prepared to handle common problems, such as difficult blood collection and situations such as fainting. The phlebotomist should also be familiar with precautions to avoid exposing themselves to blood and be trained in the following:

- Ideally staff will have cardiopulmonary resuscitation (CPR) certification.
- It is suggested that they read "Collection and Handling of Laboratory Specimens: A Practical Guide"[1] or a similar phlebotomy manual.
- Personnel should wear clean white lab coats (with no blood stains) and

[1] Slockbower, J.M., and Blumenfeld, T.A., (Eds.). Collection and Handling of Laboratory Specimens: A Practical Guide. Philadelphia: J.B. Lippincott Company, 1983.

maintain a neat appearance. Lab coats will be full length, with long sleeves. Lab coats will be buttoned closed down the full length of the coat.

- Personnel will wear protective eyewear. Safety glasses are required when performing phlebotomy, processing specimens and preparing samples for storage and/or shipment.
- Staff should wear nametags and introduce themselves (if necessary) before a blood draw.
- Long hair and bangs should be pulled back.
- Phlebotomists and assistants should not chew gum or have any food in their mouths during blood draws. Food and drink must never be brought into areas used for blood drawing or processing.
- Staff will attempt no more than three venipunctures on the same subject. After three failed attempts, another person will be asked to try.

Module I: Sample Collection Facilities

This module will include the following:

- Room requirements for sample collection
- Supplies for sample collection

The area in which phlebotomy will occur should be clean and tidy with no evidence of previous blood draws such as used needles, blood stains, etc. A phlebotomy chair should be available for 15-20 minute periods to allow subjects to be seated for 10 minutes prior to a blood draw. If not available within the room, there should be quick access to a bed or examining table and ammonia capsules in case a subject feels faint. Also, there should be easy access to emergency equipment in case of cardiac arrest. Ideally, only the participant and phlebotomist (and assistant when needed) are in the room during the procedure.

The room should be set up in advance with basic supplies for blood collection:

- Vacutainer holders/hub
- Vacutainer needles
- Disposable graduated transfer pipettes
- alcohol wipes or swabs
- 2x2 sterile gauze pads
- band aids
- adhesive tape
- urine collection cups
- disposable latex gloves
- ammonia inhalants
- paper cups
- emesis basin
- tourniquets

- biohazard labels
- biohazard needle disposal boxes
- biohazard bags
- Tube racks or supports
- Waterproof marking pen
- Refrigerator
- Centrifuge
- -70^{o}C Freezer (or lower temperature Freezer than -70^{o}C)

Module II: Sample Collection and Processing

This module will include the following:

- Completion of clinical logs
- Completion of laboratory requisitions
- Demonstration of One-Touch Sure Step Flexx procedure
- Proper labeling of vacutainers and transport tubes
- Venipuncture Instructions
- Posture during blood collection
- Difficult Venipunture Techniques
- Vacutainers for Sample Collection and Processing Instructions

Sample Collection Logs and Laboratory Requisition Forms

Clinic personnel should carefully review the description of collection requirements to ensure that specimens are collected in the proper order and use the proper technique. Each clinic should set up a blood collection and blood processing notebook or a laboratory logbook in advance. It should be located in the blood collection/processing area. This should be a hardbound notebook from which pages cannot be easily removed. Pages should have columns headed for date, visit number, participant name and ID, barcode labels, redraw labels and room to write "comments" about any problems with blood draws or processing, including hemolysis of samples, etc.

In addition to the logs for the clinical area, it will be necessary to complete a laboratory requisition form for each subject (see example of this PARTICIPANT SAMPLE FORM in Appendix C below). The completed requisition form should include the following:

- Exam ID
- Date of Collection
- Under left column marked “write the number of samples sent” record the actual number of samples sent.

After proper completion of requisition form, affix barcode label to both copies of the form and one label in the laboratory log book.

<u>Redraw</u>

If sample collection is a redraw, indicate “yes” on new requisition form and take the following steps:

- Affix original barcode label to both copies of the requisition form
- Also affix redraw barcode label to both copies of the requisition form
- Place redraw label by the appropriate participant ID in laboratory log book

One-Touch Sure Step Flexx Procedure

1) One-Touch Sure Step Flexx glucose reading from a drop of blood obtained by finger stick. Using the blood from the venipuncture procedure below will not provide comparable results since there is a difference between capillary blood (fingerstick) and venous blood values.

2) See One-Touch Sure Step Flexx procedure for calibrating the glucometer and steps to follow in obtaining a glucose reading. (Consult with the operations manual, which can be obtained from Lifescan, Inc. 1-800-227-8862) A video and training will be provided at the initial training session. Thereafter, training will be provided on-site. See Appendix A of this volume (p. IV-A-1 below) for additional instructions.

Labeling Collection Tubes and Samples:

Prior to venipuncture, a label showing the date and time of collection and participant ID number should be written by the phlebotomist.

Pre-numbered and bar-coded labels will be provided to the study sites. Take care to select the correct number depending on whether the samples are being collected from the participant as a QA sample or for a Courtesy visit.

To properly label vacutainers and shipping vials, the white section of the label must be applied (first) to the tube laterally with the clear end wrapped over the white section of the label after the label is wrapped around the tube.

Module III: Venipuncture Procedure

This module will include the following:

- Correct Venipuncture procedures

Posture During Blood Draws:

A participant should be seated during blood draws. However, if the participant is clearly uncomfortable with the blood drawing situation, because of a previous fainting episode or a fear of fainting, have the participant lie down provided the

blood draw can proceed within 10 minutes. This is to ensure that blood is collected before body fluid shifts occur, which could alter plasma concentrations of outcome variables. Therefore, it is desirable that less than **10 minutes** elapse between the participant's lying down and completion of the blood draw.

Difficult Venipunctures:

There will be several common situations in which vascular access may be difficult. These will include but are not limited to the following:

- Palpated vein feels small or rolls.
- Excess subcutaneous tissue and fat lies over veins.
- Participant complains of being stuck more than once on a previous visit (no single staff person will attempt more than three venipunctures on a single participant at a single clinic visit) or has had a bad experience elsewhere.
- Participant has been stuck once already and none of the usual veins are palpable.

All reasonable efforts should be made to collect a blood sample, including use of a 23 gauge needle if that is the only means available to obtain a sample, e.g., in the case of a child or elderly person. If the participant experiences any of the above problems, and is agreeable to a repeat attempt, you may try the following procedure:

- Check back of hand and forearm for venipuncture sites with larger veins.
- Attempt one or more vein dilation methods:

1. Hot pack venipuncture site with a warm, wet towel or apply heating pad for 3-5 minutes.
2. Have participant hold hand in warm water for 3-5 minutes.
3. Have participant dangle arm at side with tourniquet in place for one minute.
4. Use blood pressure cuff as a tourniquet by pumping pressure to 60-80 mm Hg.
5. Be sure room is not too cool.

1) Position the participant in comfortable chair in an environment free from distraction.

2) Query the participant about their fasting state. Example: "When was the last time you ate or drank anything except water?" The participant should be fasting for about 12 hours. Record the time since the last food or beverage was consumed. If subject is not fasting, record time and note in comment section what foods or beverages were consumed that morning. Be sure to include any

additives like cream, sugar, or artificial sweeteners if a beverage was consumed. Regardless of fasting state, proceed with drawing procedure.

3) Inform the participant about the procedure. Explain the procedure to the participant, e.g., "I will be drawing a blood sample from your arm today. You will probably feel a small prick when I insert the needle."

4) Assemble all materials; have extra tubes within reach.

5) Blood samples will be collected from Strong Heart Study participants using conventional vascular access with a multi-draw Vacutainer (butterfly) needle and collection of the blood sample into Vacutainer tubes.

6) The antecubital site of the left arm will be used as the first choice for venipuncture. The median cubital vein is the one most frequently used. If the venipuncture of this vein is unsuccessful, the cephalic and basilic may be the next appropriate choice, followed by veins on the back of the hand. For known mastectomy participants, avoid use of an arm where there was axillary lymph node dissection.

7) Be sure all necessary supplies and equipment are available and set up in advance. Note visit type and type of Vacutainer tubes required. Label tubes with participant ID# and date and time of collection. Complete all lab forms before specimen collection. Ensure that all necessary equipment is functioning properly.

8) Be sure a full length lab coat is worn and buttoned. Wash hands and put on protective gloves.

9) Fit luer adapter needle at end of collection set into Vacutainer sleeve and place the first collection tube into sleeve/hub.

10) Position participant's arm on the drawing table. Extend the arm toward you, palm up.

If no radial pulse can be felt, the tourniquet is too tight. *Tourniquet must not be in place more than two minutes.*

11) Apply tourniquet 3 inches above a venipuncture site. If it is necessary to apply a tourniquet for preliminary vein selection, release it for two minutes and reapply immediately before entering the vein.

12) Pull skin taut 2 inches below site to keep vein from rolling.

13) Palpate vein. (A vein feels like an elastic tube and returns when pressure is applied). If the presence of a vein is questionable, remove or loosen the

tourniquet. If the structure remains, it probably was not a vein; if it disappears assume it was a vein. Another technique to assist in locating a vein is to moisten the skin with alcohol as it will decrease the friction and may aid in the palpation of a vein. If no vein is felt, try other arm or another site (See section on "Difficult Venipunctures").

14) Cleanse skin over vein thoroughly using a circular motion from center to periphery. Wipe alcohol with new 2x2 gauze to dry the area.

DO NOT TOUCH SKIN AFTER CLEANSING.

15) With the bevel of the needle in upright position, enter vein. Hold needle in the same direction as vein and at a 15-degree angle to vein. Insert the multidraw needle bevel up, parallel to vein. Use a straight smooth movement through the skin; do not poke around. The needle is sterile; do not touch it while performing venipuncture. If vein rolls, withdraw needle slightly without coming completely out of the arm and try a second attempt. If the vein collapses, remove the needle and tourniquet. Apply slight pressure to the puncture site. Try another site and/or call another staff person to assist. After a new location has been determined, usually the other arm, begin the procedure again. Reapply the tourniquet, possibly have participant open and close the fist, swab areas with alcohol and dry, then reinsert the tube. If there is still no blood, stop the procedure and use techniques in section on "Difficult Venipunctures."

16) If the phlebotomy is successful, draw required blood tubes. After blood begins to flow, secure butterfly with a piece of tape and loosen the tourniquet. Place tubes in conditions as specified in the instructions.

If blood does not begin to flow, try the following:

a) Move the needle slightly in or out.
b) Rotate needle slightly or lift needle to move bevel away from the wall of the vein.
c) Try another tube.
d) Loosen tourniquet; blood flow may be impeded if tourniquet is too tight.
e) Be sure to watch for signs of hematoma or swelling from the vein. If there is any indication of hematoma or swelling, immediately remove tourniquet and needle. Place 2x2 gauze over the site, and apply pressure and/or ice pack on site for 5 minutes. If the first attempt to obtain blood is unsuccessful (with the subject's permission) try again on the opposite arm. **The same technician should not attempt a venipuncture more than three times.**

17) When first tube is filled, remove tube and replace with the next tube. Invert all filled tubes **except SST tubes** 8-10 times and place on ice. **DO NOT** place SST tube on ice.

18) Proceed with collection of tubes in this order. Label all tubes:

Fasting:
1. (3) Red top (SST) tubes
2. (1) or (2) Light Blue top (Citrate) tubes
3. (1) Gray top (Sodium fluoride) tubes
4. (4) Lavender top (EDTA) tubes

19) After drawing the last tube, remove the tourniquet. Use clean gauze to apply slight pressure to arm and withdraw needle, then immediately apply pressure to site. Apply gentle pressure to the site.

20) Request participant apply pressure at site for 3-5 minutes while leaving the arm straight at the elbow. This is more important than elevating the arm or bending the elbow, which some participants might do automatically.

21) Confirm that bleeding has stopped, and apply a pressure bandage at venipuncture site. If bleeding has not stopped, elevate arm and continue to apply pressure until it stops.

22) Check preprinted labels and tubes, making sure the ID# and tube designation are correct.

23) Dispose of entire needle set-up into a proper biohazard disposal container. *Never try to re-cap a needle since this puts you at risk for a needle puncture.*

24) Check site. If blood oozes from the site, have the participant apply pressure to the site 1-2 minutes longer or as long as is necessary, elevating arm above head. Apply Band-Aid.

25) Give the participant labeled urine specimen cup and instruct him to void into the container. Inform him/ her where to leave the container.

26) Remove gloves, wash hands, and proceed to next participant.

Realize that the participant might be disoriented, embarrassed, or irritable and may need additional attention. Recognize also that this incident will have an impact on future blood drawing, and possible adherence through the study, and must be handled with reassurance. Make a note in the participant's file so that clinic staff will be aware of the situation in the future.

Note: If sample is not collected, try to reschedule the visit especially if the technician and participant agree that this is an unusual situation and that is not likely to occur again. If participant does not wish to reschedule, indicate in the comment section on the visit form that the samples were not collected.

Finish venipuncture following procedures outlined above, if possible. If multiple attempts at venipuncture are unsuccessful, do not reschedule the participant unless both the technician and the participant agree that this is an unusual situation and that there is a high probability of obtaining a sample on the first try at another visit.

If Fainting Episodes Are Experienced:

If participant shows signs of becoming faint (loss of color in the face, unusual sweating on the forehead) or reports feeling dizzy:

- Finish drawing blood if possible but do not proceed if participant is clearly in trouble.
- Remain calm and call for help.
- Have participant lay head on table or move participant into a fully reclined position, if possible.
- Have participant prop feet up on pillow or cushion and elevate participant's legs above her head.
- Continue talking to participant to assess level of consciousness.
- Prevent injuries from possible fall or seizure.
- Have participant lie down for 5-10 minutes after removing the needle; apply pressure on vein.
- Apply cool compress to forehead.
- Use ammonia capsule if needed.
- Keep participant in a reclined position until the subject feels better.
- Taking blood pressure readings to assess recovery may be worthwhile.
- Offer participant water, juice and food after they have recovered.

Urine Sample Collection:

1 Containers for routine collection should be clean and hold about 50 ml in volume and

must have a tight-fitting lid.

2 The participant's privacy should be assured and a clean bathroom available.

3 Instruct the participant to perform the following steps:

- Remove cap from the labeled container before beginning urination
- Void directly into toilet and after stream is steady, pause.
- Begin stream again and fill approximately half of the cup.
- Finish urinating, firmly place cap on container and return sample to the study person.

Flow charts summarizing processing procedures are in Appendix B-1A through B-1C.

General Sample Collection:

Table I: General Instructions for Sample Processing of Blood & Urine Samples

Collection Tube	Test
3 10ml SST Chem Profile, Lipids, Insulin, CRP, FFA Serum Storage	1. Let stand at room temperature for 20 minutes so blood can clot. If samples cannot be processed within the hour, refrigerate sample or place on ice. 2. Centrifuge at 3000 rpm (1000xG) for 10 minutes. 3. Place approximately 1 ml of serum sample in each of the appropriate 2ml-cryovials and label.
1 4.5ml Lt blue or **2** 2.7ml Lt blue Fibrinogen Na Citrate Plasma Storage	1. *This vacutainer must be allowed to fill completely with blood at the time of collection.* 2. After collection gently invert 8-10 times. Place on ice or refrigerate immediately. 3. Centrifuge at 3000 rpm (1000xG) for 10 minutes at 4°C. 4. Place approximately 1 ml of plasma sample in each of the appropriate 2ml-cryovials and label.
1 4ml Gray Fasting Glucose NaFl Plasma Storage	1. After collection gently invert 8-10 times. Place on ice or refrigerate immediately. 2. Centrifuge at 3000 rpm (1000xG) for 10 minutes at 4°C. 3. Place approximately 1 ml of plasma sample in each of the appropriate 2ml-cryovials and label.
3 10 ml Purple HemoglobinA1c DNA Isolation Leptin EDTA Plasma Storage **1** purple for CBC at local lab	1. After collection, gently invert 8-10 times, place on ice or refrigerate immediately. 2. Tube #1: Prior to centrifuging, mix well and pipette approximately 1 ml of whole blood and place in each appropriate 2-ml cryovial and label. Re-cap tube #1. 3. All three tubes: Centrifuge at 3000 rpm (1000xG) for 10 minutes at 4°C. First, place approximately 1 ml of plasma sample in each of the appropriate 2-ml cryovials and label. Then, remove the buffy coat using the *Purple top tube buffy coat isolation protocol* as follows: **Buffy Coat:** 1. After plasma has been removed, there should be about 1/8th inch of plasma remaining on top of the buffy coat. 2. With either a glass or plastic pipette, place the tip of the pipette at the bottom of the small plasma layer just *slightly above* the buffy coat. Also, rest the pipette against the glass inside edge of the vacutainer tube. 3. Slowly draw up the buffy coat by moving the pipette in a circular motion around the inside of the vacutainer. 4. Remove all of the buffy coat from one tube and place in a 2.0 ml cryovial (orange cap). 5. Cap cryovial firmly, apply label. 6. With each tube repeat steps 1-4 using a different pipette for each tube. Use a new clean pipet for each tube. Do not mix the buffy coats between cryovials, ie only one buffy coat from one tube per cryovial.
1 cup Random Urine Creatinine & Albumin Urine Storage	1. Do not centrifuge. 2. After collection, place on ice or refrigerate immediately. 3. Place 1 ml of urine sample in each of the appropriate 2-ml cryovials and label.

Table II: Participant Collection Instructions

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Cryovial Type
3 10 ml SST (red/gray tiger top)	Chem Profile, Lipids, Insulin, CRP, FFA	Serum	Frozen	**4** 2 ml-red cap vial
	Storage	Serum	Frozen	**8** 2ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	**1** 2ml-blue cap vial
	Storage	Na Citrate Plasma	Frozen	**1** 2 ml-blue cap vial
1 4.0 ml Gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	**2** 2 ml-black cap vial
3 10 ml Purple	HemoglobinA1c	Whole Blood	Frozen	**3** 2 ml-neutral cap vial
	DNA Isolation	Buffy coat	Frozen	**3** 2 ml-orange cap vial
	Leptin	EDTA Plasma	Frozen	**2** 2 ml-purple cap vial
	EDTA Storage	EDTA Plasma	Frozen	**8** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	**2** 2 ml-yellow cap vial
	Storage	Urine	Frozen	**4** 2 ml-yellow cap vial

Table III: QA Collection Instructions:

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Cryovial Type
1 10 ml SST	Chem Profile, Lipids Insulin, CRP FFA	Serum	Frozen	**4** 2 ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7 ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	**2** 2 ml-blue vial
1 4 ml Gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	**2** 2 ml-black cap vial
1 10 ml Purple	HemoglobinA1c Leptin	Whole Blood EDTA Plasma	Frozen Frozen	**2** 2 ml-neutral cap vial **2** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	**2** 2 ml-yellow cap vial

Table IV: Courtesy Collection Instructions

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Cryovial Type
3 10 ml SST	Chem Profile, Lipids, Insulin, CRP, FFA	Serum	Frozen	**4** 2 ml-red cap vial
	Storage	Serum	Frozen	**8** 2 ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	**1** 2 ml-blue cap vial
	Storage	Na Citrate Plasma	Frozen	**1** 2 ml-blue cap vial
1 4 ml Gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	**2** 2 ml-black cap vial
3 10 ml Purple	HemoglobinA1c	Whole Blood	Frozen	**3** 2 ml-neutral cap vial
	DNA Isolation	Buffy Coat	Frozen	**3** 2 ml-orange cap vial
	Leptin	EDTA Plasma	Frozen	**2** 2 ml-purple cap vial
	EDTA Storage	EDTA Plasma	Frozen	**8** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	**2** 2 ml-yellow cap vial
	Storage	Urine	Frozen	**4** 2 ml-yellow cap vial

Module IV: Quality Assurance Sample Collection:

As part of the Quality Assurance process of this study, there is a need to assure that all the steps from the time that blood is collected to the time that results are reported are correct. To accomplish this, replication of unknown samples will be necessary by performing blind duplicate testing of samples. Blind duplicate samples, otherwise known as quality assurance (QA) samples, will be obtained from participants as follows:

1. Collect blind duplicate samples at a frequency of every 20th participant.

2. Collect blind duplicate samples only for the tests listed in Table III above.

3. In order to label the blind duplicate samples, the numbering system for these QA samples is similar to the Study ID and consists of 6 digits with the first digit corresponding to the center (1-SD, 2-OK, 3-AZ), the second digit will be a "3" to

indicate that the sample is a QA and the 4-digit participant ID number. The Coordinating Center should receive at monthly intervals the matching participant ID and corresponding QA for analysis. This list should not be made available to the Core Laboratory.

Processing and Shipping QA samples

These samples should be treated the same as the regular participant samples and be included in regular shipments with the participant and courtesy samples. DO NOT note the corresponding (regular) participant number anywhere on the form to go to the lab.

3.0 Sample Storage and Shipment

Module I: Equipment Maintenance

This module will include the following:

- Proper maintenance of equipment

The proper care of equipment promotes the life of any piece of equipment and will reduce the possibility of downtime while waiting for repair. Included in the proper maintenance of equipment is the requirement of taking temperatures of refrigerators and freezers.

- Refrigerators and Freezers

Storage requirements for samples include keeping samples at the proper temperature until samples are shipped. Never store samples in a self-defrost freezer. At each site, there should be a temperature log to record the temperatures of the room, all refrigerators and all freezers that hold samples. By recording and evaluating temperatures each day, you will see temperature fluctuation that is a signal that some part is not working properly and downtime is inevitable. It is also advisable to locate a maintenance/repair company that services your unit in the area before a problem is experienced. If temperatures begin to fluctuate, the repair service should be called in to evaluate the problem. It may be a simple repair like a door seal or it may require ordering a part. In any case, detecting the problem early will give you time to have the repair done while still maintaining samples at proper temperatures. In addition to recording temperatures, all refrigerators and freezers require routine maintenance. Follow manufacturer guidelines.

- Centrifuges

Like refrigerators and freezers, there are many makes and models of centrifuges. Follow manufacturer guidelines for the care of your centrifuge. In addition, locate a service company that can do maintenance and repairs. Find

this company before a problem occurs. In addition, once a month the inside bowl of the centrifuge should be cleaned with a disinfectant. Always wear gloves, safety glasses and a lab coat when performing this task.

Module II: Storage Requirements

This module will include the following:

- Proper storage
- Shipping instructions
- Proper packaging of samples
- Proper completion of FedEx airbill
- Notification of shipment to the lab

One important precaution which should always be kept in mind when handling samples is that all blood, **except for the SST tube,** should be cooled (either in the refrigerator or on ice) as soon as the samples are collected. They should be kept cold until processing is complete and samples are properly stored. After the SST tube is completely clotted (20-30 minutes) it should also be kept cool if it cannot be processed within the hour. Plasma should be separated from the cells within the hour. Plasma samples should not be allowed to freeze and thaw during any of the handling steps.

Module III: Shipping Instructions

Table V: Shipping Instructions for All Visit Types (Participant, QA & Courtesy)

PML = Penn Medical Laboratory
SFBR = Southwest Foundation for Biomedical Research

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Lab to Ship to:	Cryovial Type
3 10 ml SST	Chem Profile, Lipids, Insulin, CRP, FFA	Serum	Frozen	PML	**4** 2 ml-red cap vial
	Storage	Serum	Frozen	PML	**8** 2 ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7 ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	PML	**1** 2 ml-blue cap vial
	Storage	Na Citrate Plasma	Frozen	PML	**1** 2 ml-blue cap vial
1 4 ml gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	PML	**2** 2 ml-black cap vial
3 10 ml Purple	HemoglobinA1c	Whole Blood	Frozen	PML	**3** 2 ml-neutral cap vial
	DNA Isolation	Buffy Coat	Frozen	**SFBR**	**3** 2 ml-orange cap vial
	Leptin	EDTA Plasma	Frozen	PML	**2** 2 ml-purple cap vial
	EDTA Storage	EDTA Plasma	Frozen	PML	**8** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	PML	**2** 2 ml-yellow cap vial
	Storage	Urine	Frozen	PML	**4** 2 ml-yellow cap vial

- **Supplies Required for Shipping**

- **Frozen Samples:**

  Shipping Log Form
  Polyfoam shipping containers with cardboard cartons
  FedEx Shipping Labels
  Biohazard bags
  Dry Ice
  Paper Towels for wrapping Storage Boxes
  Newspaper or Styrofoam chips - for filling empty container space to prevent rattling
  3/4" Scotch Brand Filament Tape

Note: 20 lbs of dry ice gives some insurance against thawing if the package is delayed a few hours.

- Preparation of Samples for Shipment to Penn Medical Lab:

  ◦ Study laboratory requisitions stapled to extra unused labels for each set of samples must accompany each shipment.

  ◦ Each is printed on two-part carbonless form.

  ◦ Keep the last copy for your records and send the original with the samples. When your shipment is received, lab technicians at each laboratory will perform an inventory to be certain that all samples in the box correspond to those indicated on the shipping log. If the lab finds any discrepancies, they will call you to ask for your assistance in identifying extra samples or find lost samples.

- Packing Shipping Containers

  ◦ All samples are to be packed according to DOT regulations and in compliance with shipper's requirements. This includes the following:

  ◦ Label the exterior of all shipping boxes according to the shipper's requirements. Boxes must have dry ice labels with the amount of dry ice marked on the label and orange-red labels with "Perishable" printed.

  ◦ Sort specimens to be sent to Penn Medical Lab or Southwest Foundation for Biomedical Research (See Table V above).

  ◦ Place approximately 20 pounds of dry ice at the bottom of the shipping box.

  ◦ Place packing material (i.e., chux, Styrofoam "peanuts" or newspaper) on top of dry ice.

- Place samples in biohazard bags with forms in pocket of bag on top of packing.

- Check all of the specimens in the box against the Shipping Log Form to be sure there are no transcription errors or missing specimens.

- Add more packing material if there is additional space so samples cannot bounce around the box while in shipment.

- Place "Class 9" (dry ice) labels on the outside of the cardboard shipping carton and record the amount enclosed.

- Place polyfoam lid on box.

- Close cardboard lids.

- With ¾" tape secure the cardboard lid closed.

- Prepare FedEx air bill.

- Samples will be shipped by priority air so that they arrive at the laboratory *WITHIN 24 HOURS*. ONLY SHIP SAMPLES MONDAY though WEDNESDAY.

- Retain a copy of the air bill as a receipt for tracking and auditing purposes.

- The day of shipment, fax (202-877-7342), call 202-877-5040 or email the laboratory to inform them that a package is being sent.

- Please give the following information:

    - Date samples will be shipped
    - The name of the person responsible for shipping the package and a phone number where the call can be returned if needed
    - Number of shipping boxes sent
    - FedEx tracking number

This information will allow the lab to track the package quickly if it does not arrive as planned.

- If you have any question regarding samples or shipment to Penn Medical Lab:

  Sophia Rushton-Reid: Phone: 202-877-8379
  Fax: 202-877-7342
  Email: Sophia rushton-reid@medstar.net

  Shipping/Receiving Dept: Phone: 202-877-5040 or 202-877-5055

  Technical Area: Phone: 202-877-5630

- If you have any question regarding samples or shipment to Southwest Foundation for Biomedical Research Lab:

  Shelly Cole : Phone: 210-258-9688
  Fax: 210-670-3334
  Email: scole@darwin.sfbr.org

- **Holiday Schedule:**

Penn Medical Laboratory is closed on the following holidays:

Holiday	2006	2007	2008	2009	2010
Labor Day	September 4, 2006	September 3, 2007	September 1, 2008	September 7, 2009	September 6, 2010
Thanksgiving	November 24, 2006	November 23, 2007	November 28, 2008	November 27, 2009	November 26, 2010
Christmas Day	December 25, 2006	December 25, 2007	December 25, 2008	December 25, 2009	December 25, 2010
New Years Day	January 1, 2006	January 1, 2007	January 1, 2008	January 1, 2009	January 1, 2010
ML King Day	January 16, 2006	January 15, 2007	January 21, 2008	January 19, 2009	January 18, 2010
President's Day	February 20, 2006	February 19, 2007	February 18, 2008	February 16, 2009	February 15, 2010
Memorial Day	May 29, 2006	May 28, 2007	May 27, 2008	May 26, 2009	May 31, 2010
Independence Day	July 4, 2006	July 4, 2007	July 4, 2008	July 4, 2009	July 4, 2010

SFBR Laboratories are closed on the following holidays:

Holiday	2006	2007	2008	2009	2010
Labor Day	September 4, 2006	September 3, 2007	September 1, 2008	September 7, 2009	September 6, 2010
Thanksgiving	November 24, 2006	November 23, 2007	November 28, 2008	November 27, 2009	November 26, 2010
Christmas Day	December 25, 2006	December 25, 2007	December 25, 2008	December 25, 2009	December 25, 2010
New Years Day	January 1, 2006	January 1, 2007	January 1, 2008	January 1, 2009	January 1, 2010
Fiesta Friday	April 28, 2006	April 27,2007	April 25,2008	April 24, 2009	April 23, 2010
Memorial Day	May 29, 2006	May 28, 2007	May 27, 2008	May 26, 2009	May 31, 2010
Independence Day	July 4, 2006	July 4, 2007	July 4, 2008	July 4, 2009	July 4, 2010

Slockbower, J.M., and Blumenfeld, T.A., (Eds.). Collection and Handling of Laboratory Specimens: A Practical Guide. Philadelphia: J.B. Lippincott Company, 1983.

APPENDIX A

THE STRONG HEART STUDY, PHASE V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

The following recommendations are made regarding maintenance and operation of the One-Touch Sure Step Flexx meter in order to ensure accurate readings of blood glucose.

There are 2 types of One Touch equipment (for Home use and for Hospital use). Hospital equipment requires daily QC checks, and this is also required by SHS. Please record the QC in your daily log. Be sure to use only Hospital products including the hospital test strips.

Excerpts taken from Sure Step Flexx meter operator's guide:

General Care

To keep the meter in good operating condition, you must keep it clean and handle it with care. Follow these simple rules:

- Keep the test strip holder and lens area clean.
- Keep the meter dry and avoid exposing it to extremes in temperature and humidity.
- Do not take apart the meter.
- If you drop the meter, inspect it for obvious damage.
- Perform a quality control test prior to
- Running a patient blood glucose test.

Cleaning

When to Clean the Meter

- If dirt, blood, or lint is present.
- When an error message appears and the troubleshooting solution indicates cleaning the meter.
- As defined by your institution's infection control policies.

Cleaning the Outside of the Meter

Clean the outside of the meter with a cloth dampened with a 10% bleach solution. Follow with a cloth moistened with water to remove residual bleach. Dry the meter thoroughly. Refer to "Cleaning Agents" on page 100 for other solutions that can be used to clean the outside of the meter.

▲ **CAUTION:** *Do not get water inside the meter. Never immerse the meter or hold it under running water because it will damage the meter.*

Cleaning the Test Strip Holder and Lens

To clean the test strip holder (cover and base), lens area, and contact points, use a 10% bleach solution followed by water. Dry thoroughly.

▲ **CAUTION:** *Do not use alcohol, glass cleaners, or any cleansers containing abrasives, phenol, or ammonia to clean the test strip holder or lens area because it will damage the meter parts.*

1 Press down on the left side of the test strip holder. This releases the holder, allowing you to slide it from the meter.

2 Wipe the test strip holder cover and base with a cotton swab or soft cloth dampened with a 10% bleach solution. Be sure to thoroughly wipe the gray area on the inside cover. Clean both sides of the base. Follow with a cotton swab dampened with water to remove residual bleach.

▲ **CAUTION:** *Bleach residue left on the test strip holder may lead to an error message or an inaccurate, high result.*

3 Dry the test strip holder with a soft cloth or lint-free tissue. Close the holder and set it aside.

4 Using a cotton swab or soft cloth dampened with a 10% bleach solution, wipe the lens area and contact points. Wipe this area even if it doesn't appear to be dirty. Use a cloth moistened with water to remove residual bleach.

Be careful not to scratch the lens area or get water inside the meter, contact points, lens area

5 Dry the lens area gently with a clean, soft, lint-free cloth or tissue. Remove any lint.

6 Slide the closed test strip holder into the meter. Push the holder until it clicks into place.

7 Turn on the meter. If an error appears, check to make sure you installed the test strip holder correctly.

8 If necessary, wipe the scanner lens with a soft cloth dampened with water.

9 Perform a quality control test to verify that the result is within the expected range.

Changing the Batteries

The meter is powered by three size AA alkaline batteries. The **LOW BATTERY** message appears when the battery power is too low to perform a test. Change the batteries when the message appears. You may want to change the batteries if the battery bar on the status screen is low. Although the meter will continue to accurately perform glucose tests until the **LOW BATTERY** message appears, barcode scanning and data transfer may be affected before the message appears.

▲ **CAUTION:** *Do not use rechargeable batteries.*

■ **NOTE:** *Neither the* **LOW BATTERY** *message nor the removal of batteries affects the test results stored in meter memory.*

1 Turn off the meter.

2 Turn the meter over. Press down on the battery door latch and lift open the door.

3 Remove the batteries from the battery compartment and dispose of them according to your institution's guidelines.

4 Insert three new size AA batteries, matching the positive + end of each battery with the + signs inside the battery compartment.

■ **NOTE:** *The battery life depends on how quickly the meter is powered off after each test. Under optimal conditions—using the barcode scanner to enter information and turning off the meter immediately after test results are displayed and recorded—you can expect approximately 1000 tests.*

5 Replace the battery compartment door.

6 Turn on the meter to verify power.

Adjusting the Screen Contrast

You can increase or decrease the meter's LCD screen contrast.

1 Select Setup from the Main Menu.

2 Select LCD Contrast from the Setup Menu.

The options available at the Setup Menu are different for stand-alone meters and meters configured by a DataLink workstation.

3 Press the arrows to increase or decrease the LCD contrast.

A change occurs each time you press the arrow. The gauge within the bar gives you an approximate indication of the current setting.

4 When you are satisfied with the setting, press OK to save the setting and return to the Setup Menu, OR, press the back or menu key to ignore any changes and return to the Setup Menu.

Setting the Date and Time

You can set the date and time for meters operating in stand-alone mode.

1 Select Setup from the Main Menu.

2 Select Date/Time Entry from the Setup Menu.

The Date/Time Entry option is available for stand-alone meters only.

3 Enter the time using the 24-hour format (hours:minutes). Press OK to save the setting and advance to the date screen.

To exit the screen without changing the time, press back or menu key

4 Enter the date using the mm/dd/yy (month/day/year) format. Press Ok to save the setting and return to the Setup Menu.

To exit the screen without changing the date, press back or menu.

Performing a Patient Test

Setting Up the Meter

1 Press the power button to turn on the meter.

2 The status screen appears. Press Cont to continue.

3 Select Patient Test from the Main Menu.

4 Enter your operator ID and press OK.

If the meter is equipped with the optional barcode scanner, you may scan the barcode on your ID badge.

5 Enter the patient's ID and press OK.

If the meter is equipped with the optional barcode scanner, you may scan the patient's barcode.

■ **NOTE:** *Carefully enter the ID. An accurate patient ID is imperative for transferring the correct results to the medical record.*

❑ Operator ID required for all tests

❑ Maintain ID for ___ min. after power off

If your ID appears at the operator ID screen, press OK to confirm it is correct. If the ID is not correct or does not appear, enter your ID.

❑ Patient ID required

6 Select the test strip lot number (and code) from the list displayed.

The last test strip lot number selected appears at the top of the list. Use the arrow(s) to scroll through the list, if necessary. If the meter is equipped with the optional barcode scanner, you may scan the barcode on the test strip bottle label.

> ▲ **CAUTION:** *To obtain accurate results, you must enter the correct test strip lot number (and code) for each new test.*

The Patient Test screen appears with messages prompting you to apply blood to the strip and insert the strip.

❑ New reagent entry at workstation only

The meter may be set to allow you to enter new reagent information. If the test strip lot number does not appear in the list, press the **Entr Lot#** button and enter the test strip lot number, control code, and control ranges.

Applying Blood Sample to the Test Strip

The puncture site must be cleaned and thoroughly dried before obtaining the sample. Thus, the participant will be asked to wash his/her hands with soap and water and dry them. Then the staff will apply alcohol to the puncture site and wait for the alcohol to dry. A drop of capillary blood will be obtained by puncturing the finger using a lancing device. Follow your institution's policy and procedure guidelines for blood collection.

7 Apply the blood to the center of the pink test square as follows:

Finger Stick

Carefully touch the center of the pink test square to the drop of blood on the patient's finger. The test area will quickly absorb the blood.

8 Check the white pad on the front of the test strip and the confirmation dot on the back of the test strip.

• If the white pad becomes completely saturated, you have applied too much blood for an accurate result. Repeat the application with a new test strip.

• The confirmation dot should be completely blue. If white patches or streaks are visible, you have not applied enough blood for an accurate result. Repeat the application with a new test strip.

▲ **CAUTION:** *Do not apply additional blood to the test strip or you may get an inaccurate result.*

If white patches or streaks continue to appear after you have repeated the test and used a larger volume of blood, call the LifeScan Healthcare Professional Line at 1 800 524-7226.

Inserting the Test Strip

9 Firmly insert the test strip all the way into the test strip holder until it stops (the confirmation dot should be facing down).

▲ **CAUTION:** *If you fail to completely insert the test strip, the test may start; however, you may receive an inaccurate, low result.*

▲ **CAUTION:** *You have up to **2 minutes** to insert the test strip after the blood is applied. If you insert the test strip after 2 minutes, you may get an inaccurate result or an error message. Discard the test strip and repeat the test with a new test strip.*

Patient Results

The patient test result appears in approximately 30 seconds.

◆ **IMPORTANT:** *Do not remove the test strip until the countdown is complete.*

If an error message appears, refer to Chapter 7, Troubleshooting, for information.

A glucose range may be defined by your system administrator. Results that fall above or below the limits of this range appear as follows:

• **CRITICAL HIGH** indicates a result above the range.
• **CRITICAL LOW** indicates a result below the range.
• **HIGH** indicates a result greater than 500 mg/dL.

◆ **IMPORTANT:** *When the result is greater than 500 mg/dL and proper procedures are followed, the meter will display HIGH in virtually all cases. Additionally, the confirmation dot will be darker than the 350-mg/dL sample color dot on the test strip bottle Color Chart. This indicates hyperglycemia. Follow your institution's policies for treatment.*

10 Remove the test strip and dispose of it according to your institution's policies and procedures.

11 You may press Entr Note and choose 1 to 3 comments that correspond to the patient's current situation. Press OK, Or, press menu and continue testing.

■ **NOTE:** *Results tagged with the comment "Procedure Err" are not included in any patient reports.*

If you have problems using the meter to test patient samples, or if the meter malfunctions, call the LifeScan
Healthcare Professional Line at 1 800 524-7226.

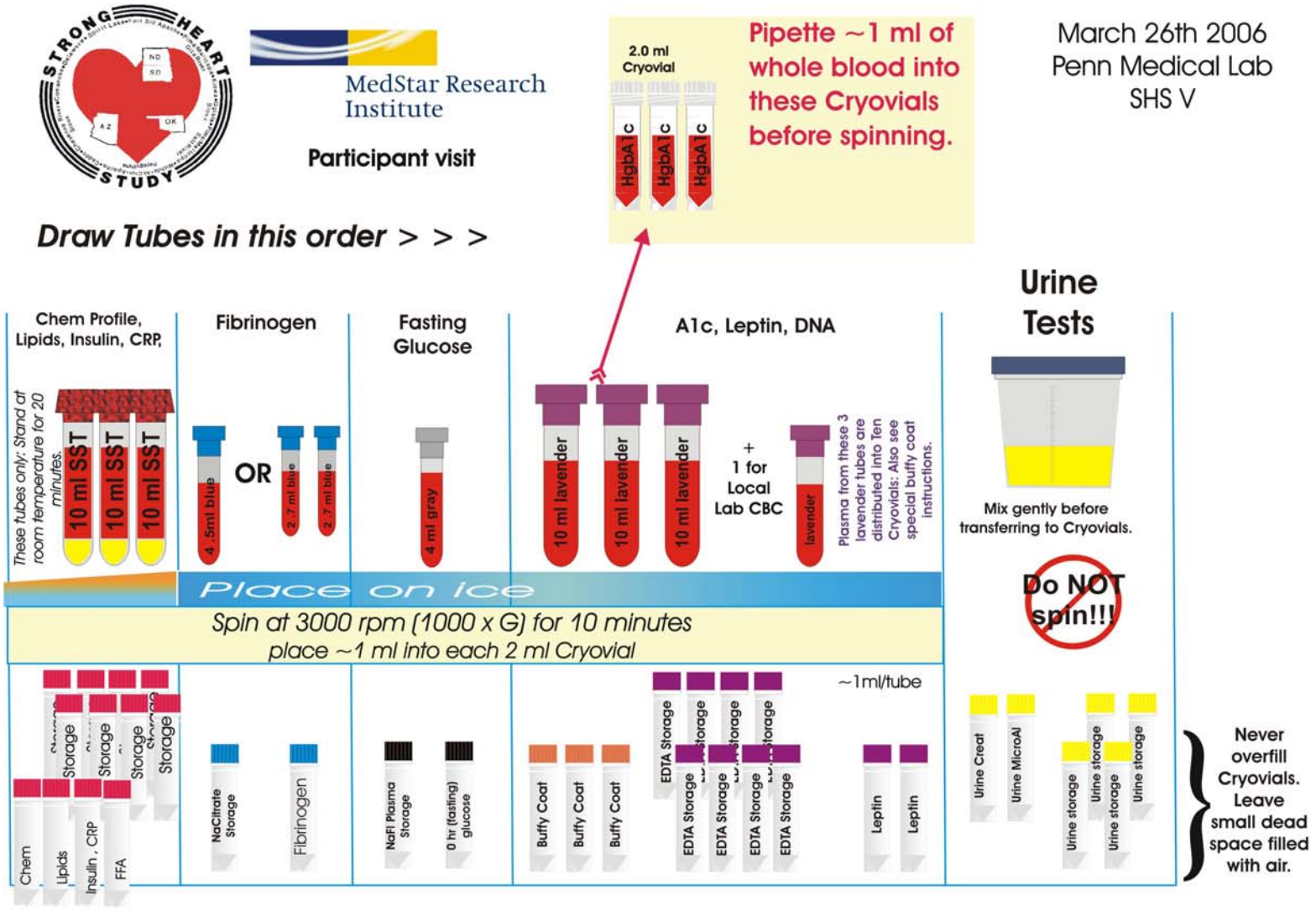
❑ Require message entry for patient tests outside the critical limits. You may be required to select a comment when a patient test result falls outside the limits of the range.

Record the glucose reading (from the Sure Step Flexx screen) on form S7, Sample Collection Checklist, item #1 (Fasting One-Touch Sure Step Flexx glucose result.)

Complete the rest of the sample collection checklist (form S7)

APPENDIX B-1A
Flow Charts Summarizing Processing Procedures

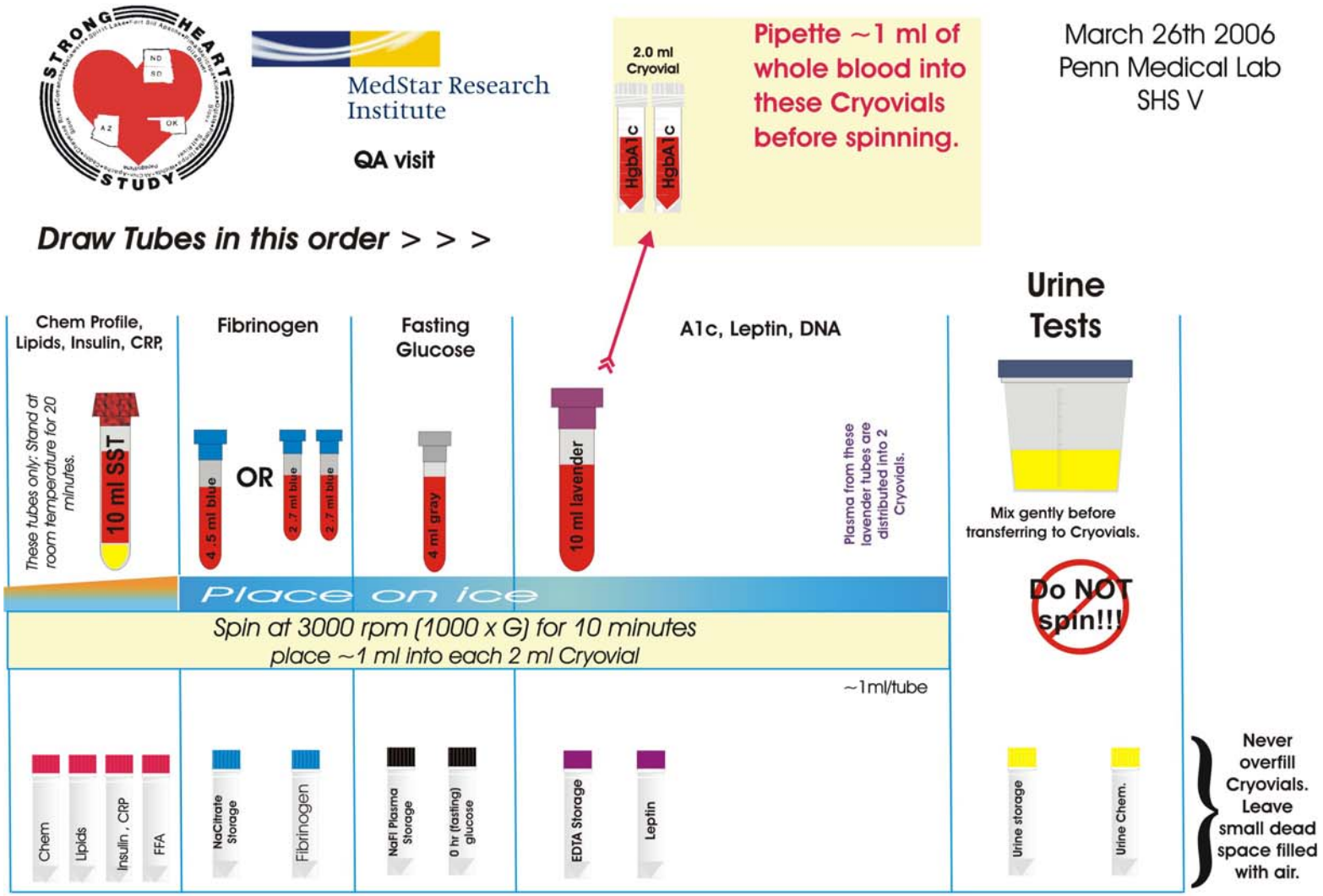
PARTICIPANT VISIT



Check to see that the caps and labels are secure. Store all samples at -70 C.
See shipping instructions in Lab Manual.

APPENDIX B-1B
Flow Charts Summarizing Processing Procedures

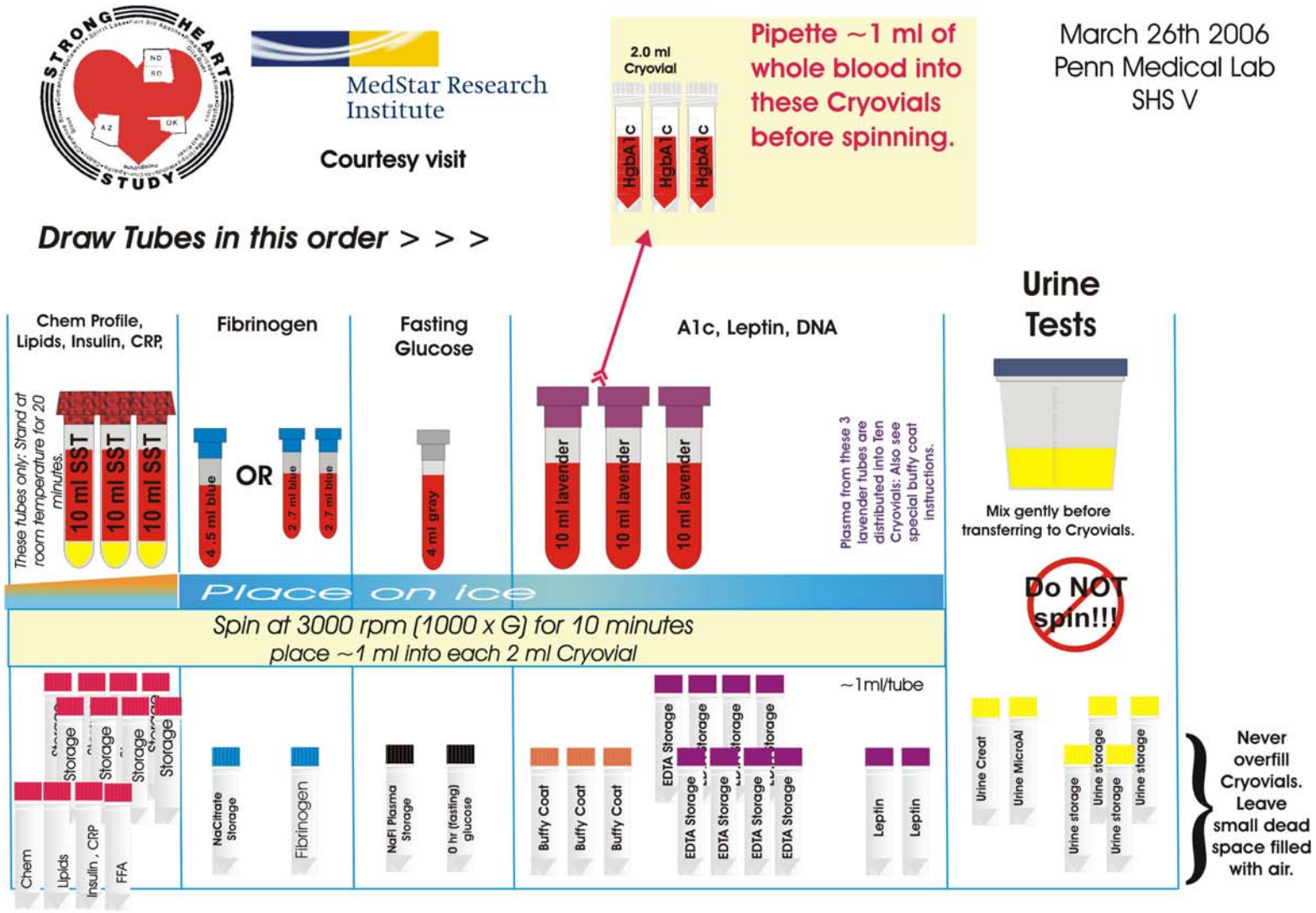
QA VISIT



Check to see that the caps and labels are secure. Store all samples at -70 C.
See shipping instructions in Lab Manual.

APPENDIX B-1C
Flow Chart Summarizing Processing Procedures

COURTESY VISIT



Check to see that the caps and labels are secure. Store all samples at -70 C.
See shipping instructions in Lab Manual.

APPENDIX B-2

Strong Heart Study DNA and Sample Storage Policy and Procedures
Presented by the SHS Ethics Committee
and adopted by the
SHS Steering Committee
New York City
February 14, 2002

1. Objectives

Penn Medical Laboratory (Washington, DC) is the custodian for plasma, serum, and urine samples of participants in all phases of the Strong Heart Study. Southwest Foundation for Biomedical Research (San Antonio, Texas) is the custodian for DNA samples. Henceforth the term "PML/SWF" will refer to the respective laboratories with regard to either blood or urine derived samples (Penn Medical Laboratory) or DNA samples (Southwest Foundation for Biomedical Research). PML/SWF are charged with inventory and safe storage of these samples under optimal conditions to insure stability of analytes. PML/SWF cannot release these samples unless directed by the Strong Heart Study Steering Committee and under current guidelines of the Indian Health Service, National Heart Lung and Blood Institute and all relevant Institutional Review Boards (Human Use). Samples can be released to foster specific meritorious and ethical research of cardiovascular disease and pulmonary disease and their risk factors as outlined in the Strong Heart Study consent forms. The specific use is subject to scientific review of the Strong Heart Study Steering Committee and the NHLBI. Released samples can only be used for the approved measurements by the designated investigator, and unused samples are to be returned in good condition to the PML/SWF with documented history of the uses of each sample including a log of freeze thaw cycles. Consistent with SHS consent forms, the samples will not be used for profit, patenting and or commercial purposes, and cells will not be kept growing and will not be cloned.

Policies and procedures described in this document are designed to:

- Release authorized samples only after appropriate review as laid out in Section 4 of this document.
- Release samples after receipt of the signed ***Strong Heart Study Sample Use Agreement*** (Appendix B3 below).
- Insure sample integrity by keeping the samples in appropriate storage conditions and documenting the history of those storage conditions.
- Insure that the samples are secure and safe from unauthorized use.
- Insure confidentiality of the sample donor in accordance with study guidelines.
- Maintain records of samples stored, removal, freeze thaw cycles, and their placement to insure efficient retrieval.
- Follow procedures to insure that samples are released appropriately and transferred under conditions, which insure sample integrity.

- Maintain records indicating where, when and why samples were released.
- Insure that disposal or destruction of samples is done in accordance both with good laboratory practice and the guidelines of the Strong Heart Study participants.

2. Sample Storage Conditions:

A. Buffy Coats, plasma, urine, serum, and DNA

Samples are stored in airtight, gasketed vials at -70 to -80^{o} C (-20^{o} C for DNA). Vials are filled leaving at least 0.5 cc airspace at the top of each vial. DNA is stored under conditions known to preserve integrity and quality of DNA (i.e. a non-frostless freezer). Vials are marked in indelible ink on freezer-safe labels with Strong Heart Study participant number, date of collection and PML/SWF Sequence number. The freezers are locked and the key is the responsibility of the laboratory supervisor.

B. Database, sample inventory

The laboratory maintains a computerized database containing the following data on each stored sample: date of receipt, condition on receipt, number of vials, approximate volumes of each sample, freezer location, sample type (DNA, buffy coat, serum, plasma, urine, etc.), release date, release destination, release purpose, return date, return volume, freeze thaw cycles logged, misc. notations. PML/SWF will maintain records of freezer temperatures. Temperatures are manually logged on all workdays by the technical staff and reviewed for drift. Periodic maintenance as recommended by the freezer manufacturer will be kept available for inspection. Records of freezer malfunction and maintenance will also be made available.

C. Damaged storage samples

Communication to the Strong Heart Study Steering Committee: At the request of the Steering Committee, PML/SWF will notify the Steering Committee of sample damage evidenced by thawing or breakage of samples. Computerized and paper logs of samples will include such events.

3. Disposal of Samples

Samples will be disposed at the direction of the Steering Committee by routine laboratory methods. Prior to this, a request will be made to appropriate tribes regarding culturally correct methods of disposal of damaged or non-usable samples and the laboratory will make a reasonable attempt to cooperate with those requests. Any procedures used for disposal of samples must be consistent with *Good Laboratory Practice,* and minimize biohazard contamination.

4. Release of samples

A. Procedures for acting on requests. Administrative pathway for release of samples:

Requests are presented in writing to the Strong Heart Study Steering Committee. Requests are judged by their scientific merit1[2,] potential benefit to the Indian Communities, and consistency with human use guidelines (as outlined in the signed consent) specific to the Strong Heart Study. Requests for Strong Heart Study samples must be specific. Strong Heart Study samples must not be used for additional measurements unless additional written approval is received from the Strong Heart Study Steering Committee. All uses must be consistent with the participant consent of the Strong Heart Study.

Request for Strong Heart Study samples must be made in writing to the Strong Heart Study Steering Committee and should justify the volume of sample requested and whether previously unused (never thawed) samples are necessary. Requests should be brief and generally follow guidelines used in scientific proposals:

- rationale,
- hypotheses,
- specific aims,
- background,
- methods and
- planned analyses.

Study participants and participating tribes will be notified by the Strong Heart Study Newsletter when new tests are done using stored specimens. The investigators will write articles in the newsletter describing what tests are being done and how they will increase understanding of CVD or pulmonary disease in American Indians. Scientific articles resulting from the laboratory studies of the stored specimens will be reviewed and approved by the SHS publications committee, all participating tribes, by NHBLI and by the Phoenix, Aberdeen and Oklahoma Area IRBs prior to publication.

This policy will not preclude obtaining explicit tribal and/or IRB approvals in the event that ancillary studies are proposed which would require re-contact of participants or other issues that would suggest consultation with appropriate IRBs or tribal governments.

B. Release instructions to PML/SWF:

Written requests to release samples (***Request to Release Samples*** – Appendix B4 below) will be made by the Strong Heart Study Steering Committee after review of scientific merit and ethical considerations. The written request must confirm that all

[2] Scientific merit will include the originality of the research, value to the tribal communities and participants, and quality of the measurements proposed.

appropriate reviews have been made. Samples to be released must be identified by date or phase of collection, volume or number of vials to be released, shipping destination and contact person, and Strong Heart Study IDs.

PML/SWF will maintain records of requests for a period of 15 years. These records will be made available to the Strong Heart Study sponsor and tribal governments upon request.

C. Technical procedure for releasing samples

Samples are removed from storage only by PML/SWF employees who are trained in safe sample handling. Written logs of the samples requested are used to locate and remove samples. Each sample found is logged onto the table and these data are promptly transferred into the computer database. The removed samples and the list are reviewed by the PML/SWF technical supervisor. Discrepancies are logged and resolved. Samples requested which are not found are logged and investigated to insure consistency between the data base and sample inventory. See ***PML/SWF Sample Request Log*** – Appendix B5 below.

The sample shipment is coordinated with the receiving laboratory to insure safe receipt of the requested samples. The requesting laboratory must acknowledge the receipt and condition of the samples upon arrival. Any discrepancies between the number and amount of samples approved for use by the requesting laboratory and those received must be reported by the requesting laboratory within one month of receipt of the samples.

SHS Storage Policy Appendix B-3

Strong Heart Study Sample Use Agreement

Strong Heart Study release tracking number_____

The release of Strong Heart Study samples is subject to the following policies and procedures. No samples will be released until the investigator agrees to the following policies and procedures approved by the Strong Heart Study Steering Committee:

1. Samples can be released to foster specific meritorious and ethical research as outlined in the Strong Heart Study consent forms. The specific use is subject to prior approved scientific review of the Strong Heart Study Steering Committee and the NHLBI. The laboratory releases samples only after written instructions are received from the Steering Committee.
2. Released samples can only be used for the approved measurements in the specified laboratory and unused samples are to be returned in good condition to PML/SWF with documented history of the uses of each sample including a log of freeze thaw cycles. The investigator must supply PML/SWF with the name, phone number, E-mail address and shipping address of the person responsible for receiving the samples.
3. The samples will be released for a period of ___ days ending on _____(dd/mm/yyyy). At the termination of this period, the investigator must either return the samples to PML/SWF or request and receive permission from the Strong Heart Study Steering Committee for a specified extension to complete the analyses.
4. Samples must be returned to the PML/SWF with any remaining material at the completion of the approved use period as described above. Samples should be returned in their original containers with the original label. Samples are to be shipped under conditions specified by the Medical or Technical Director of the PML/SWF. Unused samples must not be discarded.
5. Data derived from the use of these samples is the joint property of the Strong Heart Study Steering Committee and the investigator. Publication of the results of these investigations is subject to the policies and prior approval of the Strong Heart Study Publications Committee, the NIH and the appropriate tribal councils.
6. The investigator acknowledges and abides by the informed consent document limiting use of these specimens for the study of cardiovascular and lung diseases and their risk factors and specimens will only be used for those purposes. The samples will not be used for profit, patenting and or commercial purposes, and cells will not be kept growing and will not be cloned.

I have read the Strong Heart Study Sample Storage policies and understand that the samples must be used only for uses approved in writing by the Strong Heart Study Steering Committee. I agree to abide by the limitations set forth in these policies.

_____ _____

printed name date

_____

signature

_____address

_____address

_____city, state, zip

_____phone number

_____e-mail address

SHS Storage Policy Appendix B-4

Request to Release Samples

Date:_____

A request to the Penn Medical Laboratory is made to release the following samples (attach list or table if necessary):

Minimum volume needed for each sample: _____ **µL.**

Type of sample: ☐ plasma ☐ serum ☐ buffy coat ☐ urine ☐ other:_____

OK to use previously thawed samples? ☐ Yes ☐ No

To:
name of investigator: _____
shipping address: _____
_____
_____
_____
phone contact: _____
E-mail address: _____

Purpose of the Request:

Steering Committee Chair_____ _____
signature date

When should the samples be returned to the Penn Medical Laboratory?_____
date

_____

for PML lab use (attach log of sample request v. those actually sent):

samples pulled and shipped on: _____(mm/dd/yyyy)

technician_____signature

supervisor_____signature

SHS Storage Policy Appendix B-5

PML/SWF Sample Request Log

Sample Request Tracking number:_____
Technician:_____(pulling samples)
Technician:_____(replacing samples)

sample requested SHS ID, phase	found?	Sent (date)	Notes	returned date/volume

APPENDIX C

Strong Heart Family Study
SHS V

Penn Medical Laboratory 108 Irving Street, NW Annex 2 Washington, DC 20010	**PARTICIPANT SAMPLE FORM**	Southwest Foundation Department of Genetics 7620 NW Loop 410 San Antonio, TX 28227-5301

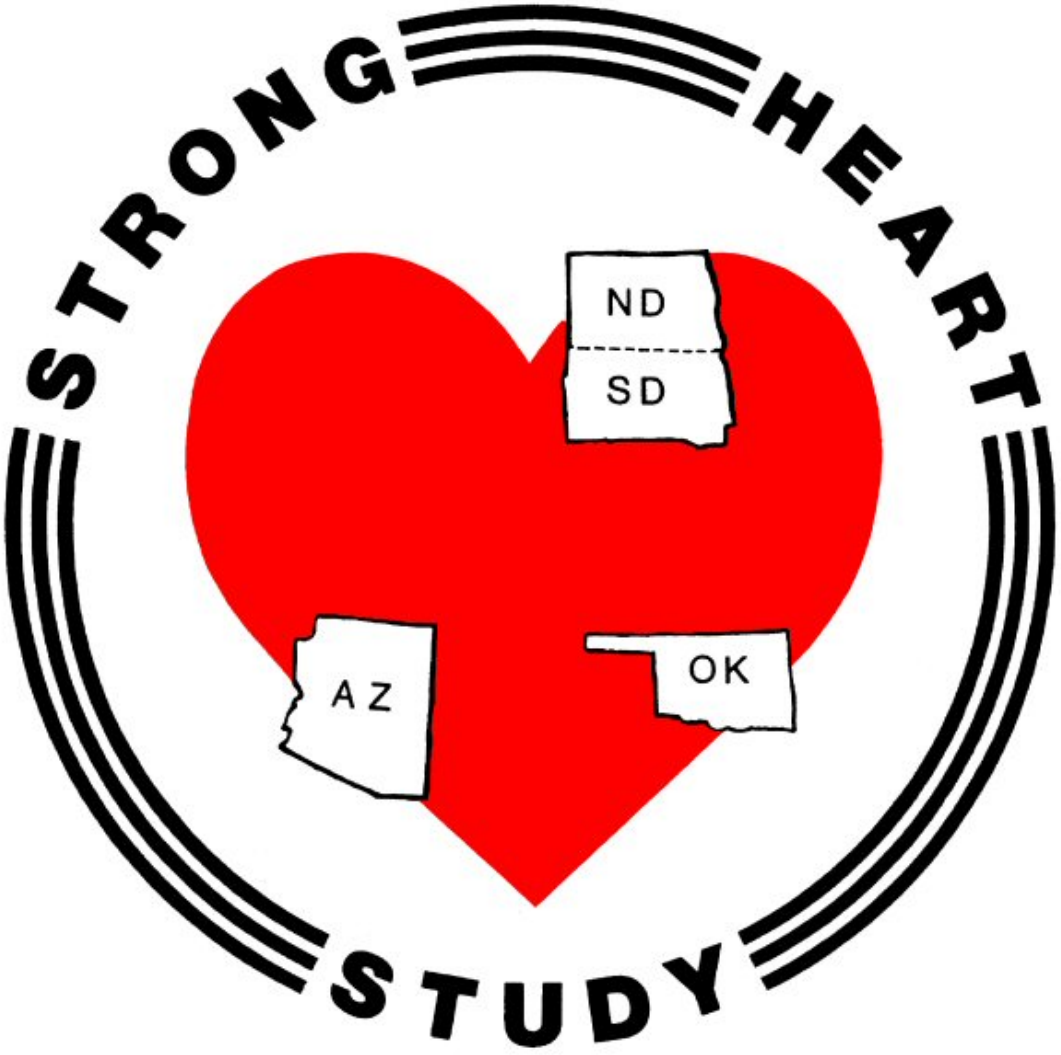
PML= Penn Medical Laboratory Phone: 202-877-5481 Email:Pennmedlab@Medstar.net
SFBR= Southwest Foundation Phone: 210-258-9688

Exam No: (Place *Barcode Label* here. Attach any extra *Barcode labels* to this form and return to PML)	Collection Date: (mm/dd/yy) Redraw: Yes ☐ No ☐

write the number of samples sent	Test	Sample Condition	Sample Type	Lab to Receive Samples	Transfer Vial Type (# & color cap)
	Chem Profile, Lipids, Insulin, CRP, FFA	Frozen	Serum	PML	12 2ml-red cap vial
	Fibrinogen	Frozen	NaCitr Plasma	PML	2 2ml-blue cap vial
	Fasting Glucose	Frozen	NaFl Plasma	PML	2 2ml-black cap vial
	HemoglobinA1c	Frozen	Whole Blood	PML	3 2ml-neutral cap vial
	Leptin	Frozen	EDTA Plasma	PML	10 2ml-purple cap vial
	Urine Creatinine & Microalbumin	Frozen	Urine	PML	6 2ml-yellow cap vial
	DNA isolation	Frozen	Buffy Coat	**SFBR**	3 2ml-orange cap vial

Site Comments:

Lab Comments:	Date and Time Samples received: Processing Technician Initials:



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Five

SPECIAL STUDIES – CAROTID and POPLITEAL ULTRASOUND and ECHOCARDIOGRAPHY

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Five

SPECIAL STUDIES - CAROTID and POPLITTEAL ULTRASOUND and ECHOCARDIOGRAPHY

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME V

SPECIAL STUDIES - CAROTID and POPLITEAL ULTRASOUND and ECHOCARDIOGRAPHY

Table of Contents

STRONG HEART STUDY

ULTRASOUND READING CENTER MANUAL OF OPERATIONS

Goals of the Study: The SHS Phase V exams will be conducted approximately 5-6 years after the original family exam and will permit evaluation of genetic factors that contribute to changes in CVD risk factors. This exam will include both carotid and cardiac ultrasound measures, so that the preliminary data on progression can be examined in more detail with a larger number of participants, and among participants as young 15 yrs. Because of the high rates of insulin resistance, obesity and diabetes among the young people in this population, the re-examination will permit detailed examination of the effects of these disorders on progression of preclinical CVD. Popliteal ultrasound has been added to provide better measures of peripheral arterial disease (PAD) because of the high rates of PAD observed during our cohort exams. Thus, we will be able to compare popliteal and carotid atherosclerosis and their risk factors with emphasis on smoking- and diabetes-related phenotypes. Carotid and popliteal arterial ultrasonography and echocardiography permit non-invasive assessments of arterial hypertrophy, detection and quantification of atherosclerosis, and estimation of hemodynamics. These methods will be used in Phase V of the Strong Heart Study to accomplish the following specific aims:

1. To assess the heritability and genetic linkage of carotid artery intimal-medial thickness (IMT) and discrete atherosclerotic plaques.
2. To assess the heritability and genetic linkage of popliteal artery intimal-medial thickness (IMT) and discrete atherosclerotic plaques..
3. To determine the separate and joint effects of diabetes mellitus (DM), overweight and hypertension on arterial structure, function and atherosclerosis in individuals ≤45 years.
4. To examine the associations of arterial structure and plaque with LV structure, systolic and diastolic function, independent of risk factors and clinically-apparent cardiovascular (CV) disease.
5. To assess the prognostic significance of measures of arterial structure and function determined during the 3rd SHS exam.
6. To evaluate change of abnormalities of arterial structure and function in participants in the SHS pilot Family Study over a mean of nearly six years.
7. To examine changes in intermediate vascular phenotypes, to try to detect genes that are related to these changes, and to assess interactions of other risk factors (adiposity, insulin resistance, hyperglycemia) with these changes. In the first exam we found many young adults with diabetes or metabolic risk factors such as obesity and impaired fasting glucose. Identification of factors promoting atherosclerotic progression in this young at-risk age group is a high priority. Additionally, we will capitalize on members of the original cohort who also are in the Family Study (over 500) to examine long-term changes (for example, left ventricular hypertrophy and carotid intima medial thickness by standardized methods used since the 2nd SHS exam).
8. To examine subclinical atherosclerosis in peripheral arteries using popliteal ultrasound, assess its heritability and relations to risk factors (with focus on diabetes and smoking), and compare these to both carotid intima-media wall thickness (IMT) and ankle-brachial index (ABI).
9. To examine the relations between quantitative measures of systemic atherosclerosis,

cardiac hypertrophy, and cardiovascular dysfunction (e.g., LV mass, carotid plaque, carotid wall thickness) and CVD incidence and mortality? Are these potential predictors related to other established CVD risk factors, such as, diabetes?

SHS PHASE 5 CAROTID ARTERY ULTRASOUND STUDY

Prognostic Utility: A number of longitudinal studies involving population-based samples in different countries have examined the relation of baseline carotid IMT and/or discrete plaque to subsequent CVD event rates. These studies have varied in methodology: IMT and plaque are not always evaluated separately; risk is stratified based on thresholds, quintiles, standard deviations and/or increments of IMT; and multivariate analyses including standard CVD risk factors have not always been applied to examine the independent or additive utility of carotid US findings. Those studies which have analyzed IMT and plaque separately show the greatest risk of future myocardial infarction to be conferred by the presence of focal plaque rather than increased IMT, in keeping with preliminary analyses examining the prognostic utility of carotid ultrasound findings from Phase III of SHS (see below). Of note, discrete carotid plaques, an unambiguous sign of atherosclerosis, can be present even when the IMT of adjacent carotid segments is entirely normal. When traditional CVD risk factors are considered, the association of baseline carotid artery findings with outcome is usually attenuated but remains significant, particularly in women. Although carotid artery atherosclerosis is a manifestation of cerebrovascular disease, the majority of events predicted are due to coronary heart disease, underscoring the systemic nature of atherosclerosis. Autopsy studies have shown reasonable correlation between the severity (not presence) of carotid and coronary atherosclerosis. Similarly clinical studies have related carotid atherosclerosis detected by ultrasonography to obstructive coronary artery disease diagnosed by contrast angiography or clinically-manifest coronary disease. However, in view of the limited ability of coronary angiography to detect significant non-obstructive mural atherosclerosis, the association between the presence of coronary and carotid atherosclerosis is certainly even stronger than that suggested by the existing literature.

Measurement Technique: Ultrasound measurement of carotid wall IMT has been validated using gross and histopathologic reference standards and been found to be highly reproducible. The IMT can be measured in the common carotid artery (CCA), the bifurcation (bulb) and either of the branch vessels (usually the internal carotid artery [ICA]). Because of its tubular shape, perpendicular location relative to the transducer beam and virtual universal accessibility, measurement yield and reproducibility of the CCA IMT are higher than the ICA or bulb IMT. In the Atherosclerosis Risk in Communities (ARIC) study involving carotid US examinations in 13,824 individuals, IMT measurements were obtainable from the CCA in 91.4%, from the bifurcation in 77.3%, and from the ICA in 48.6% of participants. A report from The Rotterdam Study (n=1881 in the analysis) showed a similar trend in measurement yield: 96% in the CCA, 64% in the bifurcation, and 31% in the ICA.

One consideration in choosing the segment(s) to measure might be differences in the extent to which IMT of a given vessel correlates with prevalent CVD and/or outcome. In the Cardiovascular Health Study (CHS), the combination of CCA and ICA IMTs resulted in

minimally higher adjusted relative risks for subsequent myocardial infarction or stroke than did CCA or ICA IMT alone (1.36 vs. 1.27 and 1.30, respectively, for 1 SD increase)(29). In CHS ICA IMT had marginally higher adjusted relative risk for prediction of incident myocardial infarction (1.34 vs. 1.24), whereas CCA IMT was slightly better at predicting stroke (1.28 vs. 1.25). Similarly, the British Regional Heart Study noted that CCA IMT was a stronger correlate of prevalent stroke than was bifurcation IMT; the latter was not associated with prevalent coronary disease when the presence of plaque (measured separately from IMT) was considered. In the Insulin Resistance Atherosclerosis Study (IRAS), the presence of diabetes and fasting glucose were associated with CCA IMT but not ICA IMT. On balance there does not appear to be compelling evidence to suggest that combined measurements or measurement of a specific segment is clearly superior. The higher yield and superior reproducibility of measurement of the CCA IMT as well as its better suitability for semi-automated measurement favor its use, particularly in protocols that do not incorporate plaque (usually seen in the bifurcation or ICA) in the IMT measurement. In such circumstances, the predictive value of focal atheroma in these areas is preserved (by the categorical presence of plaque) without sacrificing a decrease in measurement yield or accuracy (by attempting to measure bifurcation or ICA IMT).

The IMT may be measured from the near (closest to the transducer) wall and/or the far wall. Although measurement reproducibility of the near and far walls has been reported to be comparable, measurement yield of the near wall is lower and may be less accurate than that of the far wall due to technical considerations. Current technology does not permit reliable separate measurement of the intima and media, hence the standard is combined intimal-medial thickness which has been anatomically validated for the far wall. Excess gain or 'blossoming' of the highly echogenic near-wall adventitia into the echo-lucent media or of the echogenic near-wall intima into the echo-lucent lumen will result in systematic under- or over-measurement, respectively, if IMT of the near wall is measured. In contrast, incursion of echoes from the far-wall intima into the media will not influence overall intimal-medial thickness measured from the far wall. In light of the foregoing considerations, we have chosen to measure IMT from the far wall of the CCA in SHS.

IMT has most commonly been measured from B-mode images. Alternatively, B-mode guided M-mode images of the distal CCA may be obtained. Although spatial resolution is comparable with the two techniques, temporal resolution is far superior with M-mode imaging thereby facilitating standardization of measurements at the time of minimum diameter, when the diastolic distending pressure is known, and estimation of pulsatility or vascular function. Because of the desire to assess measures of vascular function in Phases III and IV of SHS, we relied on M-mode measurement of CCA IMT. In Phase V of SHS we propose to make CCA IMT measurements from B-mode images using a semi-automated system that enhances reproducibility. We are employing this system in an intervention study of American Indians with diabetes (Stop Atherosclerosis in Native Diabetics Study [SANDS]) and have found high correlation between M-mode and B-mode measurements of carotid artery structure ($r=0.89$, $p<0.001$) with an intercept near zero and a slope approximating 1.0 in the first 230 subjects studied to date.

Internal diameter of the vessel lumen (usually the CCA) can be measured at a single point in time from B-mode images or throughout the cardiac cycle from M-mode tracings.

Measurement of lumen diameter as well as IMT permits calculation of vascular cross-sectional area, a surrogate measure of vascular mass comparable to left ventricular mass. Due to cyclic variations in IMT and lumen diameter, measurements should be performed using ECG gating and/or determination of minimal (end-diastolic) and maximal (peak-systolic) diameters.

Non-obstructive plaque, which may be defined as the presence of focal thickening at least 50% greater than that of the surrounding vessel wall, is usually readily identifiable, with the best appreciation of its encroachment into the lumen detected from the transverse plane. The most common location of plaque is within the carotid bifurcation when flow becomes less laminar, followed by the ICA; plaque is much less common in the CCA due to its usually laminar flow profile. Since Doppler velocity does not usually increase until significant (>50%) luminal obstruction develops, non-obstructive plaque cannot be reliably quantified using Doppler techniques. Because of its complex three-dimensional nature, the size of a single plaque or overall plaque burden is difficult to quantify; thus the categorical presence of plaque is more reproducible than measurement of its thickness. Plaque diameter, i.e. maximum incursion into the vessel lumen, may be measured but may not accurately reflect overall plaque burden. A semi-quantitative approach relies on the presence or absence of non-obstructive or obstructive plaque or the number of segments of the extracranial carotid arteries containing plaque.

Carotid Artery Ultrasound Scanning Protocol

Instrumentation:

Ultrasonographs will be calibrated against a phantom at installation and at regular intervals thereafter; sonographers should verify that this is performed by Acuson as part of routine maintenance. The 7.0 MHz vascular probe will be set to default with processing curves optimal for imaging of the carotid artery with no persistence. The usual depth is 30 to 40 mm.

Patient Preparation:

Imaging is performed in a slightly darkened room with the subject in a supine position with slight hyperextension of the neck (a roll under the neck is optional) and lateral rotation, as necessary. Electrodes are placed for a modified three-lead electrocardiogram. The SHS study number should be entered before beginning the imaging study. In addition, the arterial system being imaged (left vs. right) should be entered on the screen.

Two-Dimensional Imaging and Doppler Study:

Two-dimensional (B-mode) long-axis imaging from multiple planes (posterior, lateral, anterolateral) should be done to maximize detection of discrete plaque. Following identification of the carotid bulb, the transducer should be moved caudally to examine the common carotid artery (CCA) until its origin from the aortic arch (left) or innominate artery (right). Both branch vessels should be scanned in a cephalad direction until their disappearance. Scanning should additionally be performed in the transverse plane. Identifying features of the internal carotid artery (ICA) on the imaging study include its larger size and motion away from the transducer as it proceeds intra-cranially, whereas the external carotid artery (ECA) is usually smaller and has extracranial branches. Pulsed Doppler analysis should also be performed to identify distinguishing characteristics of the ICA and ECA: the low resistance ICA is characterized by

spectral broadening and persistence of flow during diastole whereas the high resistance ECA has a rapid deceleration to the baseline with minimal diastolic flow.

Extensive imaging of the bulb and proximal bifurcation should be performed given the high predilection for plaque in these regions. A cross-sectional image identifying the maximum incursion of the plaque into the lumen should be obtained. Addition of color flow to the cross-sectional image may aid in distinguishing plaque from lumen and in wall detection. Pulsed Doppler analysis (with angle correction of 60 degrees) should be performed to quantify the degree of stenosis by obtaining the peak velocity at the level of the obstruction (1.5 to 2.5 m/sec = 50-74% obstruction, >2.5 m/sec ≥75% obstruction).

B-mode imaging of the distal CCA should be performed with the vessel positioned as perpendicular as possible to the transducer beam. When there is optimal definition of near and far wall IMTs of the distal 2 cm of the CCA, the freeze-frame button should be pressed, the image should be scrolled to an end-diastolic frame (largest diameter; approximately at the end of the QRS complex), and five seconds of the freeze-frame should be recorded.

The complete protocol is videotaped and the procedure is repeated on the contralateral artery.

Clinical Alerts and Referral Criteria

The presence of significant obstruction (>50%) constitutes a **clinical alert**. Such studies will be identified at the Reading Center and processed within 48 hours of receipt. Results of such studies will be reported by telephone to the Field Center. The presence of ≥75% obstruction should result in **immediate referral** whereas obstruction of 50-74% should result in routine referral. The detection of non-obstructive plaque (<50%) should provoke assessment of risk factors for atherosclerosis and discussion between the physician and the SHS subject regarding their reduction at the next routine visit.

SONOGRAPHER WORKSHEET

SHS V STUDY

Weill Medical College of Cornell University
New York Presbyterian Hospital
525 East 68th Street
New York, New York 10021
212-746-4654

Participant ID#: _____
Location: _____
Date of exam: _____
Sonographer: _____

Plaque Location	**Plaque +/-**	**Peak Velocity (m/sec) (if obstruction is present)**
L CCA, near	___	
L CCA, far	___	_____
L bulb, near	___	
L bulb, far	___	_____
L ICA, near	___	
L ICA, far	___	_____
L ECA, near	___	
L ECA, far	___	_____
R CCA, near	___	
R CCA, far	___	_____
R bulb, near	___	
R bulb, far	___	_____
R ICA, near	___	
R ICA, far	___	_____
R ECA, near	___	
R ECA, far	___	_____

_____ _____
Sonographer signature Date

SHS V

Blinded Log for Carotid Ultrasound Study

Counter	SHS#	Date	Sonographer

CAROTID IMAGE ANALYSIS PROTOCOL

Reading Center Equipment: The Reading Center is equipped with a personal computer into which a frame-grabber has been inserted and connected to a high-resolution video monitor and professional videocassette recorder. Customized software allows acquisition in real time of two-dimensional or M-mode frames thus bypassing image degradation, which might occur were analyses to be performed on stop-frame images.

Review of Videotape: The videotape of each study will be reviewed in its entirety at the Cornell Reading Center. Whenever a plaque is detected, that frame showing maximum diameter of the plaque (either longitudinal or cross-sectional) will be acquired in real time using the frame grabber and stored on a diskette. Suitable frames including B-mode imaging of the both distal common carotid arteries demonstrating continuous tracing of the lumen-intima interfaces of the near and far walls will be acquired in real-time and stored.

Measurement Techniques: Plaque will be graded as present or absent. A plaque score (0 to 8) will be generated based on the number of extracranial segments containing focal plaque. Maximum velocity at the level of a plaque causing significant stenosis will be recorded. End-diastolic (minimum dimension) lumen diameter and intimal-medial thickness of the far wall of the distal common carotid artery will be measured from digitized images using semi-automated edge-detection software. The software averages 100 separate measurements taken over a 1cm segment of the distal common carotid artery.

Data Summary and Transmission: Measurements on the worksheet will be verified by an investigator for faithfulness to the analyzed image and for outlier values before being transferred by diskette for incorporation in the main computer database. Variables to be transmitted will be: plaque (absent/present), plaque severity (non-obstructive, significant stenosis, severe stenosis), plaque score (0-8), right and left end-diastolic diameters, and intimal-medial thicknesses.

SHS PHASE 5 POPLITEAL ARTERY ULTRASOUND STUDY

Popliteal Artery Structure and Atherosclerosis. To provide direct measures of peripheral arterial disease, a highly prevalent condition in the SHS population, the geometry and presence of atherosclerotic plaque in the popliteal arteries (PA) will be assessed by ultrasound. B-mode scanning of the right and left PAs will be performed using Acuson Sequoia systems with a 5-7 MHz linear array arterial imaging transducer in multiple projections to optimize detection of discrete atheromata, identified on 2-D images as the presence of discrete plaque $\geq$50% thicker than the surrounding wall within any segment of either PA. In the SHS cohort, discrete atherosclerosis identified in this way in the carotid circulation predicted subsequent myocardial infarction, (relative risk=6.3), definite coronary heart disease events (relative risk=2.3) and stroke (relative risk=2.7). Maximum plaque diameter is quantified by computer-assisted measurement of plaque thickness on 2-D frames as described for carotid evaluation. Color Doppler is used to identify abnormalities such as aliasing and areas of turbulence indicative of obstructive disease. The severity of stenosis is further quantified using standard Doppler techniques. Stenosis severity criteria are determined by spectral broadening, flow reversal, and

peak systolic velocity ratios identified on pulse Doppler analysis. Vessels are classified as normal or having 0-19% stenosis, 20-49% stenosis, 50-99% stenosis or occlusion (Table 1). Focal areas of doubling of the measured peak systolic velocity have been shown to correspond to hemodynamically significant lesions of greater than 50% narrowing of arterial lumen diameter.

Table 1. Categorization of Popliteal Artery Stenosis Severity

Stenosis Category	Velocity	Waveform	Spectral Broadening
0-19%	Normal	Triphasic	--
20-49%	<double the proximal segment plaque present	Triphasic Monophasic	+
50-99%	>double the proximal segment, and >200 cm/sec beyond stenosis	Loss of reverse component	+
Occlusion	No flow	Monophasic pre-occlusive thump	N/A

Two-dimensionally-guided M-mode tracings of both the right and left popliteal artery are obtained to measure popliteal wall thicknesses and lumen diameter at end-diastole and peak-systole (maximum diameter).

At the Reading Center, suitable frames for measurement are acquired in real-time from the videotape using a frame-grabber (Imaging Technology, Inc., Woburn, MA) interfaced with a high-resolution (480 x 640 pixel field) video monitor and stored on diskettes. Following calibration for depth and time, the end-diastolic wall thickness (combined intimal-medial thickness of the far wall) and end-diastolic and peak-systolic internal diameters (by continuous tracing of the lumen-intima interface of the near and far walls) are measured on several cycles using electronic calipers and averaged. Measurement of wall thickness is never made at the level of a plaque. In addition, B-mode measurements of the popliteal artery (end-diastolic near and far wall IMTs and diameter) will be made using the Artery Measurement System (AMS II, v.1.111).

Popliteal Artery Ultrasound Scanning Protocol

Instrumentation:

Ultrasonographs will be calibrated against a phantom at installation and at regular intervals thereafter; sonographers should verify that this is performed by Acuson as part of routine maintenance. Popliteal artery imaging will be performed with Acuson Sequoia systems with 5-7 MHz linear array arterial imaging transducers. The 7.0 MHz vascular probe will be set to default with processing curves and a persistence setting optimal for imaging the popliteal artery.

Patient Preparation:

Imaging is performed in a slightly darkened room with the subject in a prone position with the knee slightly flexed, which will allow for a more direct, easier approach to popliteal artery imaging. Alternatively, if the prone position is difficult for the patient, the patient may remain in the supine position with the leg bent slightly and positioned out to the side away from

the patient, or the patient may be placed in a lateral decubitus position with the knee slightly flexed. Electrodes are placed for a modified three-lead electrocardiogram. The SHS study number should be entered before beginning the imaging study. In addition, the arterial system being imaged (left vs. right) should be entered on the screen.

Two-Dimensional Imaging and Doppler Study:

The ultrasound examination is begun by 2-D (B-mode) imaging in the transverse plane to establish the vascular anatomy. The transducer is placed posteriorly at the site of the popliteal fossa at the level of the knee joint. The PA is located posterior and slightly lateral to the popliteal vein. At the level of the knee joint, the PA sends off small geniculate branches. The PA is followed 6 to 8 cm superiorly into the thigh as it moves more medially within the adductor canal (above knee segment). The PA is then followed from the fossa inferiorly, approximately 6 to 8 cm from the knee joint to the superior aspect of the calf (below knee segment). Longitudinal imaging is then done along the course of the PA beginning proximally, in order to directly evaluate the vessel wall anatomy and the vessel lumen for obstructive disease. The segment being imaged (popliteal fossa, above knee segment and below knee segment) should be entered on the screen.

If plaque is present, the cine function should be activated to allow frame-by-frame scrolling to obtain the maximum plaque diameter. The transducer should then be rotated to obtain a cross-sectional image identifying the maximum incursion of the plaque into the lumen. Color Doppler is used to identify abnormalities, such as aliasing and turbulence, indicative of obstructive disease. Pulsed Doppler analysis, at an insonation angle of $\leq 60°$, is performed to quantify the degree of stenosis. Maximum velocity distal to a plaque causing significant stenosis is recorded. A point that is free of plaque, 2 to 4 cm proximal to sites of abnormal velocity is sampled to obtain a velocity ratio. The presence of collateral branches is noted whenever possible. Plaque location, peak systolic velocities and velocity ratios should be entered on the Sonographer Worksheet (see worksheet below and Table 1 above).

Evaluation for aneurysm of the popliteal artery (dilatation >1.5 times the diameter of the adjacent normal vessel) will require measurement of transverse and sagittal diameters of the above knee and below knee segments. The localization of lesions will be recorded in centimeters below and above the cranial edge of the patella, which will serve as a reference point in all patients**.**

Popliteal artery IMT will be evaluated at the site of the popliteal fossa, using the patella as a landmark. B-mode imaging of the popliteal artery should be performed with the vessel positioned as perpendicular as possible to the to the transducer beam. The 2-D imaging plane is oriented perpendicular to the intima-lumen interfaces of the near and far PA walls (in an area free of discrete plaque). Gain settings are optimized to limit "blossoming" of brighter interfaces. When there is optimal definition of near and far wall IMTs of the PA, the freeze-frame button should be pressed, the image should be scrolled to an end-diastolic frame (largest diameter; approximately at the end of the QRS complex), and five seconds of the freeze-frame should be recorded.

The complete protocol is videotaped, and the procedure is repeated on the contralateral

artery.

Clinical Alerts and Referral Criteria

The presence of a >50% obstruction or an occlusion of the popliteal artery or the presence of a popliteal artery aneurysm $\geq$ 2.0 cm in diameter constitute a **clinical alert** *in the presence of the following signs/symptoms***:**

- Foot REST pain
- Limb weakness / paralysis
- Limb coolness
- Foot/toe discoloration
- Foot/toe ulcers
- An ABI < 0.4

The incidental finding of a deep venous thrombosis (DVT) of the popliteal vein constitutes a **clinical alert**. Such studies will be identified at the Reading Center and processed within 48 hours of receipt. Results of such studies will be reported by telephone to the Field Center. Such patients should be **referred for immediate evaluation**.

The presence of >50% obstruction or occlusion of the popliteal artery without signs or symptoms of critical limb ischemia as described above should result in routine referral (within one month). The detection of non-obstructive plaque (<50%) should provoke assessment of risk factors for atherosclerosis and discussion between the physician and the SHS subject regarding their reduction at the next routine visit.

SONOGRAPHER WORKSHEET

SHS V STUDY

Weill Medical College of Cornell University
New York Presbyterian Hospital
525 East 68th Street
New York, New York 10021
212-746-4654

Participant ID#: _____
Location: _____
Date of exam: _____
Sonographer: _____

Plaque Location	Plaque +/-	Peak Velocity (m/sec) (if obstruction is present)	Peak Velocity(m/sec) proximal to obstruction
L Popliteal fossa, near	____	_____	_____
L Popliteal fossa, far	____	_____	_____
L Above knee segment, near	____	_____	_____
L Above knee segment, far	____	_____	_____
L Below knee segment, near	____	_____	_____
L Below knee segment, far	____	_____	_____
R Popliteal fossa, near	_____	_____	_____
R Popliteal fossa, far	____	_____	_____
R Above knee segment, near	____	_____	_____
R Above knee segment, far	____	_____	_____
R Below knee segment, near	____	_____	_____
R Below knee segment, far	____	_____	_____

Popliteal aneurysm +/-	**Diameter (cm)**	**Location of popliteal aneurysm**
_____	_____	_____

_____ _____
Sonographer signature Date

Ultrasound machine settings for imaging of the popliteal artery:

Set the **frequency** of the probe to the highest that it will allow (**6 MHz).**

Adjust the following (tabs are located at upper right hand corner of control panel; the adjustments made are indicated on the screen on the upper right hand corner, usually below the tape counter):

Space time = set to S2
Edge =set to +2
Delta = set to 4
Persistence = use 1

Color filter set to lowest filter (1)
Color scale (seen on upper left hand corner when color Doppler is turned on) = set to 0.20 m/s

Once these settings are adjusted on the machine, these settings can be stored as a **popliteal artery preset**, which you can then use for imaging of the popliteal artery (instead of the carotid preset):

- Click Data setup on the keyboard
- Pick presets
- On the lower left, type in "popliteal"
- Then hit the STORE button

Popliteal Artery Ultrasound Scanning Protocol ("Cheat Sheet - Version 05/2006)

B-mode/transverse

Mid segment (popliteal fossa)
Above knee segment (6-8 cm above top edge of patella)
Below knee segment (6-8 cm below bottom edge of patella; popliteal artery dips down with the patella seen to left of the artery)
Record each segment for 5-7 seconds, freeze & record each segment as well
**Measure dilated segments (trailing to leading edge)*
**Image maximum plaque incursion, freeze & record*

B-mode/sagittal

Mid
Above knee
Below knee
Record each segment for 5-7 seconds, freeze & record
**Image maximum plaque incursion, freeze & record*

Color/sagittal

Mid
Above knee
Below knee
Record each segment for 5-7 seconds, no measurements

PW Doppler

Above knee
Mid
Below knee
Obtain at least 1 spectral Doppler waveform, measure PSV, EDV (*insonation angle of ≤60°)*
**If plaque present or turbulence by color Doppler, walk sample volume ON VIDEO through the area of stenosis to obtain peak velocity; freeze, measure PSV, EDV; Obtain a spectral Doppler waveform at a point that is free of plaque, 2 to 4 cm proximal to sites of abnormal velocity, measure PSV, EDV*

IMT

Mid segment; B-mode
Record 3 sweeps at 50 speed; freeze, measure 3 beats of the far wall @ end of QRS (leading edge of intima to leading edge of adventitia)

Important points:

- Obtain flow velocity profiles for all lesions

Align cursor to vessel wall

- Angle ≤ 60 degrees

- Electronic beam-steering
- Transducer heel-toe maneuvers

•During PW Doppler, always show good color image
- Freeze Doppler spectrum with the right kidney key (color image will be in real-time update mode)
- Freeze color image with the wheel
- Use manual cine to scroll back to good color image
- THIS IS KEY for interpreting physician

•Indicator orientation: toward subject's RIGHT or HEAD

•Labels:
- AK = above knee popliteal
- BK = below knee popliteal
- PF = mid popliteal (popliteal fossa)
- Post = posterior approach
- Med = medial approach

•Above knee popliteal artery will include 6 cm proximal to the top of patella

•Medial approaches can be used as alternative window

•Phased-array transducer helpful for Doppler of popliteal artery bifurcation & distal SFA

•Criteria for **aneurysm** = dilatation >1.5 times the diameter of the adjacent normal vessel

•Aneurysm & lesion locations noted in distance (cm) relative to cranial edge of patella

•**Plaque** characteristics may be observed:
- Surface
- Morphology
- Density

• **Criteria for Popliteal Artery Stenosis Severity**

Stenosis Category	Velocity	Waveform	Spectral Broadening
0-19%	Normal	Triphasic	--
20-49%	<double the proximal segment plaque present	Triphasic Monophasic	+
50-99%	>double the proximal segment, and >200 cm/sec beyond stenosis	Loss of reverse component	+
Occlusion	No flow	Monophasic pre-occlusive thump	N/A

SHS PHASE 5 ECHOCARDIOGRAPHY

Echocardiographic evaluation of LV geometry, LV systolic and diastolic function and valvular heart disease is an increasingly useful tool in epidemiologic research as the yield of technically satisfactory echocardiograms in middle-aged to elderly adults has risen from 70% in the initial Framingham experience to 96-98% in the 4th SHS examination and other multi-center studies coordinated by the Cornell Reading Center. A central contribution of echocardiographic studies, mostly performed in white populations, is the demonstration that high LV mass predicts CV morbidity and mortality more strongly than conventional risk factors other than advancing age. In the SHS cohort we have demonstrated that LV geometry on Phase II echocardiograms strongly predicts CV mortality and CV events, independent of LV ejection fraction, standard risk factors or measures of renal dysfunction. In one of the first analyses of the prognostic implications of abnormal LV diastolic filling in a population-based sample, we showed that an elevated ratio of early diastolic/atrial phase LV filling (E/A ratio>1.5) predicted CV death more strongly (p=.0003) than age (p<.01), DM (p=.001), or systolic BP (p=.04) and that reduced E/A ratio (<0.8) also predicted CV death. High prevalences of echocardiographic abnormalities in SHS may contribute to high CV death rate in American Indians.

Despite progress made by the SHS and other studies in elucidating stimuli to increases in LV mass, only ~ 50% of the variability of LV mass can be predicted by clinical (age, gender, height, BMI and DM) and hemodynamic (BP, stroke volume and myocardial contractility) variables. An important addition to this knowledge has been demonstration in the SHS as well as the HyperGEN and Framingham studies of significant phenotypic heritability of LV mass independently of recognized stimuli to LV growth. In a parallel NHLBI-funded epidemiologic study, the Hypertension Genetic Epidemiology Network (HyperGEN), echocardiographic measurements of LV geometry made at the Cornell Reading Center showed substantial phenotypic heritability (h^2) in hypertensive sib-pairs: there was significant inheritance of both LV mass and relative wall thickness in both African-Americans and in whites, with stronger inheritance of LV mass in African-American than white participants (h^2=.70 vs. 26) and of LV relative wall thickness in whites than African-Americans (h^2=.45 vs. 18, both comparisons, P<.01). These findings, combined with the results from relative-pair analyses in SHS, document substantial heritability of LV mass, independent of age, gender, body habitus and BP, indicating that heritability is sufficient to have adequate power in the proposed research design to detect linkage with genes contributing to regulation of LV mass, geometry and function. Evidence has also been obtained that arterial structure and function influences LV geometry independent of other known factors and that arterial size shows even stronger heritability in the SHS population than LV mass. The performance of echocardiograms on 3,637 members of 95 large multi-generational families in SHS Phase IV at the same time as arterial imaging and pressure waveform recordings provides a unique opportunity to clarify pathophysiologic inter-relations between the heart and arterial tree, to establish the role of heredity in determining CV structure and function, and to find genes responsible for this heritability.

An additional area in which knowledge is evolving rapidly is the way in which abnormalities of LV structure and function participate in causal pathways leading to morbid and mortal CV events. A line of evidence developed in studies at Cornell has shown associations between, on the one hand, arterial wall thickness, discrete plaque, measures of arterial stiffness

and the augmentation index (a measure of the increase that occurs in the central [aortic and carotid] systolic arterial pressure due to early return of reflected pressure waves from the peripheral arteries) and, on the other, LV wall thickness, mass and midwall systolic function. However, these studies have been limited by their cross-sectional nature and lack of full characterization of the levels over time of potentially important covariates (e.g., lipid and lipoprotein profile, body composition beyond calculation of BMI, insulin levels, etc). The proposed study will present an ideal opportunity to examine the temporal evolution of these arterial-cardiac parallelisms and to relate progression of cardiac and arterial abnormalities to DM, obesity and other risk factors that are becoming increasingly prevalent in most populations.

One particularly promising approach to assessing myocardial systolic and diastolic function directly is use of tissue Doppler imaging (TDI) to measure the velocities of LV shortening during systole and lengthening during different phases of diastole. Spectral pulsed TDI can measure myocardial systolic shortening and diastolic lengthening velocities, which provide more direct measures of heart muscle systolic and diastolic function than previously available. Measurement of the systolic myocardial velocities at various sites of the LV provides information on global systolic function as well as regional myocardial contractile dysfunction. Of note, systolic myocardial velocity has been shown to be subnormal in hypertensive patients, paralleling the reduction of calculated midwall shortening seen in hypertensive patients with normal systolic function by conventional parameters. TDI is particularly useful in identifying abnormal LV diastolic relaxation. Because it is less affected by changes in preload, mitral anular velocity assessed by TDI is able to identify pseudonormal LV filling (abnormal LV relaxation with high filling pressures) and thereby is more sensitive for identifying impaired LV relaxation than the mitral inflow velocity flow pattern measured by conventional pulsed Doppler. Of note, the latter less sensitive method has already been shown to predict prognosis in Strong Heart Study participants. We have shown that diabetes is independently associated with abnormal LV relaxation. Thus, accurate and comprehensive assessment of diastolic function is particularly important in the Strong Heart Study.

A new method that we have developed is based on the early demonstration by Sarnoff and colleagues that myocardial oxygen consumption per heart beat per gram of myocardium is closely determined by the tension-time index (the integral of LV wall stress throughout systole) and evidence that myocardial oxygen consumption closely tracks with echocardiographic measurements of LV wall stress. We use standard echo-Doppler measures of LV mass, end-systolic stress, ejection time and heart rate to derive an estimate of myocardial work energy expenditure (MEE) in calories per minute. Compared to findings in a reference group of apparently normal SHS cohort members, MEE was appreciably higher in participants in the 2nd SHS exam with DM or hypertension, nearly 300% higher in individuals with LV ejection fractions <40% and over 150% higher in those who suffered subsequent CV death.

Measurement Technique: Standardized examinations will include 2-D guided M-mode echocardiograms and selected 2-D and Doppler recordings. Recordings to measure tissue Doppler parameters of LV systolic and diastolic function (peak systolic contraction velocity and the peak velocity of early diastolic and atrial phase myocardial lengthening of the LV myocardium at the interventricular septal- and lateral LV wall-mitral anular junctions (E' and A' velocities) will be added to those obtained in SHS Phase IV, using presets for this purpose that

were already added to the Siemens Sequoia echocardiographs during the SHS Phase IV examination. Studies will be sent to the Reading Center for blinded interpretation by experienced technician and physician readers. Study performance and interpretation will focus on measures of LV mass and geometry, global and regional systolic function, and diastolic filling to maximize the yield of reliable data to answer the specific study questions.

Because of the geographical dispersion of the Field Centers, multiple steps are used in the SHS to maximize quality control of echocardiogram performance. These include preliminary measurement of LV dimensions and other variables by examining technicians, which increases awareness of aspects of image orientation and definition needed for a measurable study. A copy of videotaped 2-D and M-mode views on study subjects is made by the Field Centers for the sonographer to review with final measurements, comments and suggestions from the Reading Center about how to enhance technical quality, for continuing education of performing sonographers. Site visits to Field Centers by Reading Center staff will be made as necessary. The Reading Center uses procedures adapted from those developed and refined in the Cornell laboratory over 20 years and used in SHS Phases II and IV. Steps to assure data quality include blinded performance of measurements, checking of initial measurements against the visual appearance of the echocardiograms, verification of technician-reader measurements by experienced investigators, and repeat verification of measurements that fall outside expected ranges for a normal to mildly diseased population or reveal unexpected relations among variables. Computer support and assistance with data management and statistical analyses is provided by the Computer Center of the General Clinical Research Center. Echocardiogram performance and measurement protocol is described in more detail in the Appendix.

PROCEDURE FOR ECHOCARDIOGRAM PERFORMANCE:

For performance of the echocardiograms, examining tables with cut-outs designed to facilitate performance of standardized, quantifiable echocardiograms are used. At the Reading Center quantitative and qualitative assessment of echocardiograms is performed using Digisonics Review Centers.

Initial Training/Start-Up: Once selected, technicians undergo phased training before the performance period. Formal training consists of a course in New York that combines didactic teaching of selected general aspects of echocardiography and the specific study protocol, and hands-on training in performing echocardiograms by the study protocol. The training course at the Reading Center can be combined with that for carotid ultrasound for sonographers who are already familiar with procedures for quantitative evaluation of the heart, with discretion to adjust the amount of training depending on the individual trainee's skill level.

Sonographer Measurements: It is the Reading Center's experience that the percentage of echocardiograms that are suitable for accurate measurement is enhanced if the examining sonographer makes preliminary measurements on each study and is then given feedback as to how to improve the suitability of the study for quantitation and the selection of interfaces to measure.

Echocardiography Performance at Field Centers: Correct orientation of the ultrasound beam and imaging planes to LV structure and blood flow is essential. The LV resembles an ellipse of rotation that is nearly circular in short-axis views, with a long-axis about twice its minor axis. To measure the LV minor axis accurately it is necessary to orient the echocardiographic beam from the parasternal (or less commonly the subcostal) window to pass perpendicularly through the interventricular septum and posterolateral LV wall at the junction of papillary muscle tips and mitral chordae under 2-D guidance. Rotation of the 2-D sector 90 degrees to the short axis projection allows one to measure the true, maximum LV diameter. If, as is common in older subjects, the best parasternal window is in a low interspace, a higher interspace should be used, which may image only a narrow sector that includes the LV minor axis. If this is not possible, linear measurements of LV minor axis and wall thicknesses should be made at the correct level and orientation by the leading-edge method from 2-D long-axis views that maximize LV cavity size.

A major advantage of 2-D echocardiography is its ability to visualize the LV long-axis and wall segments near the apex. To accomplish this, one must obtain the true (longest) long-axis dimension and visualize the LV walls in approximately orthogonal apical 4- and 2-chamber views. The LV long-axis is commonly foreshortened in the 4-chamber view, as seen when the transducer is rotated to the 2-chamber view and the LV apex is out of the field of view. The transducer should then be moved inferolaterally until the LV apex is as nearly centered at the top of the image "fan" in both views as possible. The accuracy of Doppler recordings depends on the ultrasound beam being parallel to the axis of blood flow. The apical 2- and 4-chamber views are used to sample LV inflow across the mitral anulus and valve orifice while the apical long-axis view, or the 5-chamber view, are best to measure systolic flow across the aortic anulus to calculate stroke volume and cardiac output. Color Doppler recordings in parasternal long-axis and apical 4-chamber views are used to identify significant valvular regurgitation.

Protocol for Echocardiogram Performance: Echocardiograms are performed in the same van or fixed facility as the carotid ultrasounds, described previously. Subjects change their top for a light gown to permit discrete exposure of the chest overlying parasternal and apical acoustic windows. One ECG lead is continuously monitored for timing purposes. The subject assumes a partial left decubitus position (with pillows or a foam-rubber wedge to support the back) with the head of the examining table modestly elevated. The subject's SHS study number and the date and site of recording are entered on the videotape. Careful performance of this protocol will require 30 minutes of subjects' time.

Specific recordings to be made: Parasternal long-Axis 2-D recordings will be obtained first, with the interspace and degree of left decubitus positioning chosen to allow an M-mode cursor line to traverse the interventricular septum (IVS) and LV posterior wall (PW) perpendicularly.

A. 2-D echocardiography during quiet respiration: Maximize LV and aortic diameter and record ≥10 beats on tape.

B. M-mode cursor perpendicular through LV at the LV minor axis; Record 10 beats of 2-D update image with M-mode recording, then record at least 10 beats of M-mode at 50 mm/sec during quiet respiration and attempt at least 5 beats at held expiration; the imaging plane is tilted medially and laterally to maximize the LV cavity area in the long-axis view.

C. Turn 90° into parasternal short-axis view to visualize the LV short-axis at papillary muscle tips.

D. 2-D echocardiography at the papillary muscle tips during quiet respiration: 15 beats on tape.

E. M-mode cursor through the LV meridian at papillary muscle tips: 10 beats of full-screen 2-D and 10 beats of M-mode with 2-D update during quiet respiration. Then attempt 5 beats at held expiration.

F. M-Mode Sweep from LV through mitral valve to left atrium/aortic view recorded on videotape.

G. Aortic/Left Atrial Imaging: 2-D echocardiography in long-axis views during quiet respiration aorta/left atrial level with maximization of aortic diameter at the sinuses of Valsalva: 10 beats. Color Doppler to search for aortic and mitral regurgitation in long-axis view.

H. M-mode cursor perpendicular through aorta and left atrium with maximization of aortic diameter by "tilting" medially and laterally of 2-D imaging plane: 10 beats of 2-D update image with M-mode recording.

I. At completion of these recordings the transducer will be shifted to the apical window, identified by palpating the LV impulse on the chest wall and then moving the transducer inferolaterally until the LV apex is visualized in 2- and 4-chamber views, with repositioning of the participant if needed. Pulsed Doppler transmitral flow recording with sample volume at the middle of the mitral anular plane during diastole: Using a 2.5 mega Hz transducer, record 10 beats of 2-D update image with Doppler recording, then record at least 10 beats of full-screen videotaped Doppler at 100 mm/sec during held expiration if possible. Move sample volume to leaflet tips (highest E wave velocity) and repeat recording. Locate a pulsed Doppler sample volume or continuous wave Doppler beam orientation that depicts simultaneously clear envelopes of systolic ejection of blood and diastolic transmitral flow to visualize the isovolumic relaxation period, increase sweep speed to 100 mm/sec and record $\geq$ 10 beats of full-screen Doppler during held expiration. Preset TDI controls are present on the Sequoia ultrasonographic systems that allow the system to filter out the high-velocity signals of blood flow within the cardiac chambers and display only the low-velocity and high amplitude signals representing wall motion velocities. Tissue Doppler acquisition is performed with placement of sample volumes in the basal interventricular septum and lateral LV wall, which takes no longer than 2 minutes to complete. 4- and 5-chamber view color Doppler recordings will then be made to search for aortic and mitral regurgitation.

J. Turn approximately 90° into apical 2-chamber view. 2-D echocardiography in the true apical 2-chamber view during quiet respiration or held expiration: Record 15 beats with maximum LV chamber dimension and good endocardial definition.

K. The transducer is rotated to the apical long-axis view (which visualizes the aortic valve and root as opposed to the 2-chamber view which excludes them in favor of the anterior LV wall) and 10 cycles of pulsed Doppler blood flow at the aortic annulus (hinging points of aortic cusps) is recorded during quiet respiration or held expiration.

Brachial Pressure Measurement

At this point the subject will be returned to a supine position without turning up the lights or any other change, and the brachial blood pressure will be measured using the appropriate-size cuff

and a mercury sphygmomanometer. The first and fifth Korotkoff sounds (appearance and disappearance of sound) will be used as systolic and diastolic pressures, based on the average of the last two of three sequential determinations.

With the participant remaining in the supine position, the bend of the elbow should be at heart level and the legs should be uncrossed. The participant should be able to relax the neck and shoulder muscles as much as possible. Note: because the participant has been at rest on the examining table, there is no need for the 5-min waiting period used as part of BP measurement during the clinic exam. The brachial artery is palpated (just medial to and above the ante-cubital fossa), and this location is marked for stethoscope placement. The appropriate size cuff is then wrapped around the participant's arm with the center of the bladder over the artery. Use the arm that is closest to the sonogragpher. Connect the cuff to a standard mercury manometer and establish the pulse obliteration pressure by slowly inflating the cuff while palpating the radial artery until the pulse is no longer felt. Then, deflate the cuff and record the obliteration pressure. Conversation should be limited but the procedure may be briefly explained to the participant at any time.

For each of the stethoscope BP measurements, the cuff is inflated to +30 mmHg above the obliteration pressure, the pressure is held constant for 5 sec, and then the cuff is slowly deflated (2 mm/sec) while reading pressures for Korotkoff sounds. Record the 1st and 5th phases, reading the pressure in mmHg to the nearest even number. If the mercury column falls in between two scale marks (mmHg) at the time the first or fifth Korotkoff sound is heard, the **higher number** should be recorded. The first sound heard in a series of two sounds is recorded as the systolic blood pressure (phase 1), and the first silence in a series of two silences is recorded as the diastolic blood pressure (phase 5), not the last sound heard. If the sounds do not cease completely, the fourth Korotkoff sound will be used. The sonographer records all 3 of these auscultated BP readings. Using a calculator, average the second and third readings and mention the results to the participant, clearly stating the systolic and diastolic pressures.

If the Korotkoff sounds are heard at the outset of cuff deflation, the peak inflation level used was too low. The cuff should be immediately deflated by releasing the thumbscrew and disconnecting the cuff tube. Make another blood pressure measurement, starting at a peak inflation level, which is 10 mmHg above the previous level.

Once all measurements (carotid and popliteal ultrasound and echocardiography) have been completed, the ECG leads will then be disconnected and the subject allowed to dress and to go to the SHS clinic or to leave. The technician will then complete the logging information on the echo performance worksheet, add the subject's SHS number, and date of performance to a label attached to the videocassette, and prepare the performance area for the next subject. Field Center technicians will continue the procedure begun during the training period of making preliminary measurements on each study of LV dimensions, recording the qualitative normality or abnormality of LV systolic function from 2-D recordings, and noting any clinical abnormalities. The worksheets with preliminary readings will then be assembled with videotapes for shipment to the Reading Center, preparations (videocassettes, ECG electrodes, gel, etc.) for the next day completed, and the technicians will complete the day by reviewing previous studies returned from the Reading Center with teaching comments.

ECHOCARDIOGRAM MEASUREMENT AT READING CENTER:

Central Echocardiogram Reading: Measurement and qualitative interpretation of echocardiograms will be performed primarily by technician-readers with extensive over-reading and supervision by physician-investigators. Upon receipt of studies from Field Centers, they will be logged into a hard-copy book and into a computer that already contains participant SHS number, and other demographic information needed to assure unambiguous subject identification. Videotapes will be assigned to technician and physician readers who will enter SHS number to assure a match into the Revue Center.

Videocassettes are placed in the VCR and advanced to the start of each study (identified by code number). Parasternal long- and short-axis 2-D views will be reviewed to ascertain correct M-mode beam angulation, and scored for semiquantitative wall motion of visualized wall segments. If the M-mode beam is correctly angulated, the technician-reader will choose the visually-best LV cycles (up to 6) and identify the QRS onset for each cycle on the simultaneous ECG to time end-diastolic measurements of interventricular septal and posterior wall thickness and LV internal dimension by the ASE convention (at QRS onset) and at the nadir of posterior septal motion for ASE end-systolic measurements. If the M-mode beam is not correctly oriented, the 2-D parasternal long-axis recordings will be played backward and forward to find the cycle or up to three cycles that maximize(s) the LV cavity area. In this view, septal and PW thicknesses and LV internal dimension will be measured by the leading-edge technique at the level of the papillary muscle tips along an axis perpendicular to the LV walls. This procedure contributed to the substantial increase in the proportion of subjects with measurable LVs to about 90% in the second SHS examination and to >95% in the subsequent HyperGEN echocardiography study, compared to about 70% in the Framingham and Cardiovascular Health Studies. LV mass values by this technique with the ASE correction have proven nearly identical to those from good-quality M-mode recordings in the same research subjects in the Cornell laboratory, indicating their interchangeability. With the parasternal long-axis 2-D view on the monitor, the cycle illustrating the largest LV outflow tract and aortic root diameter will be visualized to measure the aortic annular diameter at the QRS onset between the hinging points of the two visualized aortic cusps (trailing to leading edge), a measurement needed to calculate stroke volume.

The videotape will then be advanced to the apical 4- and 2-chamber views to allow detection of segmental areas of akinesia or dyskinesia that would suggest the presence of myocardial infarction and undermine the validity of linear measurements for evaluation of LV geometry and systolic function. LV systolic function in 14 segments will be made on a scale ranging from normal to dyskinetic. The videotape will be advanced to the 4-chamber view recording Doppler flow across the mitral anulus and at the level of the leaflet tips (highest E-wave velocity). Early and late diastolic flow will be traced by the leading edge (black-white interface) method to measure peak E and A velocities and the E and A time-velocity integral on the three cycles illustrating the highest velocity. The videotape will then be advanced to the apical long-axis view illustrating transaortic flow and the aortic flow time-velocity interval measured on three cycles by the leading-edge black-white method as described by Dubin et al. A pulsed sample volume location or continuous wave Doppler beam orientation that

encompasses both LV inflow and outflow signals will be identified to measure the isovolumic relaxation time. For each set of measurements the depth (or Doppler velocity) and time calibrations will be repeated. As an immediate quality-control step, the measurements obtained by the CardioRevue Center will be compared to the videotaped images with the use of calipers. The preliminary reports prepared by the Field Center technicians will be reviewed and comments made confirming the quality of recordings and measurements or indicating needed corrections and how to accomplish them that will be returned to the Field Centers. After the technician-reader has checked the computer print-out of primary and derived measurements for appropriate correspondence to the primary recordings, blinded studies will be arranged in batches for over-reading of all studies and verification of all measurements by a physician investigator.

After measurements are investigator-verified and transmitted to the computer center, they will be merged electronically with demographic data to facilitate checking of echocardiographic measurements against ranges of expected values for body size and gender. A random sample of studies will be selected for duplicate readings and ones with measurements or inter-reader differences that fall outside a priori limits for further verification as well as other quality control procedures, as well as a sample of "in range" studies will be reviewed by the physician-readers. Procedures for computerized data tracking and management will utilize standard data bases and ASCII files with limited custom programming done in house in coordination with the Coordinating Center. M-mode or analogous linear 2-D measurements at end-diastole by the American Society of Echocardiography recommendations are used to calculate LV mass by the anatomically validated formula:

$$\text{LV Mass} = 0.8 \times (1.04\,[(\text{IVS} + \text{LVID} + \text{PWT})^3 - \text{LVID}^3]) + 0.6 \text{ g}$$

Estimates of LV mass by this method were closely related to actual LV weight at necropsy ($r=0.90$, $p<0.001$) in a study of 52 adults.

Overall LV mass is the best measure of myocardial cell size, since the number of cardiac myocytes remains relatively constant after infancy, and is the most sensitive echocardiographic index of LV hypertrophy. However, additional useful information is provided by the LV wall thickness/radius ratio or "relative wall thickness" (RWT). This increases in proportion to chronic elevation of LV systolic pressure due to adaptive LV hypertrophy and adds to LV mass for prediction of complications of hypertension. RWT is calculated from M-mode measurements as 2PWT/LVID; increased LV mass is classified as concentric hypertrophy if RWT is ≥ 0.43 and eccentric hypertrophy when RWT is normal. If LV RWT is increased but LV mass is normal, the subject is considered to have "concentric LV remodeling", an LV geometric pattern newly described from the Cornell Laboratory.

Normalization of LV mass for body size will be done using body height to the appropriate power of its allometric (or growth) relation with LV mass ($\text{height}^{2.7}$), which the Cornell laboratory has shown to optimize both the sensitivity of echocardiography for detection of LV hypertrophy in hypertensive patients and the capacity to predict CV complications, and alternatively using FFM calculated from bioelectric impedance as well the traditional normalization for body surface area.

Systolic Function and Mechanics: Systolic function of a symmetrically contracting LV, such as occurs with uncomplicated hypertension, diabetes, or alcoholism, can be assessed by

measurement of the fractional shortening of LVID between end-diastole (d) and end-systole (s):

$$\text{Fractional Shortening (\%)} = [(LVIDd - LVIDs)/LVIDd] \times 100$$

If LV wall motion is uniform, fractional shortening is closely correlated with global LV ejection fraction, and is a simple substitute for it. LV ejection fraction will be assessed by a 2-D method that we have previously shown to be even more strongly predictive of cardiovascular and all-cause death in SHS participants than LV fractional shortening. Because of the recognition that endocardial shortening may be normal while myocardial function is depressed in LVs with thick walls (as occur commonly in hypertension), LV midwall shortening will also be calculated using a method that the Cornell laboratory has shown to enhance both the detection of abnormal LV systolic function in hypertensive patients and the capacity to predict an adverse prognosis in the SHS population.

Because ejection-phase indices of LV performance are highly dependent on afterload, measurement of myocardial afterload is helpful in determining whether or not observed ventricular function reflects normal myocardial contractility. The most direct measure of myocardial afterload is end-systolic stress (ESS), which can be calculated from end-systolic LV measurements and cuff BP, determined with the subject on the examining table at the end of the echocardiogram. A catheterization-validated formula will be used to calculate LV circumferential end-systolic stress. Inverse relations exist between endocardial and midwall LV fractional shortening and ESS in both normal and hypertensive subjects which becomes most linear when ESS is plotted on a logarithmic scale. The fractional shortening expected for a given level of ESS may be predicted from findings in normal subjects studied in our laboratory. Calculation of the observed/predicted fractional shortening ratio provides stress-corrected fractional shortening as an afterload-adjusted measure of LV chamber performance. Stress-corrected midwall fractional shortening has already been shown to be an extremely strong predictor of CV death in very short-term follow-up of the SHS cohort. Peak systolic shortening velocity of the basal interventricular septum and lateral LV wall will be assessed by tissue Doppler imaging.

Evaluation of LV Pump Performance and Systemic Hemodynamics: The systolic pump performance of the heart will be primarily assessed by Doppler measurement of stroke volume and cardiac output, with secondary measurements of potential interest provided by the measurement package of peak ejection rate and mean acceleration of trans-aortic blood flow. When it is appropriate in analyses to take body size into account, these measures of pump performance will be normalized for body surface area, body height to its appropriate allometric power and fat-free body mass to either eliminate from consideration or take into account the influence of overweight on cardiac pump performance. Total peripheral resistance and the ratio of pulse pressure/stroke volume will be calculated as indices of the function of the peripheral arterial tree.

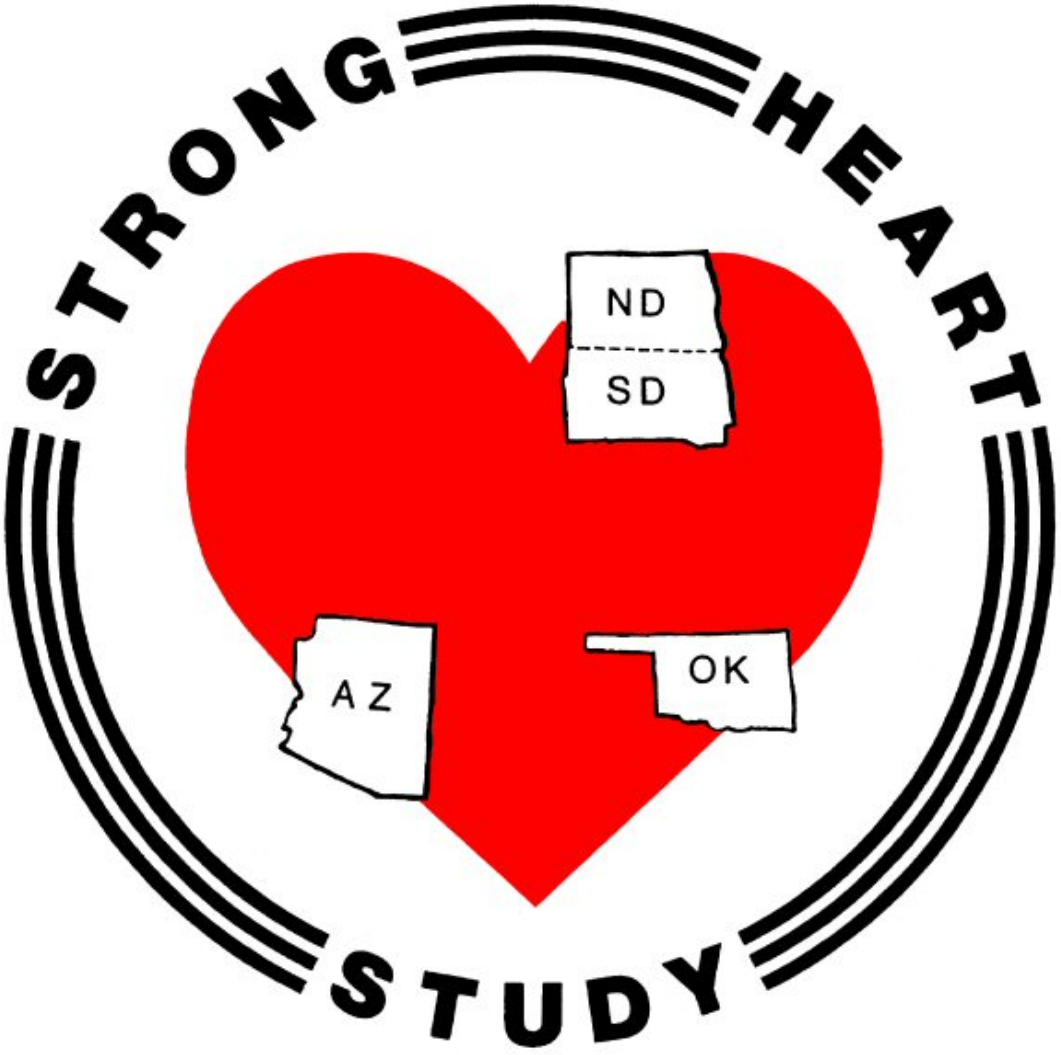
Evaluation of LV Diastolic Filling: The "E" and "A" velocities and integrals of transmitral blood flow will be used as measures of LV filling a) during ventricular relaxation and shortly thereafter and b) in response to atrial contraction. The isovolumic relaxation time, calculated as the interval between the end of systolic forward flow in the LV outflow derived and the onset of transmitral flow from the Doppler recordings described above will be used as an index of the time constant of early diastolic LV relaxation. The atrial contribution to filling

calculated from the ratio of the "A" wave integral to the total integral of diastolic flow across the mitral anulus will be used a measure of the dependence of LV filling on atrial contraction, and atrial systolic force will be calculated as described by Chinali et al as a measure of the active atrial contribution to LV filling. Diastolic LV myocardial function will be assessed by tissue Doppler measurement of E' and A' velocities of the basal interventricular septum and lateral LV wall, with E' velocities <8cm/sec taken as evidence of impaired early diastolic relaxation and an E/E' ratio >15 as evidence of elevated LV filling pressure.

Ultrasonographer Training and Quality Control:

Sonographer training, reading and quality-control procedures will be similar to those successfully employed in SHS Phases II through IV with addition of training in PA imaging. One week of intensive training will be provided at the Cornell Reading Center. Sonographers will observe the technique for echocardiography, carotid and popliteal ultrasound study as performed by a highly-experienced research sonographer. Then, sonographers will be observed and critiqued in their performance of arterial imaging. Sonographers will complete worksheets at the completion of each study, which can subsequently be utilized for written or oral feedback.

Copies of videotapes will be made and kept at the field sites to facilitate feedback and prevent loss of tapes. Initial readings will be performed by the research sonographer and verified by the physician-investigator. The initial and verification readings of the ultrasound studies will be performed in a blinded manner and then merged with demographic descriptors for final quality-control check of extreme values. Measurements will be performed using established in-house custom measurement and database and statistical analysis programs, including computer support from the Clinical Research Center. Data will be electronically transmitted to the Coordinating Center. Clinical alerts, such as high-grade stenoses, will be immediately reviewed and results relayed by FAX immediately to the Field Center.



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Six

MAC 1200 OPERATOR'S MANUAL

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Six

MAC 1200 Operator's Manual

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME VI

MAC 1200 Operator's Manual

Table of Contents

MAC® 1200

resting ECG analysis system
Operator's Manual

Version 1.1
227 492 04 GA (USA) Revision D

marquette

A GE Medical Systems Company

The information contained in this manual describes version 1.1 of the MAC® 1200 resting ECG analysis system and reflects software version 5.1.

Revision History

This manual is subject to the GE Marquette change order service. The revision letter which follows the document part number, changes with every update of the manual.

Part No./ Revision	Date	Comment
227 492 04-A	January 1999	Initial Release
227 492 04-B	March 17, 1999	ECO 061 952
227 492 04-C	May 7, 1999	ECO 062 136
227 492 04-D	October 11, 1999	ECO 062 920

MAC 1200 Option Codes

In addition to the software supplied with the unit, optional programs may be purchased to upgrade the MAC 1200 performance features. In order to use a new option, you need to activate it by entering the option code number (refer to section 9.8 for details). The option codes are entered into the MAC 1200 prior to shipping.

Software package	Functionality	Option Code
MEAS	measurement (measurement of the 10-second resting ECG)	_ _ _ _ _ _ _ _ _ _ _ _
DIAG	interpretation (interpretation of the 10-second resting ECG)	_ _ _ _ _ _ _ _ _ _ _ _
MEMO	memory (storage of a maximum of 40 10-second resting ECGs)	_ _ _ _ _ _ _ _ _ _ _ _
C100	activates the three options MEAS, DIAG, MEMO for a maximum of 100 ECGs	_ _ _ _ _ _ _ _ _ _ _ _
C500	activates the three options MEAS, DIAG, MEMO for a maximum of 500 ECGs	_ _ _ _ _ _ _ _ _ _ _ _
EVAL	activates the three options MEAS, DIAG, MEMO for a maximum of 4 weeks	_ _ _ _ _ _ _ _ _ _ _ _

Serial No:	_ _ _ _ _ _ _ _ _

How to Reach Us . . .

Service Calls and Product Support

To open a service call or obtain product support call the numbers below:

Service calls	All products	800-558-7044 (U.S.& Canada) 561-575-5000 (outside U.S.)
Product support	Monitors	800-558-7044 (U.S.& Canada) 561-575-5000 (outside U.S.)
	Cardiology	800-558-5120 (U.S.) 414-355-5000 (outside U.S.)

or contact your local sales and service representative:

Name: _____

Telephone: _____

For other product information please contact one of the offices listed on the next page.

Ordering Supplies and Service Parts

Order supplies (leadwires, electrode paste, thermal paper, etc.) or service parts (circuit boards, cables, software, etc.) and manuals from:

Supplies

GE Marquette Supplies
2607 North Grandview Blvd.
Mail Code: SN-471
Waukesha, WI 53188
Telephone: 800-558-5102 (U.S. only)
414-521-6856 (outside U.S.)
Fax: 800-232-2599 (U.S. only)
414-521-6855 (outside U.S.)

Service parts

GE Marquette Service Parts
P.O. Box 9100, 100 Marquette Drive
Jupiter, FL 33468-9100
Telephone: 800-321-3251 (U.S. only)
561-575-5000 (outside U.S.)
Fax: 800-421-6841 (U.S. only)
561-575-5050 (outside U.S.)

Have the following information handy before calling:

- part number of the defective part, or
- model and serial number of the equipment,
- part number/name of the assembly where the item is used,
- item name, and
- where applicable, reference designation (eg. R13, S12)

Ordering Manuals When ordering additional operator manuals, be sure to include the software version of the product.

Other Questions or Problems

For additional information contact one of the offices listed below.

Headquarters

GE Marquette Medical Systems, Inc.
8200 West Tower Avenue
Milwaukee, Wisconsin 53223
USA
Telephone: 414-355-5000
800-558-5120 (U.S. only)
Fax 414-355-3790

Europe

GE Marquette Hellige GmbH
Postfach 60 02 65
D-79032 Freiburg
Germany
Telephone: +49-761-4543-0
Fax: +49-761-4543-233

Australia

Marquette Medical Systems (Australia) Pty Ltd.
Forest Corporate Centre, Suite 7
19 Rodborough Road
Frenchs Forest NSW 2086
Australia
Telephone: (61) (2) 9975-5501
Fax: (61) (2) 9975 5503

Japan

Marquette Medical System, Japan
Waseda Hirai Building, 7th Floor
1-18-9, Nishi-Waseda
Shinjuku-KuTokyo, Japan
Telephone: (81) (3) 3203-1631
Fax: (81) (3) 3202-1626

Hong Kong

Marquette Medical Systems (HK)
26/F, Catic Plaza
8 Causeway Road
Causeway Bay, Hong Kong
Telephone: (852) 2804-2320
Fax: (852) 2804 1776

Southeast Asia

Marquette Electronics (SEA) Pte.
#2 Leng Kee Road
04-04A Thye Hong Centre
Singapore 0315
Telephone: (65) 471-2133
Fax: (65) 471-1540

General Information

- Standards compliance:

  European Council Directive 93/42/EEC

  IEC60601-1-2/EN 60601-1-2 "Electromagnetic Compatibility - Medical Electrical Equipment"

  CISPR11 / EN 55011 "Radio interference emission"

  IEC 60601, protection class I

  MDD class IIa

  UL 2601-1

- The symbol ⚠ means: Consult accompanying documents. It indicates points which are of particular importance in the operation of the device.
- The warranty does not cover damage resulting from the use of accessories and consumables from other manufacturers.
- On request GE Marquette will provide a service manual.
- The GE Marquette quality management system complies with the standards EN ISO 9001 and EN 46001.

1 Intended Use and Functional Description

The MAC 1200 is an ECG acquisition and recording system designed and manufactured by GE Marquette Medical Systems.

- It is intended to be used for resting ECG recording and realtime ECG recording with or without arrhythmia detection.
- It is not intended for use as a vital signs physiological monitor.
- The arrhythmia detection portion of the MAC 1200 is provided to the customer for the convenience of automatic documentation. It is not designed to provide alarms for arrhythmia detection.
- The MAC 1200 offers no diagnostic opinion to the user. Instead it provides analytical statements when configured with the appropriate options.
- It is intended to be used by trained operators under direct physician supervision when ECG records are required.
- It is not suitable for intracardiac application.
- It is designed for continuous operation.
- It is not intended for home use.
- The MAC 1200 is designed as a portable device and can easily be moved from one patient to another or to different locations. It is not intended to be used during patient transport.

Equipped with the standard software, the MAC 1200 supports the following operating modes:

- 12 Lead Mode (acquisition of 12 leads of ECG for a period of 10 seconds),
- 6 Lead Mode (real-time recording of 6 ECG leads), and
- Arrhythmia Mode (continuous ECG analysis for arrhythmias).

The graphics display shows 3 leads at a time.

Resting ECGs can be transferred to the MUSE CV Information System via the RS232 interface.

The device operates from both AC and DC (rechargeable batteries) power sources.

The unit's performance features can be upgraded with the following optional programs:

- MEAS - measurement (measurement of the 10-second resting ECG)
- DIAG - interpretation (interpretation of the 10-second resting ECG)
- MEMO - memory (storage of a maximum of 40 10-second resting ECGs)
- C100 - activates the three options MEAS, DIAG, MEMO for a maximum of 100 ECGs
- C500 - activates the three options MEAS, DIAG, MEMO for a maximum of 500 ECGs
- EVAL - activates the three options MEAS, DIAG, MEMO for a period of 4 weeks

The MAC 1200 resting ECG analysis system has a setup menu to customize the system parameters.

Patient and user data can be entered for reliable and safe archiving of patient records. The patient name is annotated on each printed report page. All other data is printed on request.

Figure 1-1. MAC 1200

2 Controls and Indicators

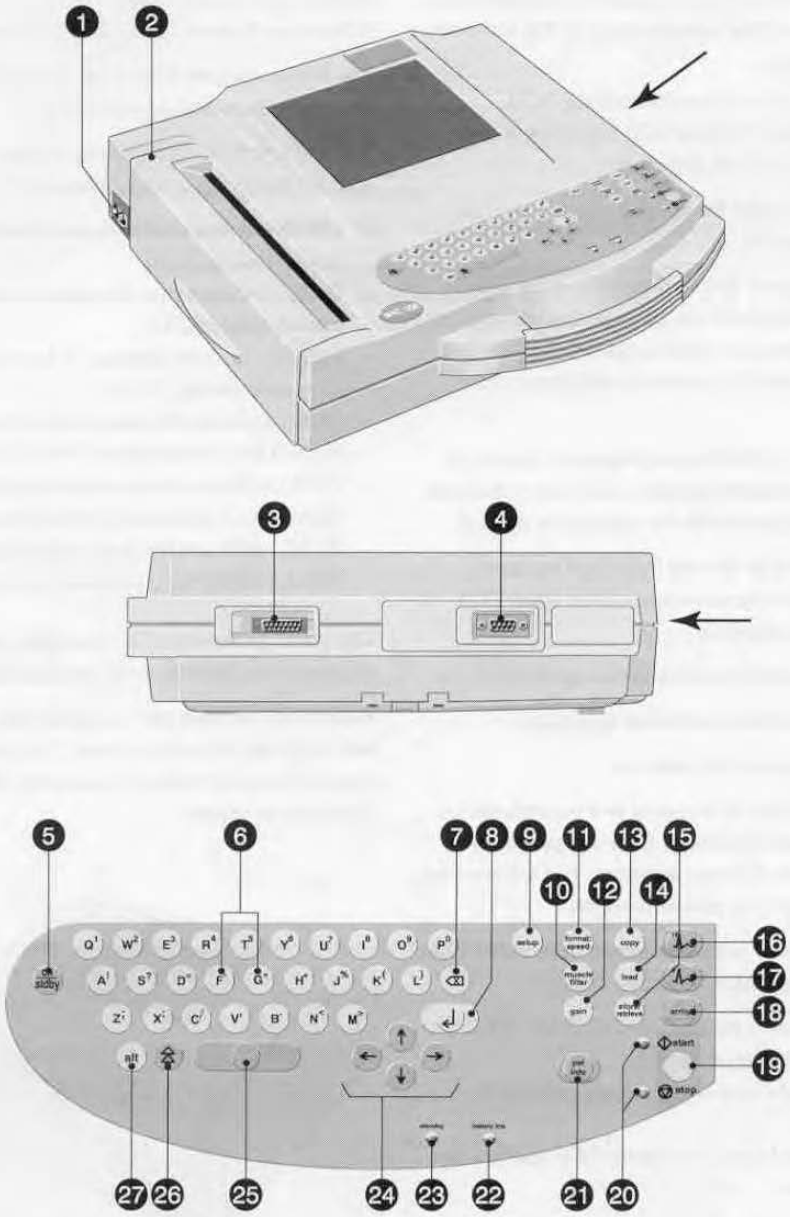


Figure 2-1. Controls and indicators of the MAC 1200 resting ECG analysis system

1 *Power input*

2 *Paper door, windows allows you to check the paper supply*

3 *Patient cable connector*

4 *Serial interface (see chapter 13 "Technical Specifications")*

5 *Power switch (ON/STANDBY)*

6 *Keys to select a higher or lower HR alarm limit*

7 *Backspace key (to correct entered data)*

8 *Confirms entered data (Enter)*

9 *Displays the setup menu*

10 *Enables/disables the muscle filter (elimination of muscle artifact)*

11 *Selects the writer speed (25, 50, 5 mm/s) in 6 Lead Mode and the report formats in 12 Lead Mode*

12 *Selects the gain (5, 10, 20, 40 mm/mV)*

13 *Press to print the report or additional copies of the ECG, or to send/receive ECGs*

14 *Selects the ECG lead in 6 Lead Mode (in 12 Lead Mode, on the display only)*

15 *Sends ECG to memory/retrieves ECG from memory*

16 *Selects the 12 Lead Mode*

17 *Selects the 6 Lead Mode*

18 *Selects the Arrhythmia Mode*

19 *Starts/stops the selected operating mode, exits the setup menu and patient data entry*

20 *Indicators, green: selected mode started, amber: selected mode stopped*

21 *Enables entry of patient data*

22 *Indicator is illuminated when battery needs to be charged*

23 *Indicator is illuminated when unit is connected to the power line*

24 *Cursor control keys*

25 *Space bar*

26 *Shift key*

27 *Press to access special characters*

Explanation of symbols used on the device


Consult accompanying documents


Signal input


Type CF signal input, highly insulated, defibrillation-proof


Start


Stop

3 Putting the Device into Operation and Performance Test

3.1 Safety Information

- This manual is an integral part of the device. It should always be kept near the device. Close observance of the information given in the manual is a prerequisite for proper device performance and correct operation and ensures patient and operator safety. **Please note that information pertinent to several chapters is given only once. Therefore, carefully read the manual once in its entirety.**
- Patient safety, the specified measuring accuracy, and interference-free operation can be guaranteed only if original GE Marquette components are used. The user is responsible for application of accessories from other manufacturers.
- This manual is in conformity with the device specifications and standards on safety of electromedical equipment valid at the time of printing. All rights are reserved for devices, circuits, techniques, software programs, and names appearing in this manual.
- The terms danger, warning, and caution are used throughout this manual to point out hazards and to designate a degree or level of seriousness. Hazard is defined as a source of potential injury to a person.

Danger
indicates an imminently hazardous situation which, if not avoided WILL result in death or serious injury.

Warning
indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

Caution
indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or product/property damage.

- GE Marquette is responsible for the effects on safety, reliability, and performance of the device, only if
  - assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE Marquette,
  - the electrical installation of the relevant room complies with the requirements of the appropriate regulations, and
  - the device is used in accordance with the instructions for use.

The safety statements presented in this chapter refer to the equipment in general and, in most cases, apply to all aspects of the device. There are additional safety statements in the other chapters which are specific to the topic described. The order in which safety statements are presented in no way implies order of importance.

DANGERS

EXPLOSION HAZARD — Do not use this equipment in the presence of flammable anesthetics, vapors or liquids.

WARNINGS

ACCESSORIES (SUPPLIES) — Use only the original GE Marquette cables. Do not connect other signal sources to the cables. The user is responsible for the use of accessories from other manufacturers.

ACCIDENTAL SPILLS — To avoid electric shock or device malfunction liquids must not be allowed to enter the device. If liquids have entered a device, take it out of service and have it checked by a service technician before it is used again.

BEFORE USE — Before putting the system into operation visually inspect all connecting cables for signs of damage. Damaged cables and connectors must be replaced immediately.

BEFORE USE — Before using the device, the operator must verify that it is in correct working order and operating condition. For instructions, refer to section 3.2.2 "Performance Check" in this chapter.

CONDUCTIVE CONNECTIONS — Do not allow electrodes to come into contact with conductive parts. The neutral electrode, in particular, must not be connected to earth.

DISCONNECTION FROM MAINS — When disconnecting the system from the power line, remove the plug from the wall outlet first. Then you may disconnect the power cord from the device.

MOISTURE CONDENSATION — Devices intended for emergency application must not be stored or transported at temperatures which cause moisture condensation at the application site. Wait until all moisture condensation has evaporated before using the device.

MPSO—The use of a multiple portable socket outlet (MPSO) for a system will result in an enclosure leakage current equal to the sum of all individual earth leakage currents of the system if there is an interruption of the MPSO protective earth conductor. Do not use an additional extension cable with the MPSO as it will increase the chance of the single protective earth conductor interruption.

OPERATOR — The user must have received adequate training in the use of the MAC 1200 and must be capable of applying it properly.

POWER SUPPLY — The device must be connected to a properly installed power outlet with protective earth contacts only. If the installation does not provide for a protective earth conductor, disconnect the monitor from the power line and operate it on battery power, if possible.

If the installation of this equipment in the USA will use 240V rather than 120V, the source must be a center-tapped, 240V, single phase circuit.

CAUTIONS

MAINTENANCE — Regular preventive maintenance should be carried out annually, inspections of equipment with measuring functions should be done every two years (refer to chapter 11 "Cleaning, Disinfection and Maintenance").

PERFORMANCE CHECKS — Check the device performance once a month, strictly following the instructions outlined in section 3.2.2 "Performance Check".

POWER REQUIREMENTS — Before connecting the device to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the unit's label. If this is not the case, do not connect the system to the power line until you adjust the unit to match the power source.

VENTILATION REQUIREMENTS — Set up the device in a location which affords sufficient ventilation. The ventilation openings of the device must not be obstructed. The ambient conditions specified in the technical specifications must be ensured at all times.

DEFIBRILLATOR PRECAUTIONS — Patient signal inputs labeled with the CF and BF symbols with paddles are protected against damage resulting from defibrillation voltages To ensure proper defibrillator protection, use only the recommended cables and leadwires. Proper placement of defibrillator paddles in relation to the electrodes is required to ensure successful defibrillation.

DISPOSAL — Dispose of the packaging material, observing the applicable waste control regulations and keeping it out of children's reach.

ELECTROCAUTERY PRECAUTIONS — To prevent unwanted skin burns, apply electrocautery electrodes as far as possible from all other electrodes, a distance of at least 15 cm/ 6 in. is recommended.

EMC — Magnetic and electrical fields are capable of interfering with the proper performance of the device. For this reason make sure that all external devices operated in the vicinity of the monitor comply with the relevant EMC requirements. X-ray equipment or MRI devices are a possible source of interference as they may emit higher levels of electromagnetic radiation.

INTERFACING OTHER EQUIPMENT — Devices may only be interconnected with each other or to parts of the system when it has been determined by qualified biomedical engineering personnel that there is no danger to the patient, the operator, or the environment as a result. In those instances where there is any element of doubt concerning the safety of connected devices, the user must contact the manufacturers concerned (or other informed experts) for proper use. In all cases, safe and proper operation should be verified with the applicable manufacturer's instructions for use, and system standards IEC 60601-1-1/EN 60601-1-1 must be complied with.

NOTES

- The MAC 1200 is designed to comply with IEC 60601/ EN 60601 requirements. It is Class I equipment/equipment with a built-in rechargeable electrical power source. The device is not suitable for intracardiac use. The device is suitable for continuous operation.
- Choose a location which affords an unobstructed view of the monitor's screen and easy access to the operating controls.
- The MAC 1200 has no additional protection against ingress of water.
- Medical technical equipment such as the MAC 1200 must only be used by persons who have received adequate training in the use of such equipment and who are capable of applying it properly.
- At the end of its service life; the MAC 1200 and its accessories must be disposed of in compliance with the special waste control regulations for electronic parts. If you have any questions in this matter, please contact GE Marquette Medical Systems.

Literature

Medical Device Directive 93/42/EEC

EN 60601-1/1990 + A1: 1993 + A2: 1995: Medical electrical equipment. General requirements for safety

EN 60601-1-1/9.1994 + A1 12.95: General requirements for safety. Requirements for the safety of medical electrical systems. Requirements for the safety of medical electrical systems.

EN 60601-2-25/1993: Medical electrical equipment. Part 2: Special requirements for the safety of electrocardiographs.

IEC Publication 513/1994: Fundamental aspects of safety standards for medical equipment.

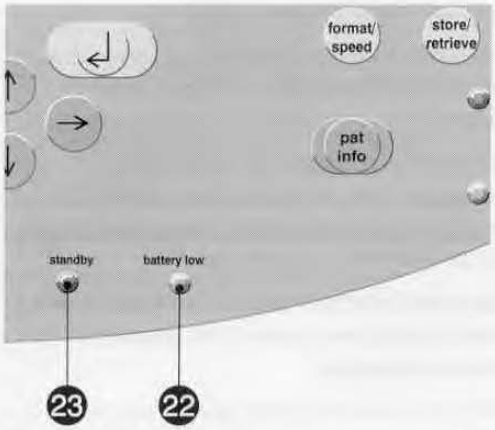


Figure 3-1. Indicators

3.2 Power Supply

The units are powered from the power line or from the rechargeable battery.

The battery charges automatically when the unit is connected to the power line and the **standby** indicator **23** is illuminated (Figure 3-1). It is not necessary to switch on the device for charging. To ensure that the battery is always fully charged, leave the MAC 1200 resting ECG analysis system connected to the power line whenever possible. After 4 hours the battery has regained its full capacity.

The **battery low** indicator **22** is illuminated when battery needs to be charged.

With a full battery, about 50 ECGs (1 page) can be recorded in 12 Lead Mode. When its capacity drops to about 25 recordings, the battery is used up and must be replaced by a service specialist.

Note

To prolong the battery life, discharge the battery at least once per month (by operating the resting ECG analysis system on battery power).

Note

In standby mode, a fully charged battery is drained within approx. 4 hours. Therefore, when operating the device on battery power, be sure to turn it off when it is not in use.

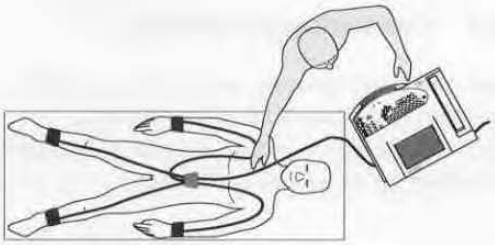


Figure 3-2. Arranging device and couch

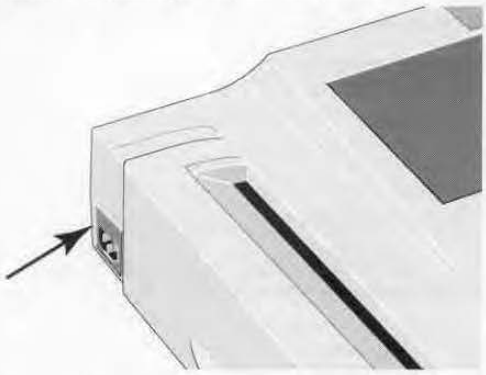


Figure 3-3. AC power input

Figure 3-4. Power switch

Note

- ***When turning off the MAC 1200 (standby mode), be sure to press the power switch long enough.***
- ***The backlighting of the display switches off automatically when no key is activated for 5 minutes (adjustable).***
- ***Run the full self-test at least once a day to ensure that the device is functioning properly.***

3.3 Installation and Mains Connection

Figure 3-2 shows a practical arrangement of patient and recorder. For interference-free operation, it is important that the patient cable and the power cord do not run parallel.

- Using the power cord, connect the device to the power line (Figure –3-1). Use only the original power cord or an equivalent cable.

The **standby** indicator **23** will illuminate.

- Check the paper supply (the window in the paper door allows you to look inside the compartment). If it is necessary to insert a new paper pad, refer to chapter 10 for instructions.

3.4 Performance Check

- Press the power switch to switch on the device (Figure 3-4).

The amber **stop** indicator **20** will illuminate.

After power-up, the resting ECG analysis system runs an automatic self-test. When no problem is detected, it defaults to the 12 Lead Mode. If a malfunction is identified, the display will show an error message "Error...". In this situation, notify service to check and repair the device.

The self-test can be aborted with the button. In this case, the device immediately activates the 12 Lead Mode.

Contrast Adjustment

- To adjust the contrast, simultaneously press and the appropriate cursor key:
  ↑ for more contrast, ↓ for less contrast.

3.5 General Device Settings

The table at left shows the general device settings that can be modified and the system defaults. For instructions on changing the device setup, refer to section 9.5 "General Device Settings".

Parameter	System Defaults	Options
Ordering Physician	empty text box	selection from a list of 10 names
Referring Physician	empty text box	selection from a list of 10 names
Technician	empty text box	selection from a list of 10 names
Institution Name	empty text box	text box (40 chrs)
Cart #	1	1 to 9999
Site #	1	1 to 255
Location	1	1 to 600
Date (dd.mm.yyyy)	current date	
Time (hh:mm)	current time	
Lead Fail Beep	No	Yes
High HR Beep	No	Yes
Lead Labels	AAMI	IEC
Date	mm/dd/yyyy	dd.mm.yyyy
Time	12	24
Units	in, lb	cm, kg
Mains	60 Hz	50 Hz
LCD light off after	5 min	1 to 99 minutes
Default mode	12 Lead	6 Lead, Arrhythmia
Language	English	English, French, Spanish
Enable password	No	Yes
Test DATA	No	Yes
Restore defaults	No	Yes
Print setup lists	No	Yes

Warning

Shock Hazard — Strictly observe the following warnings. Failure to do so may endanger the lives of the patient, the user and bystanders.

- ***Connecting peripheral devices to the RS232 interface of the resting ECG analysis system creates a medical system. This system must meet the requirements of IEC 60601-1-1.***
- ***Use only the original Marquette Hellige connection cables.***
- ***All non-medical devices of a system must be connected to the same electric circuit. Devices which are not connected to the same circuit must be electrically isolated (use isolated RS232 interface as per IEC 60601-1).***
- ***A PC connected to the resting ECG analysis system should meet the requirements of EN 60601. If it doesn't, it must be set up outside the patient environment. If the PC fulfills the requirements of EN 60950, it must be set up within the medically used area, but outside the patient environment.***
- ***Do <u>not</u> connect PCs to the resting ECG analysis system that fulfill neither EN 60601 nor EN 60950.***
- ***Modems connected to the resting ECG analysis system must meet the requirements of EN 60950 or UL1950 (all modems recommended by Marquette Hellige meet these requirements). The specific regulations valid in your country must also be observed.***
  The modem must be set up within the medically used area, but outside the patient environment.

3.6 Connecting External Devices

Via the serial interface, the resting ECG analysis system can be connected to a MUSE CV Information System. These external devices can be connected directly or via a modem. Please contact GE Marquette Application Support for details.
Resting ECGs acquired in the 12 Lead Mode as well as the corresponding data can be transferred to these external devices (see section 5.5 "ECG Transmission").
The table below shows the system defaults and all possible adjustments.
For instructions on changing the default setup, refer to section 9.6 "Communication".

Parameter	System defaults	Options
Choices for "Modem → Other"		
		none user-defined MultiTech 19.32 MultiTech 56.6 Elsa 28.8 Elsa 33.6 Elsa 56.6
Choices for "Modem → user-defined"		
telephone init string dial string hangup	 AT&FM0&D0 &Q1V0 ATDT +++ATH	
Choices for "Modem → MultiTech 19.32, 56.6, ELSA 28.8, 33.6, 56.6"		
dial mode phone outside line	tone	pulse 0 to 9 (28 digits) 0 to 9 (20 digits)

4 Preparations for ECG Recording

4.1 Connecting the Patient Cable

Use the 10-leadwire patient cable for acquisition of the 12 standard ECG leads.

- Connect the patient cable to connector **3** (Figure 4-1).

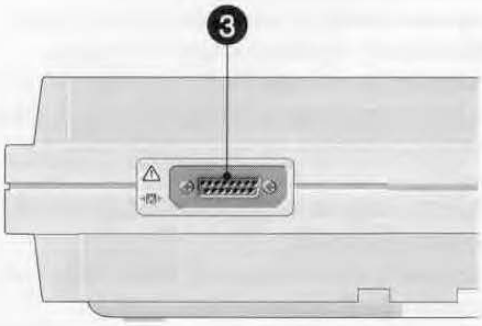


Figure 4-1. ECG signal input

Warning

Shock Hazard — Strictly observe the following warnings. Failure to do so may endanger the lives of the patient, the user and bystanders.

- ***For reasons of patient safety, use only the original GE Marquette patient cable. Before connecting the cable to the device, check it for signs of mechanical damage. Do not use a damaged cable.***
- ***Ensure that conductive parts (such as the patient, connectors, electrodes, transducers) that are connected to the isolated patient signal input do not come into contact with other grounded, conductive parts. This would bridge the patient's isolation and cancel the protection provided by the isolated input. The neutral electrode, in particular, must not come into contact with ground.***

4.2 Applying the Electrodes

Careful application of the electrodes and skin preparation is the key to an interference-free ECG.

Caution

Use only silver-silver chloride electrodes, if the patient may have to be defibrillated. (Refer to chapter 8 "ECG Recording during Defibrillation".)

4.2.1 Applying Electrodes (Limb Leads)

Refer to the illustration shown in Figure 4-2.

RA (white)	electrode on right arm
LA (black)	electrode on left arm
LL (red)	electrode on left leg
RL (green)	electrode on right leg

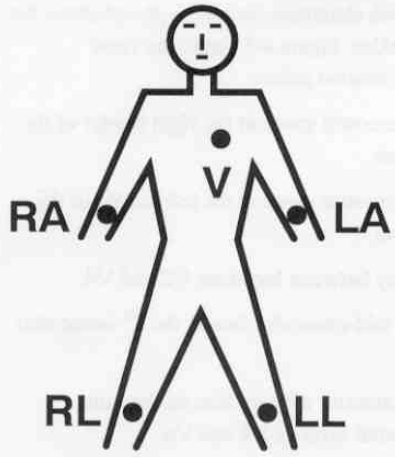


Figure 4-2. Applying limb-lead electrodes

Please see Appendix at the end of this volume (pp. VI-Appendix – 1 to 4) for standard ECG instructions for the Strong Heart Study.

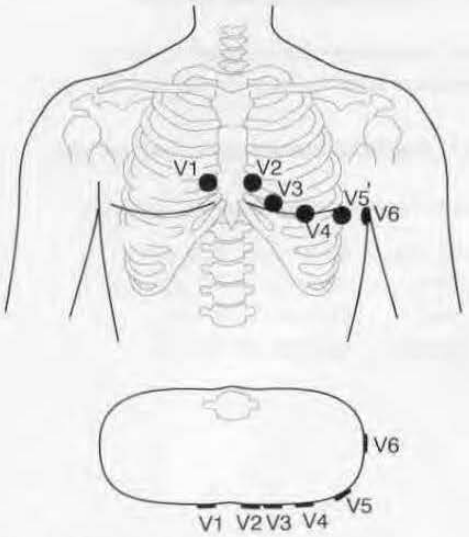


Figure 4-3. Chest electrode placement

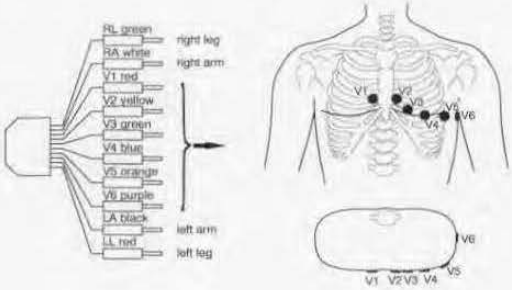


Figure 4-4. Connecting the patient cable (10-lead cable, standard ECG leads)

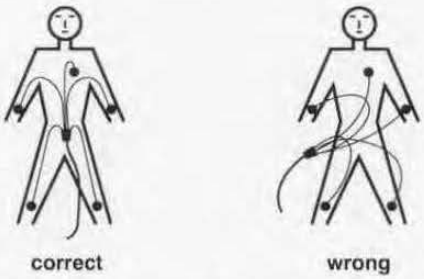


Figure 4-5. Arranging the patient cable

4.2.2 Applying Electrodes (Thorax)

- Shave application points, if necessary.

4.2.3 Electrode Placement for Standard Leads (I, II, III, aVR, aVL, aVF, VI...V6)

For acquisition of the standard ECG leads four electrodes must be applied on the limbs and six on the chest. The limb electrodes should be placed above the wrists and ankles. Figure 4-3 shows the chest electrode application points.

V1 4th intercostal space at the right border of the sternum

V2 4th intercostal space at the left border of the sternum

V3 midway between locations V2 and V4

V4 at the mid-clavicular line in the 5th intercostal space

V5 at the anterior axillary line on the same horizontal level as V4 and V6

V6 at the mid-axillary line on the same horizontal level as V4

- Connect the 10-lead patient cable as shown in Figure 4-4.

- Arrange the leadwires and patient cable as shown in Figure 4-5.

4.3 Artifact Due to Poor Electrode Application

The resting ECG analysis system is equipped with state-of-the-art electronic utilities that ensure artifact-free recordings. Among these are the automatic baseline adjustment and the anti-drift system (cubic spline) (ADS).
At the beginning of the recording the automatic baseline adjustment algorithm verifies the incoming signal and adjusts the baseline position accordingly.

During the recording, the anti-drift system (cubic spline) continuously checks the baseline position and returns it to the normal level, if required (Figure 4-6).

For the 6 Lead Mode, the anti-drift system (cubic spline) can be enabled and disabled from the setup menu, in the 12 Lead and Arrhythmia Modes, it is **always** enabled.

When electrodes are not properly applied, these measures may not fully compensate for artifact. High polarization voltages induced by electrodes applied without conductive gel may cause the amplifier to overrange, so that a straight line will be recorded instead of the ECG (see Figure 4-6). The device will then automatically block and return the baseline to its normal position. A baseline is then recorded for approx. 1 second. It is possible to block the amplifiers manually by disconnecting the RL electrode.

On the display this condition is indicated by **** instead of the electrode label (e.g. at **i**, Figure 5-1).

Remedy

- Apply the electrodes according to instructions.
- Do not apply the electrodes on top of clothing.
- Use a contact agent with reusable electrodes (e.g. moistened electrode paper, electrode cream, spray, etc.).
- Wait approx. 10 seconds before initiating a recording. After the 10-second period, the automatic functions are enabled and the polarization voltages have stabilized, provided the electrodes are properly applied. In case of improper electrode application, an error message will appear on the display (RL, LL, LA, LL, V1 to V6).
- If required, the ADS (cubic spline) and the filters (20/40 Hz, 60 Hz) can be disabled to verify the "raw" ECG signal.

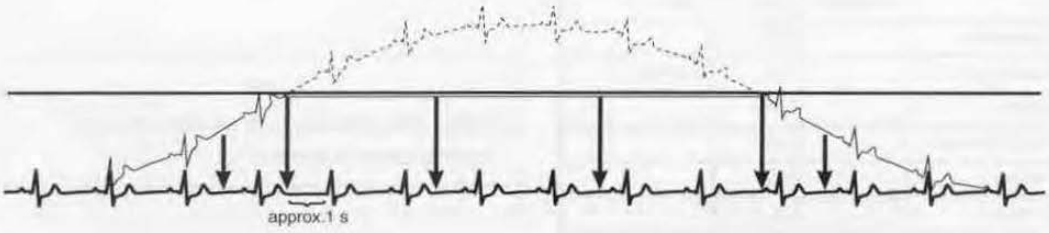


Figure 4-6. Sample recording

Parameter	Factory Default		Options
	adjusted	Menu item displayed	
New Patient	No	Yes	Yes
Last Name		Yes	
First Name		Yes	
Date of Birth	00.00.0000 (mm.dd.yyyy)	Yes	
Patient ID		Yes	
Secondary ID		No	
Pacemaker	No	Yes	Yes
Gender	-	Yes	female, male
Height		No	
Weight		No	
Race	unknown	Yes	other
Systolic BP	0 mmHg	No	
Diastolic BP	0 mmHg	No	
Ordering physician		Yes	selection from a list of 10 names
Referring physician		No	selection from a list of 10 names
Technician ID		Yes	selection from a list of 10 names
Telephone		Yes	
Medication		No	
1.	unknown	No	other
2.	unknown	No	other
Comments		No	
Location #		No	1 to 600
Room		No	
Order Number		No	
Prompt 1		No	
Prompt 2		No	
Prompt 3		No	
Prompt 4		No	

Table 4-1. Patient data entry menu

4.4 Entering Patient Data

It is possible to enter patient data and have them annotated on the recording for easy archiving of patient records.

- Press pat info to enter the patient data mode.

– The recorder displays the menu items in a defined order.
In the patient data setup menu (section 9.7 "Patient Data") you determine the items to be included in the menu (In the table at left, the items that appear in the patient data menu in the default setup are marked as "Yes" in the "Menu item displayed" column, the other menu items are marked as "No".

– To skip a menu item, press ↵ or the cursor key ↓ or ↑.

– It is not possible to write capital and small letters (do not use the Shift key).

– For entry of numbers (e.g. date of birth), it is not necessary to press the Shift key.

– All entries must be confirmed with ↵.

– Press pat info or ◇▽ to exit the patient data mode.

The table at left shows the menu items in the correct order. On the display, selected options are shown in brackets. Refer to section 9.7 for details on setting up the patient data menu.

Note

Please refer to the Appendix for instructions on entering special characters.

New patient
yes: existing patient data are deleted
no: entered data can be edited

Last Name / First Name
Enter the patient's last and first names (18 characters maximum each) and confirm entries with ↵.

Date of birth
The slash key c/ must be entered between month/day/year.

Patient ID / Secondary ID
16 characters maximum each

Pacemaker
Influences the identification of pacer pulses in Arrhythmia Mode. Enable the function ("Yes") when recording the ECG of a pacemaker patient. The recording will then be annotated with the message "Pacemaker Patient".

Gender/Race
If you do not intend to enter all demographic data, select the neutral entries "-" and "unknown".

Height/Weight
Enter the patient's height (in inches) and weight (in pounds). The weight can be entered with one decimal place.

Systolic BP/Diastolic BP
Enter the blood pressure readings in mmHg.

Phone No.
Enter the patient's telephone number.

Ordering Physician / Referring Physician / Technician
When you choose "yes" for "New patient", the default names entered in the General Settings will appear here. When you choose "other", you can pick a name from the list. It is also possible to choose "no".

You can exit the menu with ◇▽.
The "Referring Physician" is only relevant if you send ECGs to the MUSE CV Information System. This name will not be annotated on the ECG recording.

Medication
Enter the patient's medications and confirm entries with ↵.

Comments
4 lines of 30 characters each

Location #
ID number of the sending system (3 digits). The default value entered in System Setup will be used, but this value can be changed.

Room
Enter the hospital room number (5 characters maximum).

Order number
Enter order number of the ECG recording, if available (5 characters maximum).

Prompts
Answer the prompts entered in the patient data setup menu (section 9.7).

5 Recording in 12 Lead Mode

Note

Please bear in mind that no automated analysis of ECG signals is completely reliable. Therefore a physician should always overread and reassess the system interpretation before performing patient diagnosis.

5.1 Some Basic Facts

In 12 Lead Mode, 12 leads of ECG are acquired simultaneously for a period of 10 seconds. When initiated with  , ECG acquisition and recording proceed automatically. The system, however, may be set up to start recording only when specific patient data (ID, Secondary ID, name) have been entered (see section 9.7 "Patient Data").

Depending on the implemented software options, the ECG

- is only printed out (options MEAS - measurement -, DIAG - interpretation - not implemented)
- is measured and printed out with the measurement results (with option MEAS - measurement)
- is measured, interpreted (analyzed) and printed out with the interpretative statements (with option DIAG - interpretation)

Units equipped with the optional "Memory" function can save up to 40 resting ECG. These ECGs can be

- printed or
- sent to the MUSE CV Information System (CSI protocol) (see section 5.3 "The Memory Function").

The unit offers different report formats for printout of the ECG. With the system defaults, all 12 leads including the measurement and analysis results will be documented on a single page (see section 5.4 "The Report Formats").

Several system settings can be customized. In this manual they are labeled "configurable".

The following information refers to a unit with the system defaults (see table below). For instructions on changing the system setup, refer to section 9.2 "12 Lead Mode".

Parameter	System defaults	Options
Report sequence	STANDARD	CABRERA
Rhythm leads	II, V1, V5	I, III, aVR, aVL, aVF, V2, V3, V4, V6
Gain	10 mm/mV	"*auto", 5, 20, 40 mm/mV
Report format	4x2.5R1	1x10R12, 2x5R1, 2x5_50, 4x2.5R1, 1x10R3, 4x2.5R3
Detailed results	No	Yes
Muscle filter	No	Yes
Frequency	40 Hz	20 Hz
AC line filter	Yes	No
Manual copy to	EKG	HOST
No. of copies	1	0 to 9
Delete ECG after transm.	No	Yes
Auto save ECG	No	Yes
Use screen. crit.	No	Yes
Suppr. normal st.	No	Yes
Suppr. abnormal st.	No	Yes
Interpretation	Yes	No
Print interpretation	Yes	No
Override function	Yes	No

5.2 Recording

On power up, the unit defaults to the 12 Lead Mode (system defaults) (configurable).

- Before recording the ECG, patient data can be entered ( ). We recommend to enter the patient's name to annotate it on every report.
- After applying the electrodes, please wait about 10 seconds for the signal to stabilize (stabilization of polarization voltages, see section 4.3 "Artifact Due to Poor Electrode Application"). If you initiate a recording with immediately after selection of the 12 Lead Mode, a waiting period of 10 to 12 seconds ensues (message "Collecting data").
- Before initiating a recording, check the display for error messages (see table at left). Check all electrodes; if the message persists, there must be a break in the patient cable. Replace the cable with a new one.
- The MAC 1200 continuously saves 10 seconds of the incoming ECG signal.
- The device can be set up to allow a recording only when specific patient data have been entered (last name, first name, ID, 2nd ID, section 9.7 "Patient Data").

When you initiate a recording with , the unit prints the most recent 10 seconds of ECG data and analyzes it. Therefore it is recommended to wait until the patient has been lying relaxed and motionless for about 10 seconds before starting the recording.

**RL*:*	*right leg electrode disconnected*
**RA*:*	*right arm electrode disconnected*
**LA*:*	*left arm electrode disconnected*
**LL*:*	*left leg electrode disconnected*
**V1*:*	*chest electrode V1 disconnected*
**V2*:*	*chest electrode V2 disconnected*
**V3*:*	*chest electrode V3 disconnected*
**V4*:*	*chest electrode V4 disconnected*
**V5*:*	*chest electrode V5 disconnected*
**V6*:*	*chest electrode V6 disconnected*

Messages indicating disconnected electrodes

Note

Please note that filters may suppress diagnostically relevant portions of the signal, because they limit the transmission range. Filters should therefore only be enabled if necessary.

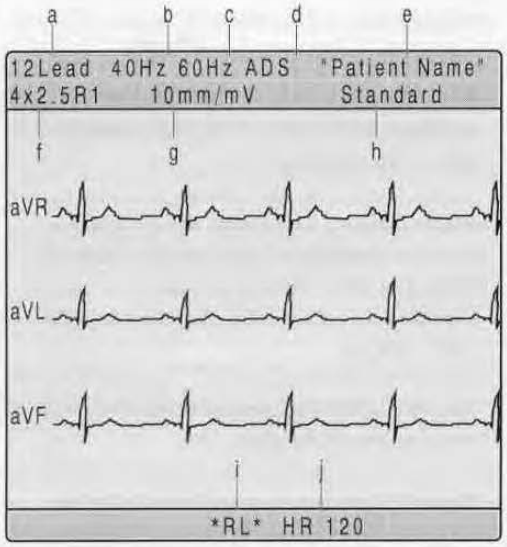


Figure 5-1. 12 Lead mode display

a *Operating mode*
b *Muscle filter enabled*
c *AC line filter enabled*
d *Anti-drift system enabled*
e *Patient name*
f *Report format or "REC OFF" when no recordings are made*
g *Gain 10 mm/mV (automatic gain adjustment off)*
h *Report sequence*
i *Right leg electrode failure message*
j *Heart rate*

With the system defaults unchanged, the unit will activate the following functions and settings after power-up:

- the 12 Lead Mode (configurable)
- the Standard report sequence: I, II, III, aVR, aVL, aVF, VI, V2, V3, V4, V5, V6
- rhythm leads II, V1 and V5 (configurable)
- a gain of 10 mm/mV (configurable) (calibration pulse at the beginning of the recording
- the AC line filter is on (configurable)
- the muscle filter is off (muscle filter) (configurable)
- the anti-drift system (cubic spline) is enabled (wandering baselines are automatically restored to their original position)
- the report format is "4x2.5R1", i.e. 12 leads and all data are printed on one page (configurable)
- the "Detailed results" page (including the median complexes and the ST measurement results) is not printed (configurable)
- pressing copy will print one copy of the ECG (configurable)
- units with MEMO option: documented ECGs are not automatically saved (configurable)
- units with MEMO option: after transmission to a host system via the RS232 interface, the ECGs remain stored in the MAC 1200 memory (configurable)
- the "Override Function" is enabled (configurable)
- QTC is calculated with the Bazett formula (only with option MEAS (measurement) or DIAG (interpretation))

All relevant device settings are shown on the display (Figure 5-1).
The display shows 3 leads at a time. With lead you can successively display all leads of the report sequence in groups of 3.

- The recording can be stopped with ◇⊘.
- For a description of the different reports, refer to section 5.4 "The Report Formats".

Note

When the unit runs out of paper while printing all stored ECGs (menu item "All stored ECGs - Print"), press ◇ ▽ after inserting a new paper pad. Then print the remaining ECGs successively, or restart a printout of all recordings (All stored ECGs - Print).

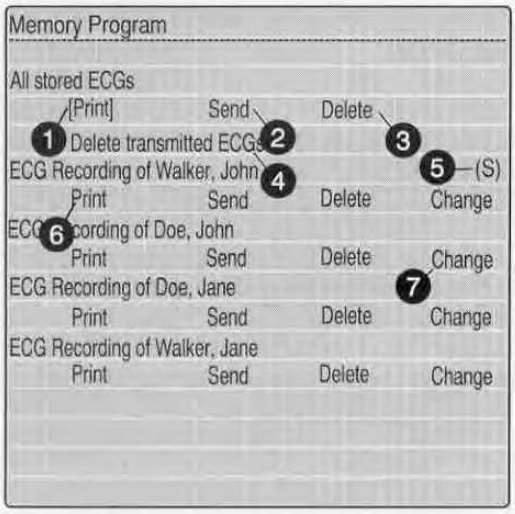


Figure 5-2. ECG identified by patient name
1 All stored ECGs will be printed
2 All stored ECGs will be transmitted
3 All stored ECG will be deleted
4 All transmitted ECGs will be deleted
5 ECG has been sent (S)
6 John Walker's ECG will be printed
7 Select to edit the patient data

Note

With a fully charged battery and the unit turned off, ECGs will remain stored for approx. 4 weeks.

5.3 The Memory Function

Units equipped with the optional MEMO function permit storage of the ECG including patient, measurement and interpretation data with store/retrieve. A message informs the user that ECGs are being saved and indicates the number of stored ECGs (40 max.).

To retrieve an ECG from memory, hold down ⇧ and press store/retrieve.

You will see the memory program as shown in Figure 5-2.
The first line refers to all stored ECGs. The Print, Send, and Delete commands following this line will therefore print, send or delete all stored ECGs.
With the command in the line below all ECGs that have been transmitted to another system can be deleted.
The individual ECGs (either identified by name or, if the patient name was not entered, by date and time) follow.

The cursor is positioned at "All stored ECGs [Print]" **1**, which means that all stored ECGs will be printed when you press the ↵ button.

To transmit or delete **all stored** ECGs, position the cursor on "Send" **2** or "Delete" **3** and confirm the command with ↵.

To delete **all sent** ECGs (identified with the letter "S" **5**), position the cursor on field **4** and confirm the command with ↵.

To print, transmit or delete an individual ECG or change the corresponding patient data, position the cursor in the appropriate field (e.g. **6** [Print] or **7** [Change]).

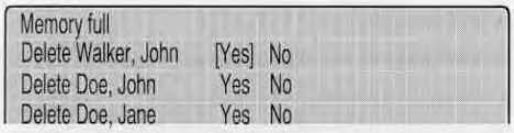


Figure 5-3. "Memory full" message

Note

- ***If you intend to print a large number of stored ECGs, we recommend to connect the unit to the power line or to check that the battery is fully charged.***
- ***When you terminate the memory function with ◇▽, it is not possible to save the current ECG again.***

If you try to save an ECG when the memory is full, you are informed of the memory status and can remove one of the stored ECGs from memory. Use the cursor keys to select the ECG to be deleted. After discarding the ECG, the unit will automatically save the new data (Figure 5-3).

The unit may be set up to automatically save ECGs (without pressing store/retrieve) and to remove ECGs from memory that were successfully transmitted to a host system (MUSE) (see section 9.2 "12 Lead Mode").

The memory program can be terminated at any time with ◇▽.

5.4 The Report Formats

The length and scope of the reports depends on the implemented software (standard, MEAS (measurement), DIAG (interpretation)).

The table below shows all of the 12 different report formats available with the MAC 1200 units.

Format	ECG traces	Rhythm lead	Speed	Measurement*	Interpretation*	Pages
	length/leads	length/leads				
4x2.5R1 (default format)	4x2.5s/4x3	10 s/1	25 mm/s	yes	yes	1
4x2.5R3	4x2.5 s/4x3	3x10 s/3	25 mm/s	yes	yes	1
2x5R1	2x5 s/2x6	10 s/1	25 mm/s	yes	yes	1
2x5_50	2x5 s/2x6	no	50 mm/s	yes	yes	2
1x10R12	10 s/1x12	no	25 mm/s	no	no	1
1x10R3	10 s/1x3	10 s/3	25 mm/s	yes	yes	1

* measurement results and interpretative statements are only available from MAC 1200 with the appropriate software options

Note

- ***The printed reports are unconfirmed documents. They must be overread, verified, and signed by a physician for confirmation.***
- ***The heart rate HR annotated on the report pages is calculated from all beats of the 10 second ECG.***
- ***To obtain a printout of the full patient data, select the 6 Lead Mode and press*** copy.

Detailed results

In the setup menu of units equipped with the MEAS or DIAG option, you can choose the "Detailed results" page. When selected, this page will be appended to the reports. It contains patient data, measurement results (MEAS), interpretative statements (DIAG), medians and the tabular measurement values.

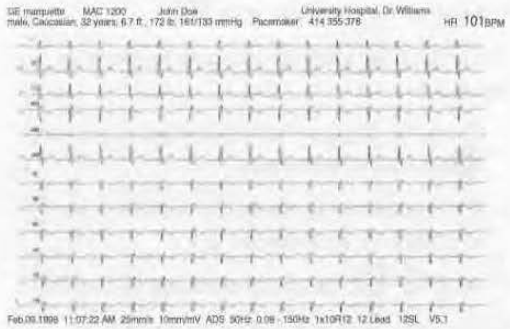


Figure 5-4. 1x10R12 report format

Note

Observe the safety information given in section 3.6 "Connecting External Devices".

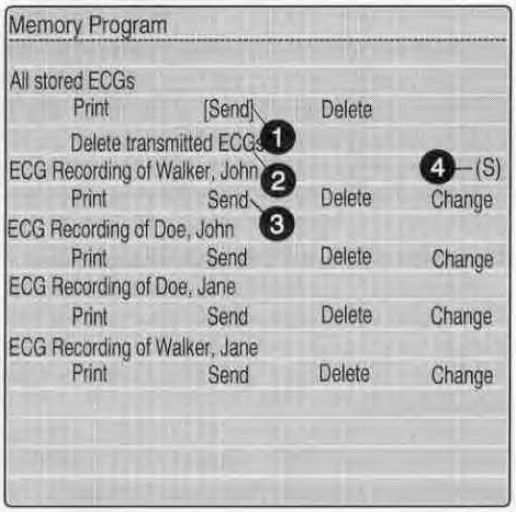


Figure 5-5. Memory program
1 All stored ECGs will be transmitted
2 All transmitted ECGs will be deleted
3 John Walker's ECG will be transmitted
4 ECG has been sent (S)

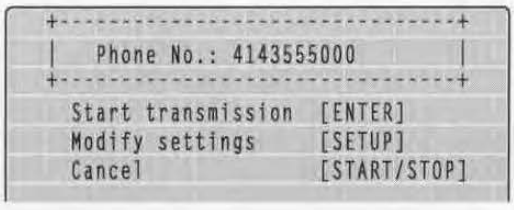


Figure 5-6. Transmission menu

5.5 ECG Transmission

Resting ECGs acquired in 12 Lead Mode can be transferred to host systems (e.g. to the MUSE CV Information System (version 004A or higher)). The units can either communicate via modem or directly via a connection cable (see section "Direct Transmission" below).

5.5.1 Transmission via Modem

Depending on the modem model used, the modem **must** be connected either with the 9-pole cable 223 378 01 or with the 25-pole cable 223 378 02.

For transmission of the ECG, the unit must be set up as described in section 9.9 "ECG Transmission via Modem".

After acquisition of the ECG, the transmission is initiated with copy (if "Manual copy" is set to "Host" in the setup menu - see section 9.2 "12 Lead Mode").

The recorder is also capable of transmitting stored ECGs (if MEMO option is installed). To retrieve ECGs from memory, hold ⇧ down while pressing store/retrieve. You will see the memory menu (Figure 5-5).

- To transmit all stored ECGs in one pass, position the cursor on "All stored ECGs - Send") (**1**, Figure 5-5), to transmit individual ECGs, position the cursor on the "Send" command of that ECG (e.g. **3**, Figure 5-5).
- Confirm the command with ↵.

You will see the transmission menu as shown in Figure 5-6.

- Check the displayed telephone number and press ↵ to initiate the transfer.
- If it is necessary to change the number, press setup to display the setup menu.
- With ◇▽, the transmission can be stopped.
- ECGs that were successfully transmitted are identified with the letter "S" (for "Sent", **4**, Figure 5-5).

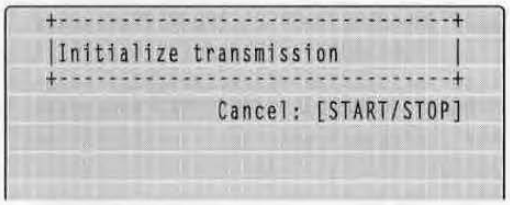


Figure 5-7. Initializing the transmission

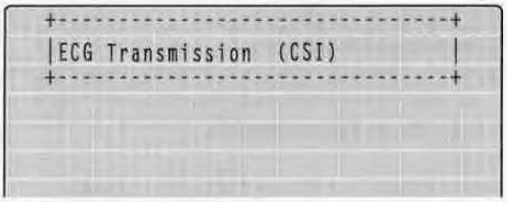


Figure 5-8. Display during ECG transfer

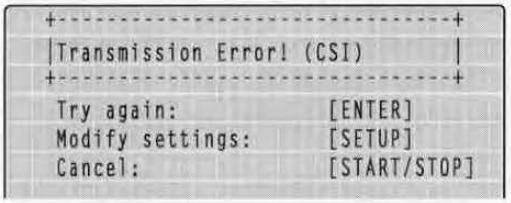


Figure 5-9. Error message

As soon as you initiate the transmission with ↵, the unit will automatically dial the number of the modem at the receiving end and establish a connection (Figure 5-7). Then it will send the ECG (Figure 5-8).

After the transmission, a message on the display indicates the number of successfully transmitted ECGs. As soon as you acknowledge the message with ↵, the 12 Lead Mode acquisition screen appears.

The system identifies ECGs that were successfully sent to the host system with the letter "S" (**4**, Figure 5-5). All of these ECGs can be deleted with the command "Delete transmitted ECGs" (**2**, Figure 5-5).

If it is not possible to transmit the ECG (wrong modem setup, modem off), the unit will display an error message, such as "Transmission error! (CSI)" (Figure 5-9).

In this situation you have the following choices:

- you can repeat the transmission with ↵
- you can change the settings with setup
- you can stop the transmission with ◇▽.

Modem Error Messages	Cause
Transmission Error! (CSI)	The connection was interrupted due to a fault.
Check interface!	Fault in RS232 interface or modem. Modem may be switched off.
No dial tone!	No dial tone detected.
Busy!	Busy signal detected.
No answer!	No answer at remote end.
No carrier!	Carrier signal lost or not detected.
Check modem setup!	Modem configuration error.

> **Note**
>
> ***Pacemaker information, telephone number and comments entered in the patient data are not transmitted to MUSE.***

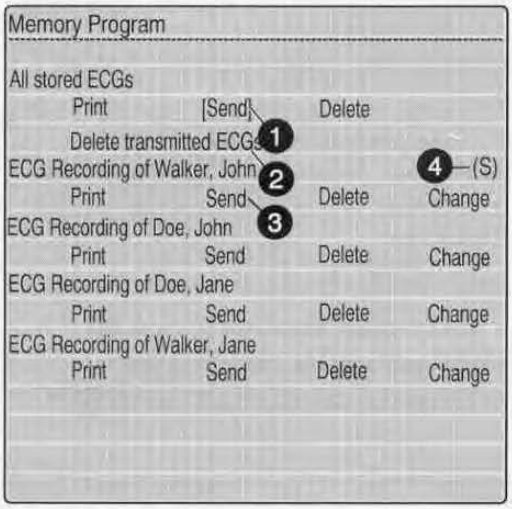


Figure 5-10. Memory program
1 All stored ECGs will be transmitted
2 All transmitted ECGs will be deleted
3 John Walker's ECG will be transmitted
4 ECG has been sent (S)

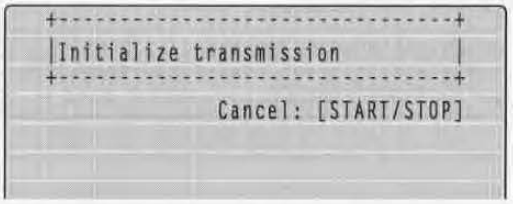


Figure 5-11. Initializing the transmission

5.5.2 Sending Data to a MUSE CV System via Modem

Before sending data to the MUSE CV system, the MAC 1200 automatically logs on to MUSE. Then the data will be transmitted. If the transmission is stopped, the MAC 1200 may take a few seconds before canceling the connection because it has to log off the MUSE system first. Then the communication link with the receiving modem is interrupted and the standard display reappears.

5.5.3 Direct Transmission

The unit must be connected to the PC or to the MUSE CV system by means of the connection cable 223 362 03.

For transmission of the ECG, the unit must be set up as described in section 9.10 "Direct ECG Transmission".

After acquisition of the ECG, the transmission is started with copy.

The MAC 1200 is also capable of transmitting stored ECGs (if Memory option MEMO is installed).

Activate the memory program by simultaneously pressing ⇧ and store/retrieve (press the ⇧ button first and hold it depressed) (Figure 5-10).

- To transmit all stored ECGs in one pass, position the cursor on "All stored ECGs - Send" (**1**, Figure 5-10), to transmit only one ECG, position the cursor on the "Send" command of that ECG (e.g. **3**, Figure 5-10).
- Confirm the command with ↵.

The transmission is first initialized (Figure 5-11), then it starts (Figure 5-12).

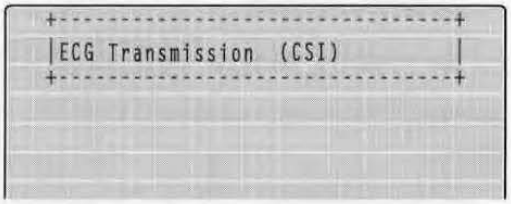


Figure 5-12. Display during ECG transfer

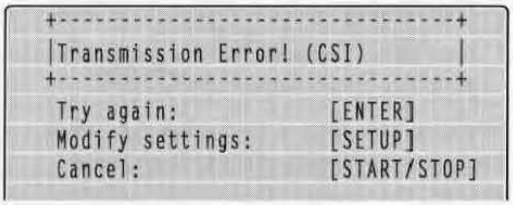


Figure 5-13. Error message

After the transmission, a message on the display indicates the number of successfully transmitted ECGs. As soon as you acknowledge the message with ↵, the 12 Lead Mode acquisition screen appears.

If it is not possible to transmit the ECG (wrong modem setup, modem off), the unit will display an error message, such as "Transmission error! (CSI)" (Figure 5-13).

In this situation you have the following choices:

- you can repeat the transmission with ↵
- you can change the settings with setup
- you can stop the transmission with ◇▽.

5.5.4 Direct Transmission of Data to a MUSE CV System

Before sending data to the MUSE CV system, the MAC 1200 automatically logs on to MUSE. Then the data will be transmitted. If the transmission is stopped, the MAC 1200 may take a few seconds before canceling the connection because it has to log off the MUSE system first. Then the standard display reappears.

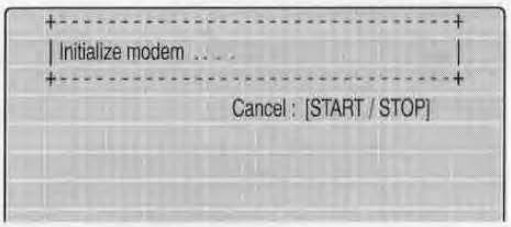


Figure 5-14. Screen display after activation of and copy

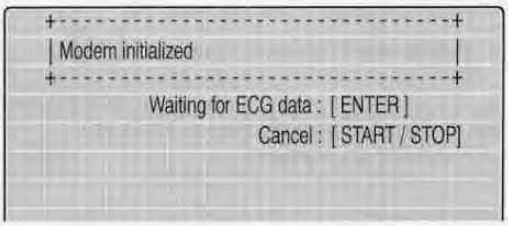


Figure 5-15. Screen display after modem initialization

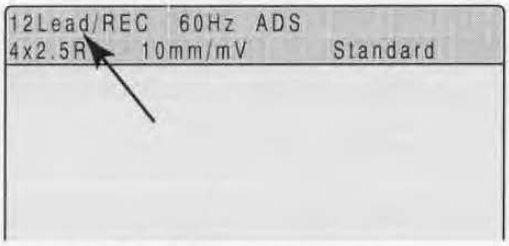


Figure 5-16. Unit is ready to receive data

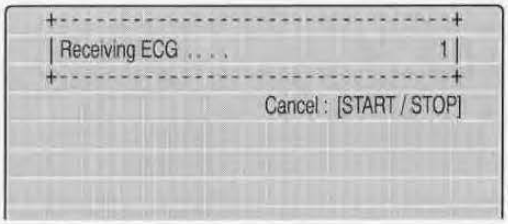


Figure 5-17. Unit is receiving ECG 1

5.5.5 Receiving Data with the CSI Communication Protocol

(see also chapter 13 "Technical Specifications")

Receiving ECGs is only possible in the 12Lead Mode.

- Use the key combination and copy to display the screen for receiving ECGs (Figure 5-14). The connected modem is automatically initialized. The procedure can be aborted with .
- Press to enable the "receive data" mode. The procedure can be aborted with .

When you have enabled the "receive data" mode, the standard screen display of the 12 Lead Mode displays. The message "12Lead/REC" indicates that the unit is ready to receive data (Figure 5-16).

ECGs can be recorded in the 12 Lead Mode even while the unit is in the "receive data" mode.

A message displays on the screen when the unit is receiving data (Figure 5-17). The reception can be aborted with .

The ECG which has just been received is processed for the printout. The report is printed in the selected format. Multiple ECGs are received and printed one after the other.

After printout of the last ECG, the "receive data" mode is automatically disabled. The mode is also disabled when you select another operating mode.

The following information is annotated in the bottom line of each report:

- the sender
- the software version and analysis program version used at the sending unit (e.g. "ACQ-DEV: M1200 V5.1M12i 12SL V1.13).

5.5.6 Cart to Cart Communication

Via modem, ECG data can be transmitted between two MAC 1200 units or between a MAC 1200 and any ECG recorder using the CSI protocol (see sections 5.5.1 and 5.5.2).

5.5.7 Modem Setup (for Modem --> other)

If you prefer to use another modem than the standard models listed in the setup menu (MultiTech, Elsa), you will have to enter a few parameters required for communication between the MAC 1200 and the modem.

For the AT commands which your modem understands, please refer to the modem user instructions. Three command sequences have to be entered in all, each of which defines a specific modem operating state:

1. the modem is initialized (init string)
2. a communication link is established (dial string)
3. the communication is terminated (hangup string)

These three strings are entered in the modem setup menu (see section 3.6 "Connecting External Devices").

The example below shows the command strings for the MultiTech ZDX modem.

1. AT Command for Modem Initialization

AT prefix that precedes every command line

&F fetch factory configuration (loads the factory configuration from ROM into the active configuration memory (RAM))

MO speaker is always off

&DO ignore DTR status transition

&QI standard AT result code

VO digit result codes selected (0 to 999)

- init string: AT&FMO&DO&:QIVO

2. AT Command for Establishing a Communication Link

Example of a dial string for a modem connected to a branch (PBX system) and dialing a modem via the public telephone network, using the touch tone mode.

AT prefix that precedes every command line

DT touch tone dial mode

xxx after DT, enter the characters for access to the public telephone network (e.g. 0) 0)

W W, placed after a number, tells the modem in a PBX system to wait for the dial tone of an outside telephone line

- dial string: ATDTOW

3. AT Command for Termination of the Communication

The communication is terminated in two steps.

First of all, the MAC 1200 sends an escape command to return from the on-line state to the command state. Then the hangup command follows:

+++ escape command

AT prefix that precedes every command line

H hangup command

- hangup string: +++ATH

5.6 Brief Operating Instructions - 12 Lead Mode

- Switch on the unit and wait for self-test to end
- Apply electrodes to patient
- Enter patient data - 
- Check device settings
  - report sequence
  - report format
  - AC line filter
  - override function
  - 12SL interpretation configuration
- Modify device settings, if required - 
- Wait for patient to lie motionless and for the unit to collect 10 seconds of ECG data
- Check that no lead failure message is displayed
- Start recording with  .

6 Recording in 6 Lead Mode

6.1 Some Basic Facts

In 6 Lead Mode, the system acquires 6 leads of ECG in realtime. Recordings are started and stopped with ◇⊽. Some of the system settings can be customized. They are labeled with "configurable".

The following information refers to a unit with the system defaults (see table below). For instructions on changing the device setup, refer to section 9.3 "6 Lead Mode".

Parameter	System defaults	Options
Report sequence	STANDARD	CABRERA, SEQ.NO.4
Gain	10 mm/mV	"*auto", 5, 20, 40 mm/mV
Speed	25 mm/s	5, 50 mm/s
Muscle filter	No	Yes
Filter frequ.	40 Hz	20 Hz
AC line filter	Yes	No
Anti-drift system	No	Yes
Start at queue mark	No	Yes

6.2 Recording

After switching on the unit, press  to select the 6 Lead Mode.

- Before recording the ECG, patient data can be entered with  . We recommend to enter the patient's name to annotate it on each page.

Note

In 6 Lead Mode, messages indicating disconnected electrodes are annotated on the recording, e.g. Lead fail V1.

- Before initiating a recording, check the display for error messages (see table below). Check all electrodes; if the message persists, there must be a break in the patient cable. Replace the cable with a new one.

***RL*:** *right leg electrode disconnected*
***RA*:** *right arm electrode disconnected*
***LA*:** *left arm electrode disconnected*
***LL*:** *left leg electrode disconnected*
***V1*:** *chest electrode V1 disconnected*
***V2*:** *chest electrode V2 disconnected*
***V3*:** *chest electrode V3 disconnected*
***V4*:** *chest electrode V4 disconnected*
***V5*:** *chest electrode V5 disconnected*
***V6*:** *chest electrode V6 disconnected*

Messages indicating disconnected electrodes

Note

- *Please note that filters may suppress diagnostically relevant portions of the signal, because they limit the transmission range. Filters should therefore only be enabled if necessary.*
- *Before and during the recording, the second set of 6 leads can be selected with the lead key.*

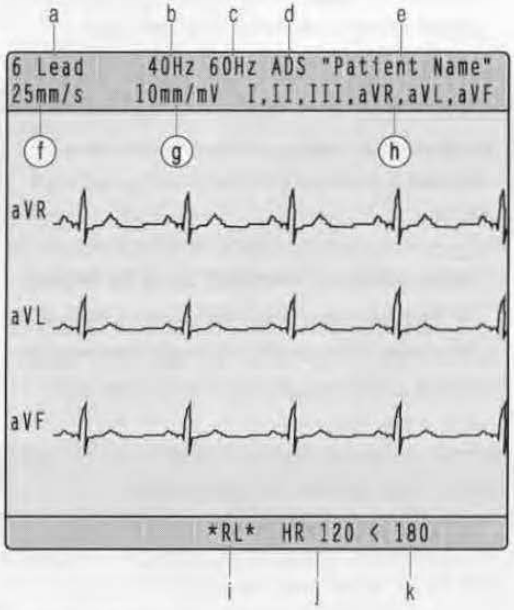


Figure 6-1. 6 Lead mode display
a Operating mode
b Muscle filter enabled
c AC line filter enabled
d Anti-drift system enabled
e Patient name
f Writer speed
g Gain 10 mm/mV (automatic gain adjustment off)
h Report sequence
i Right leg electrode failure message
j Heart rate
k Heart rate limit (adjustable)

- The recording is started and stopped with .

With the system defaults, the MAC 1200 will activate the following functions and settings:

- the standard report sequence: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6, also available: CABRERA, SEQ. NR. 4 (custom report sequence)
- a gain of 10 mm/mV (configurable) (calibration pulse at the beginning of the recording The unit can be set up to automatically adapt the gain to the ECG signal (see section 9.3 "6 Lead Mode"). Also, the gain setting can be changed with gain (5, 10, 20 and 40 mm/mV).
- the AC line filter is enabled
- the muscle filter is disabled
- the anti-drift system (cubic spline) is disabled (configurable)
- the writer prints at a speed of 25 mm/s, the speed can be changed with format/speed
- Pressing copy will output the patient data after the ECG recording.
- The unit will not advance the paper to the beginning of a new page each time a recording is initiated (configurable)

All relevant device settings are shown on the display (Figure 6-1).

- If you change the writer speed, lead group or any filter settings during a recording, the unit will briefly stop.
- With lead you advance to the next group of 6 leads of the selected report sequence.

- With ↓ / ↑ you toggle between the two lead sets (3 each) on the display that belong to the recorded group.
- When the anti-drift system is enabled, there will be a short delay before the recording starts. The ECG will then be recorded with a delay of 2.2 s.

The heart rate limit is automatically calculated from the date of birth (WHO 100% = 220 - age). When the date of birth is not entered, the unit will set the limit at 180 bpm. This value can be changed with F and G+ (in steps of 5 bpm). The minimum value for the heart rate limit is 30 bpm.

6.3 Brief Operating Instructions - 6 Lead Mode

- Switch on the unit and wait for self-test to end
- Apply electrodes to patient
- Select the 6 Lead Mode -
- Enter patient data - pat info
- Check device settings
  - report sequence
  - AC line filter
  - ADS (cubic spline)
  - heart rate alarm limits
- Modify device settings, if required - setup
- Watch ECG on display
- Check that no lead failure message is displayed
- Start recording with
- Proceed to the next group of 6 leads with lead
- Change the writer speed with format speed
- Switch on muscle filter with muscle filter
- Stop the recording with
- Print patient data with copy

7 Arrhythmia Mode

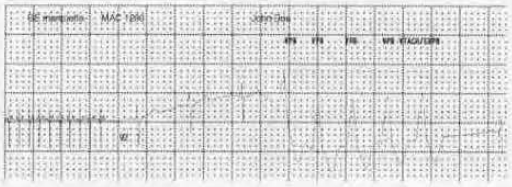


Figure 7-1. Event recording

Note

After starting the program, press format/speed to select a continuous recording with a speed of 5 mm/s (configurable). If the unit identifies an arrhythmic event, it will automatically switch to the fast paper speed. With the same key format/speed, the trend recording can be stopped. The unit can be set up to automatically start a trend recording when the Arrhythmia Mode is initiated.

Parameter	System defaults	Options
Report sequence	STD_C (chest leads V1 through V6)	STD_RED (I, II, III, V2, V4, V6) STD_LI, (I, II, III, aVR, aVL, aVF) CABR_LI (aVL, I, -aVR, II, aVF, III) HIGH_C (V1' through V6')
Gain	10 mm/mV	"*auto", 5, 20, 40 mm/mV
Muscle filter	No	Yes
Frequency	40 Hz	20 Hz
AC line filter	Yes	No
Trend rec.	No	Yes
Arrhythmia data	unequal	all, no
Episodes	chron.	prio, ventr., no

7.1 Some Basic Facts

In Arrhythmia Mode, the MAC 1200 continuously scans the ECG for arrhythmias.

From six simultaneously acquired leads, the MAC 1200 automatically selects the two that provide the best signal for analysis.

When the analysis algorithm detects an arrhythmia, the event is recorded with "context" (Figure 7-1). The length of the recording varies with the duration of the event episode. In the setup menu (section 9.4 "Arrhythmia Mode") you determine the conditions for a recording:

- the recorder starts each time it detects a single-beat event - all
- the recorder starts each time it detects an event different from the previous event - unequal
- the recorder does not start at all - no.

Some of the system settings can be customized. They are labeled with "configurable". The following information refers to a unit with the system defaults (see table at left). For instructions on changing the system setup, refer to section 9.4 "Arrhythmia Mode".

**RL*:*	*right leg electrode disconnected*
**RA*:*	*right arm electrode disconnected*
**LA*:*	*left arm electrode disconnected*
**LL*:*	*left leg electrode disconnected*
**V1*:*	*chest electrode V1 disconnected*
**V2*:*	*chest electrode V2 disconnected*
**V3*:*	*chest electrode V3 disconnected*
**V4*:*	*chest electrode V4 disconnected*
**V5*:*	*chest electrode V5 disconnected*
**V6*:*	*chest electrode V6 disconnected*

Messages indicating disconnected electrodes

Note

- *With* (copy)*, a single-page recording can be initiated after program start.*
- *Please note that filters may suppress diagnostically relevant portions of the signal, because they limit the transmission range.*
  Filters should therefore only be enabled if necessary.
- *For proper functioning of the ECG analysis algorithm, pacemaker patients must be identified in the patient data: Pacemaker – yes (section 4.3 "Entering Patient Data").*

7.2 Recording

- After switching on the unit, press (arrhy) to select the Arrhythmia Mode.
- Before recording the ECG, patient data can be entered ((pat info)). We recommend to enter the patient's name to annotate it on each page.
- Before initiating a recording, check the display for error messages (see table at left). Check all electrodes; if the message persists, there must be a break in the patient cable. Replace the cable with a new one.
- The recording is started and stopped with the ◇/▽ key.

Upon program start, the unit records 6 leads of ECG (1 page). During the following learn phase, the analysis algorithm learns the patient's typical QRS complex. After the learn phase, the recorder prints a report where the QRS complexes acquired in the learn phase are labeled "L" and the complex found to be the patient's typical complex is labeled "QRSL". Having completed the learn phase, the MAC 1200 is ready to identify arrhythmias.

With the system defaults, the MAC 1200 will activate the following functions and settings:

- the STD_C report sequence V1 through V6 (configurable)
- a gain of 10 mm/mV (configurable) (calibration pulse at the beginning of the recording The unit can be set up to automatically adapt the gain to the ECG signal (*auto)
- the AC line filter is enabled (configurable)
- the muscle filter is disabled (configurable)

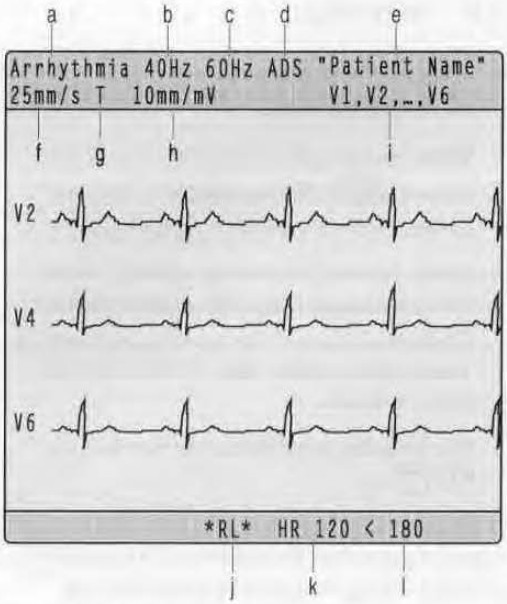


Figure 7-2. Arrhythmia mode display

a *Operating mode*
b *Muscle filter enabled*
c *AC line filter enabled*
d *Anti-drift system enabled*
e *Patient name*
f *Writer speed (event episodes)*
g *Trending enabled*
h *Gain*
i *Report sequence*
j *Right leg electrode failure message*
k *Heart rate*
l *Heart rate limit*

Note

The letter A on a recording indicates the presence of artifact which does not allow the algorithm to identify arrhythmias. Causes include wandering baselines. The anti-drift system largely prevents these disturbances. Still you should check the electrodes and leadwires.

- the anti-drift system is enabled
- the automatic baseline adjustment is enabled
- the slow trend recording is disabled (configurable)
- event episodes are recorded at a speed of 25 mm/s
- the unit documents all events that are different from the previous event (configurable). You can set up the unit to document all events or no event at all.

All relevant device settings are shown on the display (Figure 7-2).

The arrhythmia codes annotated on the recording are explained in table 7-1 (next page).

The heart rate limit is automatically calculated from the date of birth (WHO 100% = 220 - age). When the date of birth is not entered, the unit will set the limit at 180 bpm. This value can be changed with F and G+ (in steps of 5 bpm). The minimum value for the heart rate limit is 30 bpm.

Final Report

The arrhythmia recording can be stopped with ◇▽.

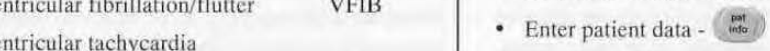
The final report can then be printed with copy. The final report consists of

- the patient ID sheet (with all patient data as well as with all analyzed QRS complexes, type and number of detected events and the analysis duration in tabular form) and
- the episodes (3 sheets max. with 2 episodes each).

Arrhythmic Events	
– asystole, limit value	ASYSTO
– ventricular fibrillation/flutter	VFIB
– ventricular tachycardia (>3 PVCs)	VTAC
– ventricular run (3 PVCs)	RUN
– ventricular couplet (2 PVCs)	CPLT
– pause of 2 missed beats	PAU2
– pause of 1 missed beat	PAU1
– early PVC	EPVC
– ventricular bigeminy	VBIG
– new form (e.g. intermittent bundle branch block)	NF
– multiform PVCs	MULT
– supraventricular arrhythmia	SVAR
– paroxysmal supraventricular tachycardia	PSVT
– tachycardia	TACH
– bradycardia	BRAD
– pacemaker malfunction	PERR
– ventricular escape beat	ESC
– premature ventricular contraction	PVC
– premature supraventricular contraction	PSVC
– aberrant beat	ABR
– pacemaker capture	PCAP
– pause (>1.5 times the normal RR interval)	TL
– absolute pause, limit value	PAUA
– artifact	A
– learn phase	L
– learned QRS complex	QRSL

Table 7-1. Arrhythmia codes

7.3 Brief Operating Instructions - Arrhythmia Mode

- Switch on the unit and wait for self-test to end
- Apply electrodes to patient
- Select the Arrhythmia Mode - 
- Enter patient data - 
- Check device settings
  - report sequence
  - AC line filter
  - trend recordings
  - episodes
  - heart rate alarm limits
- Modify device settings, if required - 
- Check that no lead failure message is displayed
- Start recording with 
- Switch on muscle filter with
- Stop the recording with 
- Print patient data with

8 ECGs of Pacemaker Patients / ECG Recording during Defibrillation

8.1 Recording ECGs of Pacemaker Patients

Due to the slow paper speed it is not possible to display pacer pulses directly on the ECG recording. At a paper speed of 50 mm/s and a pulse duration of 0.5 ms, the width of the recorded pacer pulse would be only 0.025 mm.

For this reason the recorder reduces the pulse amplitude and expands the pulse width, so that the pacer pulse is easier to identify. The MAC 1200 records the pulse with the correct polarity, with a width of 5 ms and with the same amplitude in all leads (depending on the polarity of the pacer pulse in leads I and II, the pacer pulse in lead III may be suppressed). The amplitude of the reverse current may differ from lead to lead. Figure 8-1 shows an ECG recording with pacer pulses.

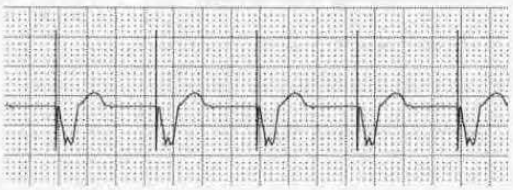


Figure 8-1. ECG recording with pacer pulses

Warning

Incorrect HR, No HR Alarm — If several adverse conditions exist at once, the possibility that the pacer pulses are interpreted (and counted) as QRS complexes should be considered. At the same time, however, QRS complexes might be suppressed in certain situations. Therefore, pacemaker patients should always be watched closely.

8.2 ECG Recording During Defibrillation

The patient signal input is defibrillation-proof so it is not necessary to remove the ECG electrodes before defibrillating the patient. However, when using stainless steel or silver electrodes, the defibrillator discharge current may cause complete polarization at the electrode/skin interface. This condition may prevent ECG signal acquisition for several minutes. With silver/silver chloride electrodes, this will not happen.

Set the MAC 1200 to 6 Lead Mode when you may have to defibrillate the patient while recording the ECG, and disable the anti-drift system as this would cause a 2 second signal delay (section 9.3 "6 Lead Mode").

If electrodes made of other materials are used, disconnect the patient cable from the recorder while the shock is applied.

Warning

- ***Equipment Damage — For reasons of patient safety, use only the original GE Marquette patient cable. Before connecting the cable to the device, check it for signs of mechanical damage. Do not use a damaged cable.***
- ***Patient Hazard, Delayed ECG Display — Use silver/silver chloride electrodes for ECG signal acquisition, if the patient may have to be defibrillated.***
- ***Shock Hazard — The patient signal input of the recorder is protected against damage resulting from defibrillation shocks. Nevertheless, extreme care should be exercised when defibrillators are used on a patient connected to other devices while a shock is released. During defibrillation, do not touch the patient, the electrodes or the leadwires.***

Note

Observe the safety information of the defibrillator.

9 System Setup

9.1 Some Basic Facts

- Press setup to display the setup menu.

The setup menu with the following options will appear:
- Operating mode: 12 Lead (6 Lead, Arrhythmia)
- General Settings
- Communication
- Patient Data Setup
- Option Code

At "Operating mode", you will always see the currently selected mode. So be sure to select the appropriate mode before entering the setup menu.

- To access the menu options, position the bar cursor on the option with the cursor keys and confirm the selection with ↵.

The operating steps to select a setting are always the same:

- Using the cursor keys ← and →, you select the option, then you confirm the selection with ↵.

The cursor will move to the next menu item.

- Individual items can be skipped with ↓ or ↑.
- Press ◇ ▽ to exit the setup mode.

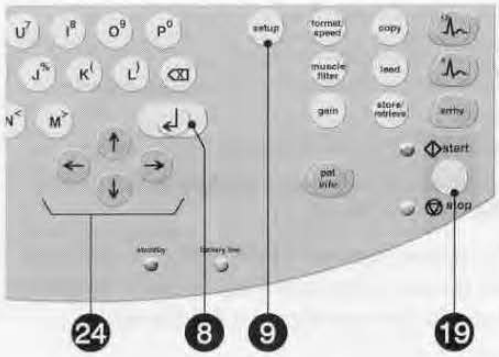


Figure 9-1. System setup keys

9.2 12 Lead Mode

- Use the cursor keys to position the bar cursor on "12 Lead" and confirm the selection with ↵.

The setup menu for automatic 12 lead recording will appear.
The angular brackets [ ] denote the system defaults.

Report sequence

[STANDARD] (I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)
CABRERA (aVL, I, -aVR, II, aVF, III, V1, V2, V3, V4, V5, V6)

Rhythm leads

Any three of the available ECG leads can be selected as rhythm leads. They are printed with report formats 4x2.5R3 and 1x10R3. Formats 2x5R1 and 4x2.5R1 will show only the first of the rhythm leads.

Gain

5, [10], 20, 40 mm/mV, *auto

Report format

For an overview of the available report formats, refer to section 5.4 "The Report Formats". The default format is 4x2.5R1.

Detailed results

The "Detailed results" page will be printed, yes/[no] (section 5.4 "The Report Formats", only available with option MEAS or DIAG).

Muscle filter/AC line filter

Elimination of muscle artifact and AC line interference.
Default: muscle filter [No], AC line filter [Yes]

> **Note**
>
> ***Please note that filters may suppress diagnostically relevant portions of the signal, because they limit the transmission range. Filters should therefore only be enabled if necessary.***

Filter frequency

Cut-off frequency of the muscle filter ([40 Hz], 20 Hz).
The frequency range is indicated in the lower margin of the recording strip.
"0.08 - 40 Hz" (40-Hz muscle filter enabled)
"0.08 - 20 Hz" (20-Hz muscle filter enabled)
"0.08 - 150 Hz" (muscle filter off).

Manual copy to

When the copy key is pressed, the unit will print a copy of the ECG [EKG] or send the ECG to a HOST system (MUSE CV Information System).

No. of copies

If you do not want to print the ECG, but only collect data, select "0" (message on display "REC OFF"). When a number greater than 1 is selected, multiple copies of the reports will be printed. Default: [1]

Autosave ECG (only with MEMO option)

After report generation, the ECG will or will not be automatically saved to the internal memory (yes, [no]).

Delete ECG after Transmission
(only with MEMO option)

ECGs that were successfully sent to a host system via the RS232 interface will be cleared from the recorder memory (yes, [no]).

If this menu item is set to "yes" and ECGs have already been sent from the recorder memory, these ECGs will be deleted after the next transmission of a stored ECG.

Configuration of the 12SL Interpretation

Use screening criteria

The screening criteria can be enabled or disabled.
Default: [disabled]

Suppress "normal" statement

If you select 'Yes', the interpretation statement "normal ECG" will not be shown.

Suppress "abnormal" statement

If you select 'Yes', the interpretation statement "abnormal ECG" will not be shown.

Interpretation

Default: [Yes]. If you select 'No', 12 SL interpretation results will not be generated nor shown.

Print Interpretation

Only available if "Interpretation" is set to "Yes".

Default: [Yes]. The interpretative statements are printed on the reports. When you select "No", the interpretation will not be printed, but it can be sent to the MUSE CV Information System.

Override function

When this function is enabled [yes], the recorder will print in 12 Lead Mode, even when not all electrodes are applied or do not supply a good signal.
When electrodes are disconnected, a message informing the user of poor signal quality will be printed on the recording.

Furthermore, systems with interpretation capability will print a message indicating that the measurement results and interpretation may be incorrect.

9.3 6 Lead Mode

- Use the cursor keys to position the bar cursor on "6 Lead" and confirm the selection with ↵.

The setup menu for continuous recording of 6 leads will appear.

Report sequence

1. [STANDARD] (I, II, III, aVR, aVL, aVF, VI, V2, V3, V4, V5, V6)
2. CABRERA (aVL, I, -aVR, II, aVF, III, VI, V2, V3, V4, V5, V6)
3. SEQ. NO. 4 (here, users can define a custom report sequence):

- Position the cursor on "SEQ. NO. 4".
- Press setup.

The display shown in Figure 9-2 will appear.

Report sequence	SEQ. NO. 4	
	Lead	Label
Channel 1:	I	I
Channel 2:	II	II
Channel 3:	III	III

Figure 9-2. Creating a custom report sequence

- Press ↓.

The cursor will move to the position for entry of the lead in channel 1. Follow these steps, if you wish to record aVR in channel 1, for instance:

- Enter AVR and confirm the entry with ↵.

The cursor moves to the position for entry of the lead designation. AVR appears there as well.

- If you wish to enter another designation, you can overwrite the default name (4 characters max.).
- Confirm your entry with ↵ and repeat the above steps for channel 2, etc.

You can write over "SEQ. NO. 4" if you wish to enter another name for the report sequence.

Gain

*auto, 5, [10], 20, 40 mm/mV; with "*auto", the unit will automatically determine the appropriate gain setting for the 6 simultaneous leads.

Speed

Changes the writer speed. Default: [25 mm/s]

Muscle filter/AC line filter

Elimination of muscle artifact and AC line interference
Default: muscle filter [No], AC line filter [Yes]

Filter frequency

Cut-off frequency of the muscle filter ([40 Hz], 20 Hz).
The frequency range is indicated in the lower margin of the recording strip.
"0.08 - 40 Hz" (40-Hz muscle filter enabled)
"0.08 - 20 Hz" (20-Hz muscle filter enabled)
"0.08 - 150 Hz" (muscle filter off).

Anti-drift system (ADS) (cubic spline)

In case of wandering baselines, the anti-drift system restores the baseline to its original position (signal delay with ADS approx. 2 s). Default: [No]

Start at queue mark

Before each recording, the recorder advances the paper to the beginning of a new page (yes, [no]).

9.4 Arrhythmia Mode

- Use the cursor keys to position the bar cursor on "Arrhythmia" and confirm the selection with ↵.

The arrhythmia mode menu will appear.

Report sequence

[STD_C]: V1, V2, V3, V4, V5, V6
STD_RED: I, II, III, V2, V4, V6
STD_LI: I, II, III, aVR, aVL, aVF
CABR_LI: aVL, I, -aVR, II, aVF, III
HIGH_C: V1', V2', V3', V4', V5', V6'
(C = chest leads, RED = reduced number of leads, LI = limb leads)

Gain

*auto, 5, [10], 20, 40 mm/mV; with "*auto", the unit will automatically determine the gain setting.

Muscle filter/AC line filter

Elimination of muscle artifact and AC line interference
Default: muscle filter [No], AC line filter [Yes]

Filter frequency

Cut-off frequency of the muscle filter ([40 Hz], 20 Hz).
The frequency range is indicated in the lower margin of the recording strip.
"0.08 - 40 Hz" (40-Hz muscle filter enabled)
"0.08 - 20 Hz" (20-Hz muscle filter enabled)
"0.08 -100 Hz" (muscle filter off).

Trend rec.

The slow trend recording of 5 mm/s automatically begins at program start ([no]/yes).

Arrhythmia data

The recorder will document arrhythmias in the following situations:

- each time an arrhythmia occurs
- each time an arrhythmia occurs that is different from the preceding event
- arrhythmias are not documented

all, [unequal], no.

Episodes

Final report includes episode report, with episodes listed by one of the following criteria

- in chronological order
- according to priorities (see table 7-1)
- ventricular beats only
- no episodes

[chron.], prio., ventr., no

9.5 General Device Settings

Ordering / Referring Physician / Technician

In the field at left, you see the last name of the physician or technician selected as the default name. When selecting "other", a menu displays where you can enter up to 10 names (2-digit ID number, first name, last name). The default name (and ID) is automatically selected at power-up.
The "Referring Physician" is only relevant if you send ECGs to the MUSE CV system. This name will not be annotated on the ECG recording. Press the  key to exit the menu.

Institution Name

The name entered here will be printed on each report page.

Cart #

Enter any number between 1 and 9999 to identify the cart (local system). The cart # entered here is the default number that appears in "Patient Data".
Default: [1]

Site #

Enter any number between 1 and 255 to identify the MUSE CV Information System to which the ECGs will be sent. The site # entered here is the default number that appears in "Patient Data".
Default: [1]

Location #

Enter any number between 1 and 600 to identify the location of the sending system. The location # entered here is the default number that appears in "Patient Data".
Default: [1]

Date/Time

Enter date and time (enter 4 digits for the year).

Lead fail beep

Indicates when electrodes are not properly applied or disconnected (yes/[no]).

High HR beep

An audible signal sounds when the heart rate exceeds a limit value (yes/[no]) (only in 6 Lead and Arrhythmia Modes). The limit value (220 - age) can be changed manually.

Lead labels

[AAMI] codes: RA, LA, RL, LL, V1 to V6 or
IEC codes: R, L, F, N, C1 to C6

Date

Format: [month/day/year] or day.month.year

Time

Time format [12] hours (am/pm) or 24 hours

Units

Units of measurement for the patient's height and weight: [in/lb] or cm/kg

Mains

AC line frequency (USA [60 Hz], Europe 50 Hz)

LCD light off after

If operating controls are not activated within the selected period of time the display backlighting automatically switches off (system default [5 min], adjustment range 1 to 99 min).

Default mode

This is the operating mode the unit defaults to after power-up: [12 Lead], 6 Lead, Arrhythmia

Language

Select the language for user interface and printouts.

Enable password protection

Select "yes" to protect the setup menu with a password. You will be asked to enter a password and to repeat it. The password protection is then active. To change the password (only possible when password protection is active)

- select menu item "Enable password"
- enter the old password
- enter the new password
- repeat the new password

Test DATA

Used for demonstration purposes (yes). It must be set to [no] for proper clinical use.

Restore defaults

Selecting "Yes" will restore the default setup (including the defaults of the three operating modes).
The resting ECG analysis system must be switched off (standby) and on again for the new settings to become effective.

Print Setup Lists

Selecting "yes" will display a menu with all available setup lists.

- all lists
- System Setup / Communication / External Devices / Patient Data Setup
- 12 Lead
- 6 Lead
- Arrhythmia

9.6 Communication

Protocol

The recorder offers two communication protocols: "CSI" (**C**lient **S**erver **I**nterface) and A5.
The CSI protocol supports the transfer of resting ECGs from the resting ECG analysis system to a MUSE CV system.
With the "A5" protocol, the 10-second resting ECG can be transmitted to CardioSys and CardioSoft.

Baud rate (HOST)

Transmission rate for the selected protocol. We recommend the default setting of [19200 baud].

Modem

Select the modem type. You can choose among the standard modems MultiTech (MT 19.32, 56.6), Elsa 28.8, Elsa 33.6, Elsa 56.6 and a user-defined modem.

When using one of the standard modems, all you have to enter is

- the dial mode (pulse or tone, depending on your telephone network)
- the telephone number (28 digits max.)
- the number to access the public telephone network (e.g. "0").

For a user-defined modem, enter

- the telephone number (28 digits max.)
- the init string (20 characters max.) (see modem operator's manual)
- the dial string (20 characters max.) (see modem operator's manual)
- the hangup mode (20 characters max.) (see modem operator's manual)

The **master password** overriding all other passwords is

SYSTEM

Use this password if you cannot remember your own password.

9.7 Patient Data

The patient data menu can be set up to meet individual requirements. If you do not want to enter blood pressure readings, for instance, you can remove the corresponding prompts:

- Use the cursor keys to position the bar cursor on "Setup Patient Data" and confirm the selection with ↵.

The patient data setup menu will appear.

- Select "no" for prompts that you want to remove from the dialog.

Items
- Last name
- First name
- Date of birth
- Patient ID

cannot be removed.

Items
- Height
- Weight
- Diastolic BP
- Systolic BP
- Referring Physician
- Medication
- Comments
- ID required
- Secondary ID
- Secondary ID required
- Last name required
- First name required
- Extra Questions (Prompt 1 through Prompt 4)

are disabled. They can be enabled from the patient data setup menu.

"Required" Data Fields

If, for one of the data fields

- ID required
- 2nd ID required
- Last name required
- First name required

you choose "yes", an ECG can be recorded in 12 Lead Mode only if the corresponding patient data is entered.

Prompt 1 to 4

You can enter any text here (10 characters max.). When you have entered the text, you can select the format of the response field. There is a choice of 3 formats:

- alphanumeric field (17 characters max.)
- only numbers (9 numbers max.)
- yes or no

- To exit the menu, press ◇⊘.

9.8 Option Code

In this menu you enter the option codes to enable a number of optional software functions. The respective option becomes active after you have entered the code number. The code numbers are listed on the option code sheet supplied with the different software options.

- In the setup menu, position the bar cursor on "Option Code" and confirm the selection with ↵.

The option code menu appears. There is a choice of 6 options:

MEAS: measurement of the 10-second resting ECG
DIAG: measurement and interpretation of the 10-second resting ECG
MEMO: program for storage of up to 40 resting ECGs
C100: activates the three options MEAS, DIAG, MEMO for a maximum of 100 ECGs
C500: activates the three options MEAS, DIAG, MEMO for a maximum of 500 ECGs
EVAL: activates the three options MEAS, DIAG, MEMO for a maximum of 4 weeks

- Position the bar cursor on the option you wish to activate.
- Enter the 12-digit code number from the keyboard and confirm the entry with ↵.

The unit will accept the entered number only if it corresponds to the unit's serial number. The serial number is indicated at the top of the menu (Ser.No. = xxxxxxxxx). This number must be the same as printed on the nameplate (back of the device). When you enter the code number for DIAG and MEMO, the fields for C100, C500 and EVAL will disappear.

- Exit the menu with ◇▽.

9.9 ECG Transmission via Modem

- Select the 12 Lead Mode and press setup.
- Press ↵ to display the setup menu for the 12 Lead Mode.
- Use the cursor keys to position the bar cursor on "Manual copy to HOST" and confirm the selection with ↵ ([HOST]).
- Press ◇▽ to clear the setup menu.
- Use the cursor keys to position the bar cursor on "Communication" and confirm the selection with ↵.

Selecting the Communication Protocol

- Using the cursor keys, position the bar cursor on "Protocol". Select the protocol CSI to send data to a MUSE CV system, or select A5 if you will send data to CardioSys/CardioSoft.
- Use the cursor keys to position the bar cursor on "Modem, other" and confirm the selection with ↵.
- Choose the modem you use from the list and confirm the selection with ↵.
  If your modem is not included in the list, select "other" and enter the required modem commands (see also "Modem Setup" in section 5.5).
- When you have selected a standard modem, position the bar cursor on "Dial mode" and select the appropriate mode.
- Enter the telephone number of the receiving modem and the number to access the public telephone network and terminate the setup with ◇▽.

9.10 Direct ECG Transmission

- Select the 12 Lead Mode and press setup.
- Press ↵ to display the setup menu for the 12 Lead Mode.
- Use the cursor keys to position the bar cursor on "Manual copy to HOST" and confirm the selection with ↵ ([HOST]).
- Press ◇▽ to clear the setup menu.
- Use the cursor keys to position the bar cursor on "Communication" and confirm the selection with ↵.
- Select the same baud rate as at the receiving modem (9600, 19200, 38400, 57600).

Selecting the Communication Protocol

- Using the cursor keys, position the bar cursor on "Protocol".
  Select the protocol CSI to send data to a MUSE CV system, or select A5 if you will send data to CardioSys/CardioSoft.
- Use the cursor keys to position the bar cursor on "Modem, none" and confirm the selection with ↵.

10 Loading Chart Paper

Figure 10-1. Opening the paper compartment door

- Switch on the recorder.
- Pull up the handle of the paper door and fold it out (Figure 10-1).
- Remove the cardboard backing of the previous paper pad.

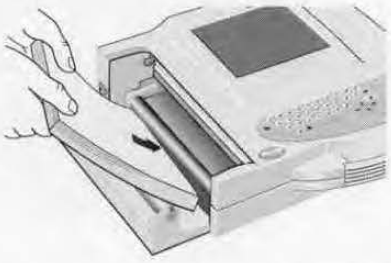


Figure 10-2. Inserting the new Z-fold pad

- Remove the cardboard from the top of the new pad and place the pad, including the cardboard backing at the bottom and with the arrow pointing towards the unit, into the paper compartment (Figure 10-2).

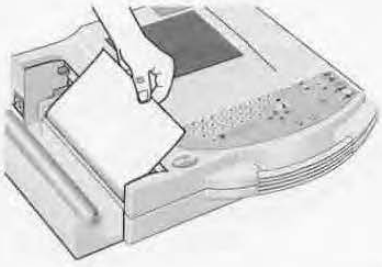


Figure 10-3. Guiding the leading paper edge over the guide roller

- Pull the top sheet out of the compartment and guide it around the guide roller (Figure 10-3).

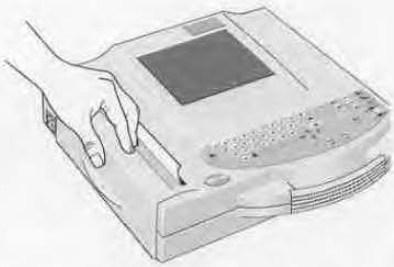


Figure 10-4. Closing the paper compartment door

- Holding the leading edge of the paper in place between the two markers on the recorder, close the paper door (Figure 10-4). Ensure that it locks into place on both sides.

When inserting an already started Z-fold pad, the grid side must face up and the first fold must point towards the paper compartment.

Note

- *Having inserted a new paper pad, be sure to acknowledge the "end of paper" message with ↵, not with ◇▽.*
- *When closing the paper door, take care that it locks into place on both sides.*
- *There is a window in the paper door that allows you to look inside the compartment and check the paper supply.*
- *Use only the original HELLIGE CONTRAST® chart paper or the GE Marquette thermal paper with queue marks or holes. This paper has a special coating that prevents*
  - *contamination and debris collecting on the printhead and*
  - *electrostatic build up.*
- *Furthermore, the thermosensitive layer and the printhead characteristics are exactly matched. Using other paper may result in recordings of poor quality.*
  Moreover, the printhead may wear out prematurely. Use of other paper voids the warranty.

End-of-Paper Indication

A stripe marks the last 10 pages of the Z-fold pad.

When the writer runs out of paper during a recording, it will emit an audio signal and displays the message "End of paper or paper jam, if OK, press ↵".

- Insert a new paper pad and acknowledge the message with ↵.

Aging Stability

The standard ECG writer paper CONTRAST® is designed to guarantee full contrast for a period between 3 and 5 years if it is handled as described below before and after recording:

- Store the paper in suitable rooms at a temperature between 18° and 24° and a relative humidity between 40 % and 60 %.
- Avoid direct contact of the paper with
  - carbon and carbonless forms
  - chart papers and adhesives containing tributyl phosphate, dibutyl phthalate, or any other organic solvents
  - document protectors, envelopes, and sheet separators containing plasticizers.
    Caution: The above components may also be found in recycled papers.
  - solvents or solvent-based products containing alcohols, ketones, esters, or other substances from this chemical group.
- We recommend archiving ECG recordings on our ECG filing cards only (P/N 217 043 03).
- If longer storage periods are required, we suggest using our ARCHIVIST 30 chart paper (image legibility up to 30 years) or other image storage technologies.

A stripe marks the last 10 pages of the Z-fold pad.

11 Cleaning, Disinfection and Maintenance

11.1 Cleaning and Disinfecting the Recorder Housing

Warning

Before cleaning or disinfecting the device, disconnect it from the power line.

- Clean the recorder housing with a moist cloth. Do not let liquid enter the device. All cleaning agents and disinfectants that contain alcohol and are commonly used in hospitals are suitable, but do not use disinfectants on a phenol base or peroxide compounds.

11.2 Cleaning and Disinfecting the Patient Cable

- Disconnect the cable from the recorder before cleaning or disinfecting it. When disconnecting the cable, be sure to pull on the connector, not on the cable.
- **Clean** the cable by rubbing it down with a cloth moistened with soap water. Use a disinfectant for **disinfection**. Do not immerse the cable in liquid.

11.3 Cleaning and Disinfecting the Electrodes

In addition to the information given in this manual, observe the instructions for use of the respective electrode types.

- Discard disposable adhesive electrodes immediately after use to prevent that they are reused.
- Clean reusable electrodes immediately after removing them from the patient.
- Peel off the adhesive foil before cleaning the electrodes (rests of the adhesive can be removed with benzine).
- Then use warm water and a small brush to clean the electrodes of cream or gel. Do not use pointed or sharp objects for cleaning.
- Disinfect the electrodes with alcohol-free disinfectant. Ensure that connectors and sockets do not become wet.
- The only approved sterilization method is gas sterilization.
  Frequently sterilizing the electrodes with ethylene oxide gas reduces the life of the plastic material.

11.4 Maintenance

Checks before each use

Before each use, visually inspect the device, the leads and electrodes for signs of mechanical damage.

If you detect damages or impaired functions that may adversely affect the safety of the patient or user, do not use the device before it has been repaired.

Technical Inspections

For safety, the devices require regular maintenance. To ensure functional and operational safety of the MAC 1200 units, Technical Inspections should be carried out on an annual basis.

These checks should be performed by persons with adequate training and experience.

The checks can be carried out by GE Marquette within the framework of a service contract. The inspections include the following checks:

- Visually inspect the device and the accessories for signs of mechanical damage that may impair the device functions.
- Check that the device labeling relevant for safety is legible.
- Run a performance test as described in the operator's manual.
- Measure the resistance of the protective earth conductor and the equivalent leakage current per your national regulations.

The device does not require any other maintenance.

Disposal at the End of Its Service Life

Note

At the end of their service life, the device described in this manual and its accessories must be disposed of in compliance with the applicable local waste control regulations. If you have questions regarding the disposal of the product or of accessories, please contact GE Marquette or its representatives.

12 Troubleshooting

Symptom	Cause	Remedy
Periodic superimposition of AC line interference (60 Hz) (Figure 12-1)	interference from the power line	Ground bed, verify position of the leadwires, switch on AC line filter
Superimposition of irregular AC line interference (Figure 12-2)	Muscle artifact caused by patient movements, hiccup, coughing	The patient should be warm enough and resting comfortably (place cushions under arms and knees). Comfort patient or distract patient's attention, enable muscle filter (20 Hz / 40 Hz), if necessary.
The printed date and time are incorrect	Built-in lithium battery is depleted. The battery has a life of approx. 5 years	Notify service to check and/or replace battery
The green **standby** indicator **23** does not light up, although the recorder is connected to the power line	Defective AC power adapter or fuse	Notify service to check and/or replace fuse
The recorder does not write over the entire paper width	Paper compartment not properly closed	Paper door must lock into place on both sides
In 12 Lead Mode, the recorder does not stop and continues to feed paper. This does not happen in 6 Lead Mode.	The paper pad was inserted the wrong way round so the recorder cannot detect the cue mark	Insert the paper pad as instructed
Recorder does not start after activation of the ◇/▽ key, or the recording is aborted.	Unit operated on battery power: battery discharged	Connect recorder to the power line. After a few minutes, the recorder is able to resume operation. Always connect recorder to the power line when the **battery** low indicator **22** lights up. The battery capacity depends on age, temperature and charge level (chapter 3 "Putting the Recorder into Operation").
No recording in 12 Lead Mode	Failure of at least one electrode	Check all electrodes or enable Override function (section 9.2 "12 Lead Mode").
Paper jam		Open paper compartment and removed jammed sheet, place beginning of paper between the marks, close paper compartment and press ↵.

Figure 12-1. Regular AC line interference

Note

In the presence of very strong AC line interference in all leads, the thermal printhead may interrupt the recording. Activate the AC line filter (60 Hz) in these situations.

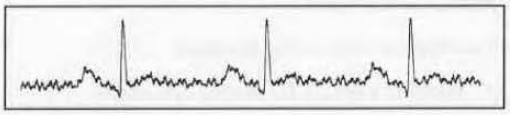


Figure 12-2. Irregular AC interference

13 Technical Specifications

Recording

Direct recording of waveforms and alphanumeric characters with rectangular coordinates by means of thermal-array printhead printing on thermosensitive paper.

- 3 or 6 recording channels, or 12 in 12 Lead Mode, overlapping
- baseline pitch 3 channels: 62 mm (arrhythmia)
  6 channels: 31 mm (6 Lead)
  12 channels: 16 mm (12 Lead.)
- writing width 200 mm max.
- annotation of recorder settings, date, time and entered patient name in the margin of the recording strip
- with appropriate software, documentation of analysis results in the respective operating mode
- resolution of the recording:
  vertical 8 dots/mm
  horizontal 25 µm at 25 mm/s

Printer paper

HELLIGE CONTRAST® Z-fold pad , 150 pages per pad, equivalent to a chart length of approx. 45 m

paper width: 8.5 inch

sheet length: 11 inch

To prevent damage to the printhead use only the original HELLIGE CONTRAST® paper or the GE Marquette thermal paper with queue holes or marks.

Paper transport

- paper speed
  5-25-50 mm/s, key selectable
  error limits at 25 and 50 mm/s, typ. ±1%
  at 5 mm/s, ±10% max.
- At paper end, the recorder emits an audio signal and stops recording
  the last pages of the pad bear a colored stripe in the lower margin

Membrane keypad

Pushbuttons with tactile feedback

- function keys for all routine operations
- alphanumeric keyboard for entry of text

Display

graphics display with 24 x 40 characters, contrast adjustment

resolution of 320 x 240 pixels with display backlighting

Indicators (LEDs)

For mains power, battery status and start/stop function

Automatic functions

They assist and facilitate operation by

- automatic control of lead selection, paper feed, calibration (configurable)
- report formatting (configurable)
- automatic baseline adjustment
- anti-drift system (cubic spline) compensating for polarization voltage fluctuations (configurable)

Detection of pacer pulses

- pulse length between 0.1 and 2.5 ms
- pacer pulse marker independent of pulse polarity
- pulse amplitude between ± 5 mV and ± 700 mV

Heart rate indication

derivation of the heart rate from all ECG signals

- display range between 30 and 300 bpm
- display update with every heart beat, maximum every 2 seconds

Signal inputs

isolated patient signal input, IEC type CF, high-voltage protection for all lead connections and neutral electrode, interference compensation via neutral electrode, monitoring for open leads

- electrode connections for RA, LA, LL, LA, Vl to V6
- input impedance for differential signals between any two electrode connections > 10 MΩ at 10 Hz
- input impedance for common-mode signals referred to neutral electrode > 50 MΩ up to 60 Hz
- dynamic range for differential signals between any two electrode connections for AC voltage ±10 mV, for superimposed DC voltage (polarization voltage) ±600 mV
- dynamic range for common-mode signals referred to neutral electrode ±l V, referred to chassis 263 V AC (rms)
- quiescent input current via any electrode connection for l kΩ termination referred to neutral electrode < 50 nA
- patient leakage current (rms values) according to IEC, class CF: in normal condition < 10 µA, in single-fault condition (e.g. patient in contact with line voltage) < 20 µA
- non-destructive range for lead-electrode connections and the neutral electrode connection referred to neutral electrode ±50 V, referred to chassis ±1500 V
- pulse voltage resistance of all lead electrode connections and of the neutral electrode connection referred to chassis (either polarity, e.g. defibrillation) 5000 V
- monitoring of each electrode for open leads: RA, LA, LL, RL, V1, V2, V3, V4, V5, V6 audio signal at printer start

Data interface

one serial RS232 interface for exchange of data with suitable external devices and software handshake

RS232 interface (standard V.24 interface):

- input voltage range. ± 15V max.
- output voltage range ±5 V min.
- interface protected from electrostatic discharge for ±10 kV max.

Transfer of ECGs with the CSI protocol between the MAC 1200 and the following units

MUSE CVIS	SW version 004A and later
MAC 5000	SW version 001B and later
MAC VU	SW version 002A and later
MAC 1200	SW version V5.01 and later

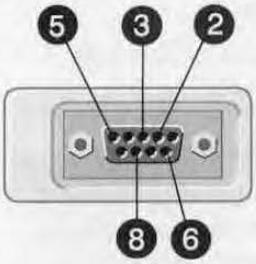
Receiving data with the CSI communication protocol from the following units

CardioSmart	SW version V4.21 and later
CardioSmart ST	SW version V4.21 and later

Sending ECGs to the following units with the A5 protocol

CardioSys / CardioSoft SW version V1.0 and later

Pin assignment of data port



2 RXDE
3 TXDE
5 circuit reference
6 modem supply
8 remote start

Remote start (hardware)

Paper feed via remote control connection (depending on selected operating mode). External make contact referred to chassis via circuit reference:

- source impedance $R_i < 300\ \Omega$
- contact dwell > 100 ms
- non-destructive load ± 10 V
- ESD interface protection up to ± 10 kV

Signal Transmission

Patient input to recording

After lead formation and digitization simultaneous transmission of all electrode signals to the digital processing system; muscle filter, AC filter, pacing pulse identification, automatic or manual sensitivity adjustment, automatic baseline adjustment and drift compensation by means of the anti-drift system (A.D.S.) can be enabled or disabled simultaneously for all channels; digital output of processed signals via thermal-array printhead.

- low cut-off frequency (-3 db limits) 0.08 Hz, equivalent to a time constant of 2.04 s
- high cut-off frequency (3 dB limits) operating mode: 12 Lead, 6 Lead 150 Hz (IEC/AHA) operating mode: Arrhy 100 Hz (IEC)
- signal sampling rate: 1000/s
- resolution, referred to the input 5 µV
- output rate to recorder 2000/s
- for all leads, gain adjustment in four steps: 40-20-10-5 mm/mV
- with active muscle filter (low-pass characteristic) 3-dB drop of the amplitude frequency response at approx. 40 or 20 Hz
- with active AC line filter detection and compensation of periodic 50 or 60 Hz frequency components (depending on recorder model) attenuation >40 dB
- non-linear distortion below values specified in IEC and AHA recommendations
- coincidence error limits between any two channels ±0.5 mm
- detection of pacer pulses in V2 or other V leads and marking in all channels for signals referred to patient input:
  duration ≥ 0.1 ms, amplitude > 5 mV
- noise in the signal transmission path below values specified in IEC and AHA requirements:
  ≤ 2.5 µV rms
- common-mode rejection for 50 or 60-Hz signals (depending on recorder model) with AC filter switched on >140 dB

ECG calibration

automatic recording of a defined voltage step, valid for all channels

- calibration voltage, referred to ECG signal input: 1 mV
  calibration pulse width on recording depends on paper speed
  25 mm/s 5 mm
  50 mm/s 10 mm
  5 mm/s 1 mm

Automatic ECG gain adjustment

The gain automatically adapts to the incoming signal. The maximum amplitude of the lead group or of all leads determines the gain setting.

- automatic adjustment range 5 to 40 mm/mV
- amplitude range (6 channels) 18 to 31 mm

Baseline

automatic adjustment of the baseline to the optimal recording range, in dependence of the signal amplitude

Anti-drift system (ADS) (cubic spline)

automatic compensation of baseline fluctuations caused by polarization voltage fluctuations at the lead electrodes (delay in recording: 4.2 s)

ECG storage

in 12 Lead Mode, storage of up to 40 ECGs

- stored ECGs can be deleted (individually or all in one pass), printed, transferred, and patient data can be edited
- when memory is full user is informed of the possible actions

Blocking

rapid charge reversal of the coupling capacitors in the preamplifiers after electrode application, ensures that the baseline is quickly restored to its original position after overranging

Electrode monitoring

audible and visual indication on the LCD of disconnected electrodes or line break; each single electrode is monitored

Text input

patient and user data as well as comments can be entered via the panel keyboard and are annotated on the recording strip

Copy function

after ECG recording in 12 Lead Mode, copies of the ECG can be printed from memory and/or transferred to a MUSE CV system (configurable)

Test

automatic performance test upon power up, including verification of the signal path starting at the signal input

stored test ECG data for demonstration of the device functions

Power supply

from the power line or from a built-in rechargeable battery, automatic switchover; automatic battery charging during line-power operation from integrated AC adapter module

Mains operation

- instrument design in protection class I according to IEC 60601-1
- Rated voltage range 95 to 240 V
- operating voltage range 85 to 264 V, 49 to 65 Hz
- rated current: 0.2 to 0.6 A
- fuse 2 x T1.25A, 5x20
- typical power consumption battery charging 14 W
- max. power consumption 29 W

Battery operation

- type: nickel-cadmium
- rated battery voltage 18 V

- rated battery capacity 1.3 Ah
- fully charged battery sufficient for up to 50 12 Lead Mode, 1-page ECGs, if unit is only switched on to record the ECGs
- battery charge time approx. 4 hours (min. charge time for one 12 Lead Mode ECG: 10 minutes)
- battery life approx. 2 to 3 years, replacement by service only
- lithium battery for built-in clock, battery life approx. 5 years, replacement by service only

Operational readiness

After successful self-test, approx. 10 s after power-up

Operating position

horizontal

Environment

Operation

- temperature between 50 and 104 °F
- relative humidity between 25 and 95%
- atmospheric pressure between 700 and 1060 hPa

Transport and storage

- temperature between -22 and +140 °F (including battery)
- relative humidity between 25 and 95%
- atmospheric pressure between 500 and 1060 hPa

Recorder dimensions

- width 14.5 in.
- height 3.7 in.
- depth 12.6 in. (incl. handle)

Weight

- approx. 12.3 lb (with battery)

Appendix

Entering Special Characters

The following special characters can be entered by means of the appropriate keystroke combination.

character	keystroke combination
\	Alt + Q
@	Alt + W
#	Alt + E
$	Alt + R
&	Alt + Y
¿	Alt + D
—	Alt + F
Ç	Alt + G
Å	Alt + K
Ü	Alt + L
î	Alt + X
Ñ	Alt + C
"	Alt + V
Ø	Alt + B
Ö	Alt + N
Ä	Alt + M
Á	Alt + I, then A
É	Alt + I, then E
Í	Alt + I, then I
Ó	Alt + I, then O
Ú	Alt + I, then U
À	Alt + O, then A (enter È, Ì, Ò, Ù in the same manner)
Â	Alt + P, then A (enter Ê, Î, Ô, Û in the same manner)
ÿ	Alt + U, then Y (enter Ï, Ã, Õ, Ü in the same manner)
Ã	Alt + H, then A (enter Ñ, Õ in the same manner)
Đ	Alt + A
Æ	Alt + J
Z	Alt + T, then Z
Š	Alt + T, then S
¡	Alt + X

Index

APPENDIX

STANDARD ECG INSTRUCTIONS FOR THE STRONG HEART STUDY

1. ELECTROCARDIOGRAM (ECG)

1.1 Introduction

A standard supine 12-lead resting ECG is recorded during the clinic exam of the Strong Heart Family Study.

1.2 Procedure for Recording ECG

The standard electrocardiograph for the Strong Heart Study is the MAC 1200 by GE Marquette Medical Systems, Inc. The standard configuration for the MAC 1200 is shown in this section. A 12-lead resting ECG tracing is obtained consisting of 2.5 seconds of each of the leads simultaneously (I, II, III, aV_R, aV_L, aV_F, V_1-V_6) with a 10 second lead Rhythm Strip.

1.3 Electrode Position Measuring and Marking

Because it is essential for the study to be able to compare this ECG with other participant ECG records, a uniform procedure for electrode placement and skin preparation is required. The method and procedure for standardizing locations are outlined below.

The participant, stripped to the waist, is instructed to lie on the recording bed with arms relaxed at the sides. The individual is asked to avoid movements, which may cause errors in marking the electrode locations, but encouraged to converse with the technician. Prior experience with electrocardiograms is discussed, as is the purpose of the ECG recording. The participant should be told this is a research ECG to be used for statistical analysis later in the study. However, it can also be used by the clinic physician for general diagnostic purposes, and a copy can be sent to the individual's private physician.

For best electrode/skin interface, place the electrodes on the skin at least 2-3 minutes before taking the ECG. Patient information can be entered in the MAC 1200 during this time.

A good felt tip pen is used to mark the six chest electrode positions. It is extremely important that care be taken to locate these positions accurately. Therefore, the procedure given below must be meticulously followed. Electrode positions in women with large, pendulous breasts must be determined in relation to the anatomic points

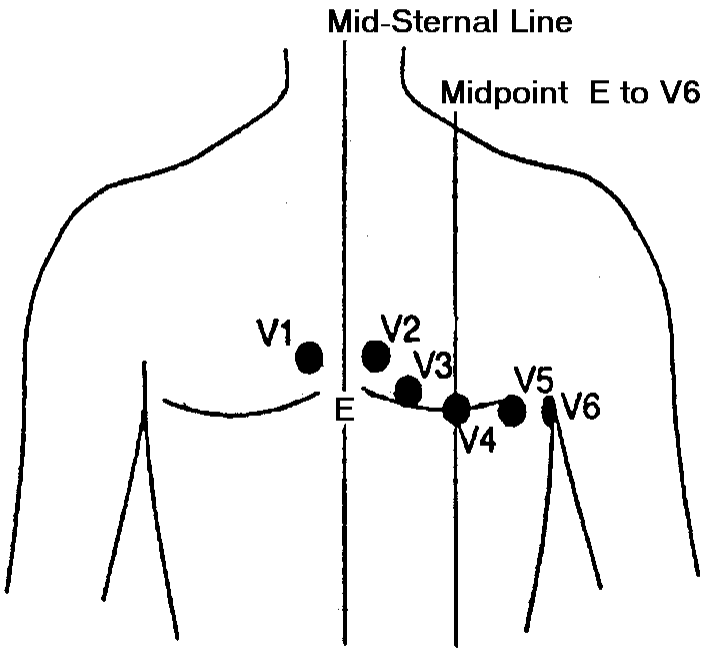
described below – as for all participants. The electrodes must then be placed on top of the breast (in the correct position).

1.3.1 Chest Leads (see Figure below)

1. Electrode V_2

Locate the sternal angle and second left rib between the index and middle fingers of your right hand. Count down to the fourth rib and identify the fourth intercostal space below it. Locate V_2 in the fourth intercostal space immediately to the left of the sternal border.

Figure



2. Electrode V_1

Locate the electrode V_1 in the fourth intercostal space at the right sternal border. This should be at the same level as V_2 and immediately to the right of the sternum.

3. Anterior 5th Interspace Marker (E Point)

Identify the fifth rib and fifth intercostal space below V_2 by counting down ribs as described for V_2. Follow this space horizontally to the midsternal line and mark this point. This is the "E" point (see E in Figure above).

4. Electrode V_6

Locate the V_6 electrode at the same level as the E point in the midaxillary line (straight down from the center of the armpit). If breast tissue is over the V_6 area, mark the V_6 location on the breast. Do not attempt to move the breast in order to mark V_6 on the chest wall, unless doing so is absolutely necessary to achieve a better anatomic position.

5. Electrode V_4

Electrode V_4 is located using the E-V_6 Halfpoint Method. Using the medical tape measure used in anthropometry, measure the distance between the E point and the V_6 marking. The tape should be resting lightly on the skin, not pressing into the flesh. The E and V_6 marks should be clearly seen. Place electrode V_4 midway between E and V_6.

6. Electrode V_3

Using the medical tape measure employed in #5, mark the location of electrode V_3 midway between the locations of V_2 and V_4.

7. Electrode V_5

Using the medical tape measure again, mark the location of electrode V_5 midway between the locations of V_4 and V_6.

1.3.2 Limb Leads (see Figure 4-2 on p. VI-21 and Figure 4-5 on p. VI-22)

Locate electrode LL on the left ankle (inside)
Locate electrode RL on the right ankle (inside)
Locate electrode LA on the left wrist (inside)
Locate electrode RA on the right wrist (inside)
(The electrodes on the right limbs should be placed at same approximate location as the corresponding left limb electrodes)

1.4 Skin Preparation

Skin preparation is undertaken only in the presence of observed technical problems due to poor electrode contact. As a first step, it may be sufficient to rub the

skin lightly with an alcohol wipe, a tongue depressor, or a piece of gauze to produce reddening. If this does not resolve the problem, then:

1. With the participant's consent, remove any excess hair from each electrode site on the chest using a shaver.

2. At each electrode location in turn, the outer horny layer of the epidermis is removed by gentle dermal abrasion with a piece of gauze. Only three passes (in the form of an asterisk) at each site using light pressure are required.

If the skin preparation has removed the felt pen marking at any of the electrode sites, these are accurately re-established by carefully repeating the procedure described above in section 1.3 Electrode Position Measuring and Marking. It is important that the electrode sites be marked using the exact technique described.

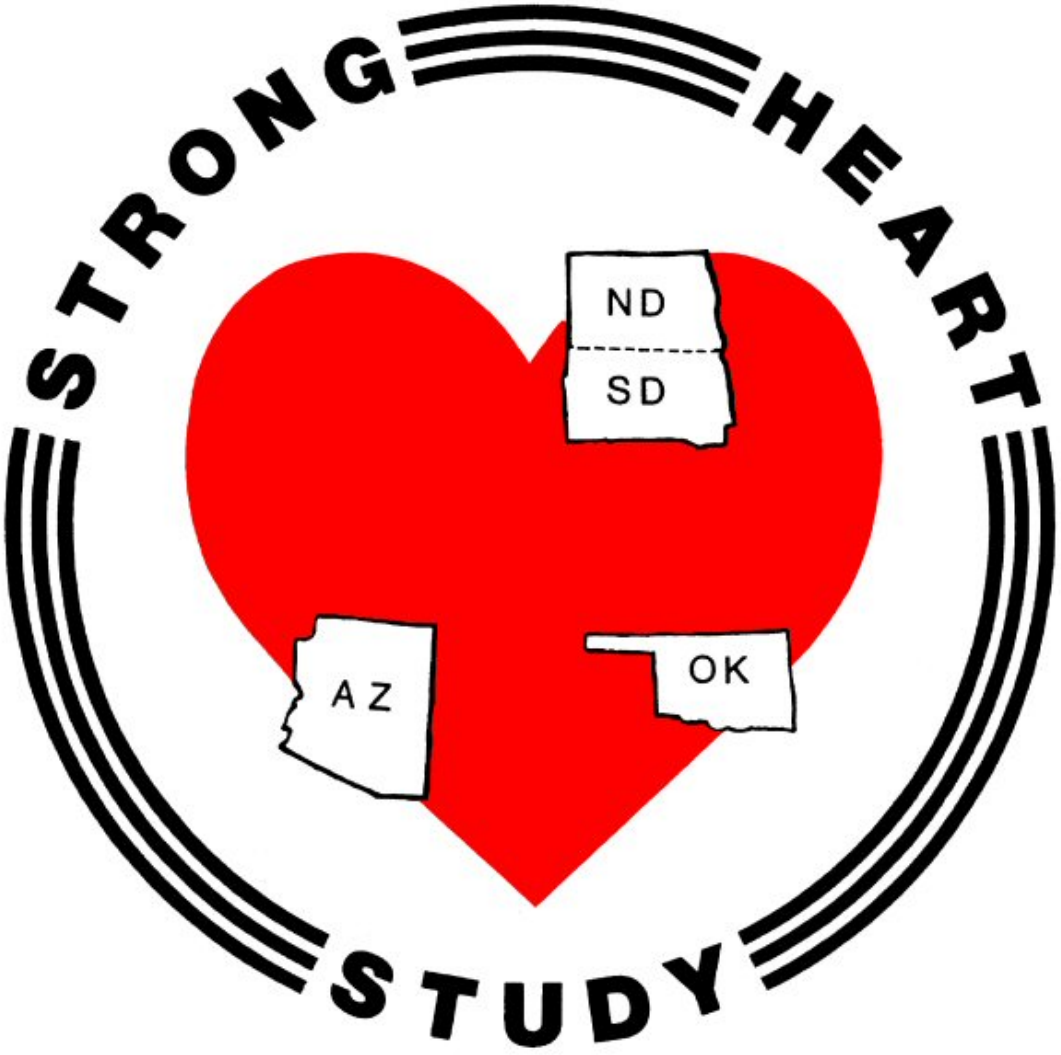
1.5 Application of Electrodes

Disposable electrodes are used in the Strong Heart Study. Adapters are used with the lead wires to connect the "banana" plug from the MAC 1200 lead wire to the disposable electrode via a clip.

When placing each electrode, avoid overlap of gel from one electrode to the next. The clip should be attached so that it touches only the silver ends of the electrode.

Center the four limb electrodes on the inside of the wrist or ankle with the tabs for the clips pointing toward the head. Center the six chest electrodes on the chest markings with the tabs pointing down. Do not let the electrodes overlap or touch each other, if possible.

Clip the appropriate lead wire to each electrode (see Figure 4-4 on p. VI-22). Do not pull or jerk tangled wires. To untangle wires, disconnect lead wires from electrodes.



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Seven

DATA ENTRY

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY V

Cardiovascular Disease in American Indians

Operations Manual

Volume VII

DATA ENTRY

July 01, 2006

MS ACCESS Programmers: **Martha Stoddart, MS**
Fawn Yeh, MPH, PhD
Debra Gates

Systems Specialist: **Yiming Wang, MS**

For copies, please contact:

Strong Heart Study Coordinating Center

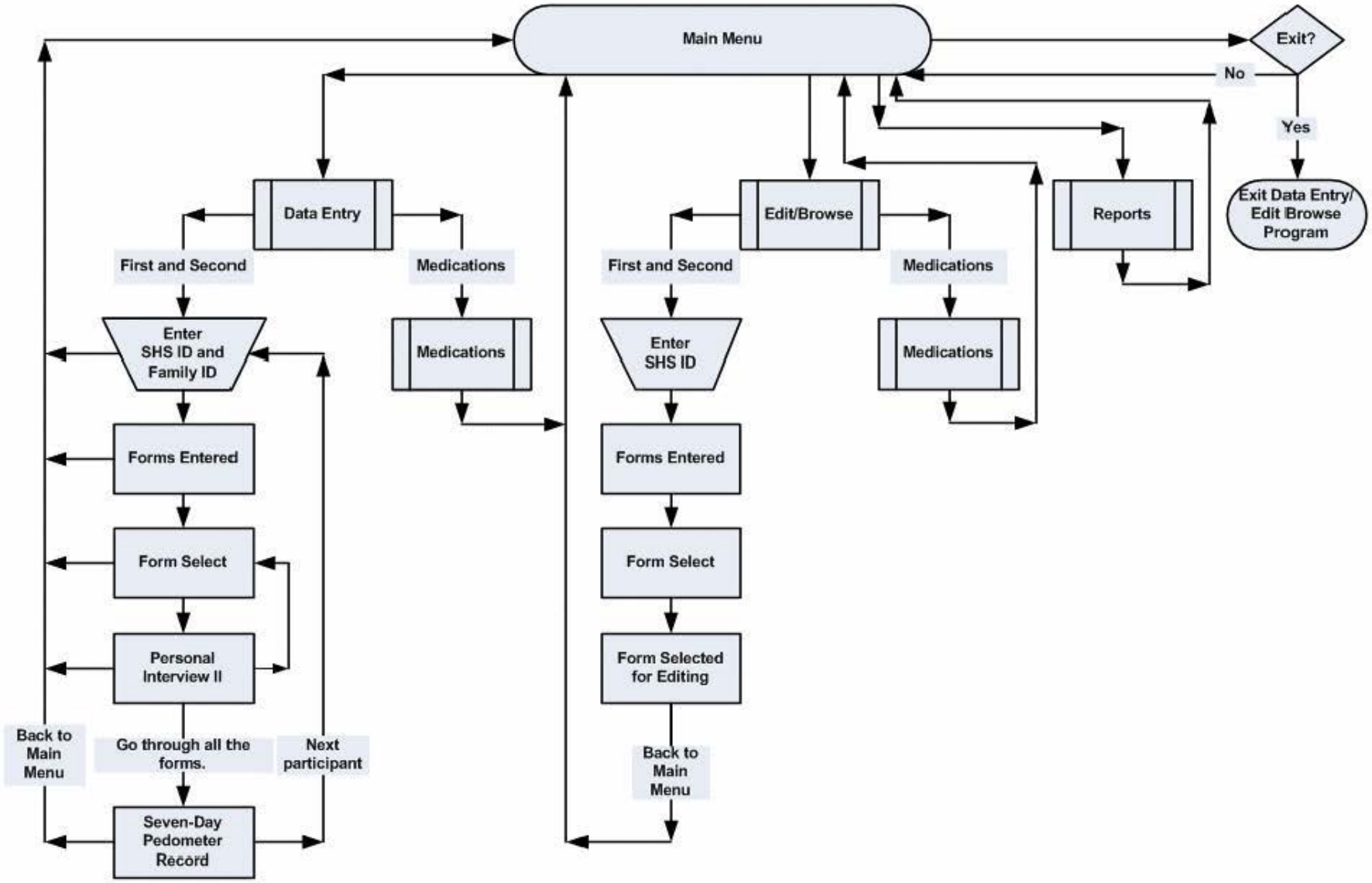
Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME VII

DATA ENTRY

Table of Contents



FLOWCHART FOR THE DATA ENTRY/EDIT BROWSE PROGRAM

Introduction

This manual was developed to assist Field Center (FC) data entry personnel in understanding and using the programs developed for Phase V of The Strong Heart Study. The following topics will be discussed: first, second and medications data entry, editing data, reports, correcting data entry errors, data entry codes and data clean up.

Before Starting

Before entering data, the data entry operator should screen each participant's folder. This includes putting the forms in numerical order and skimming each form to make sure it has been filled out properly. If errors are found, contact the interviewer and correct them before entering the data. Performing these preliminary steps will make the data entry process more efficient and less tedious. If complications should arise when using the data entry program, contact the Coordinating Center (CC).

Getting Started

The data entry program is hosted on the Strong Heart Study Phase V Data Entry Server (SHS5-DES). To access the SHS5-DES, you need a network-ready computer system running the Windows XP operating system. Windows XP systems have the built-in Remote Desktop Client (RDC) software that allows you to connect to the server remotely. To run the RDC, perform the following procedures on your desktop computer:

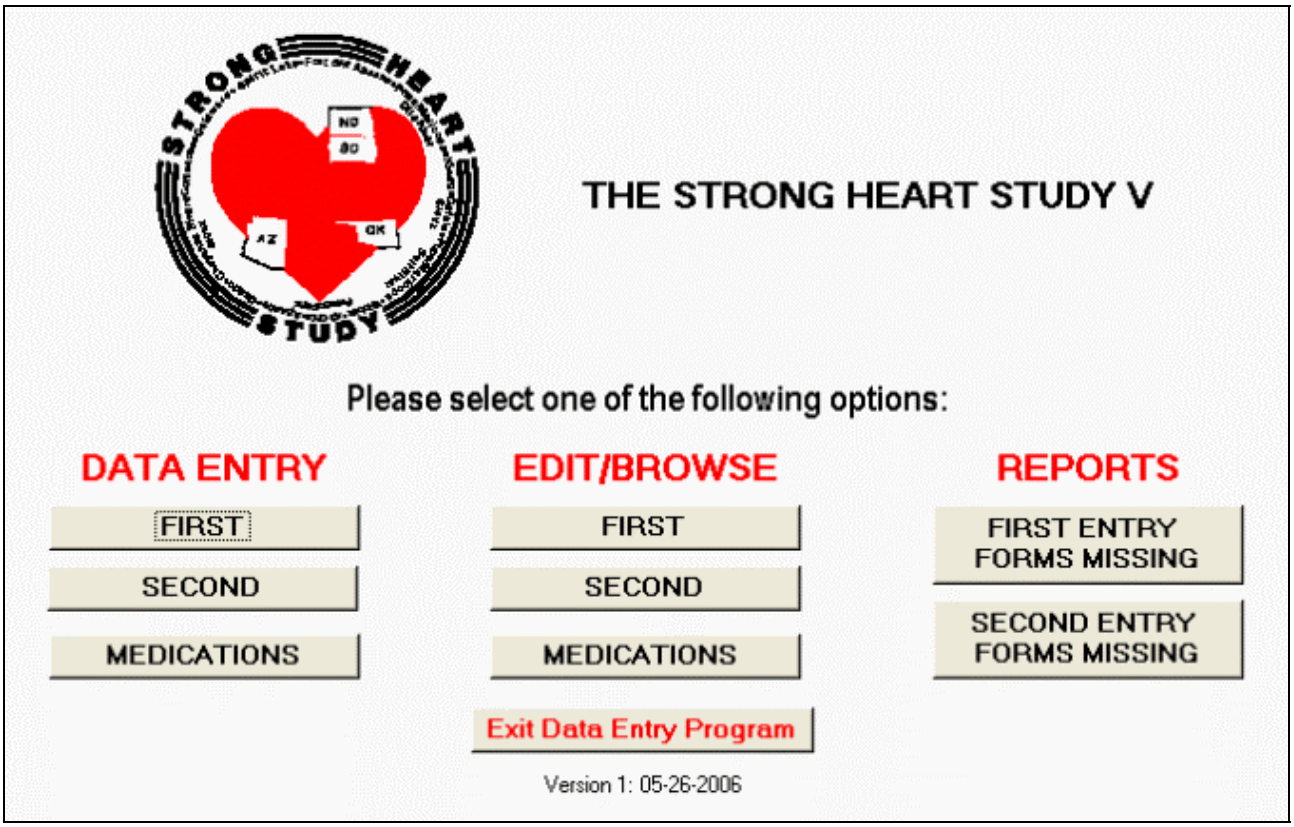
Start -> All Programs -> Accessories -> Communications -> Remote Desktop Connection

After the 'Remote Desktop Connection' window appears, type in the Internet Protocol (IP) address (157.142.52.123) for the SHS5-DES in the box next to 'Computer' and then click on the 'Connect' button. After the connection is made, a new window, named 'Log On to Windows,' appears on your desktop asking you to provide your log-on information to the server. Enter the username and password provided by the Server Administrator. Please note that they are all case sensitive. After you type in this information and click 'OK,' the data entry session begins.

The next time when you log on to the server using the same computer, you usually do not need to retype the IP address and the username, because the computer remembers the previous entries. However, you do need to type in the password every time you log on to the server.

If you are accidentally disconnected from the server for any reason, you will have 3 hours to log on again to the server to continue your previous session without disruptions and loss of data.

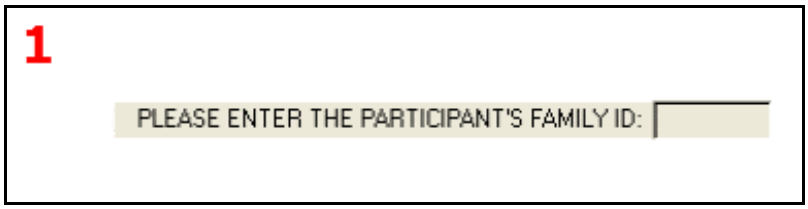
When the data entry session begins, the following screen appears.



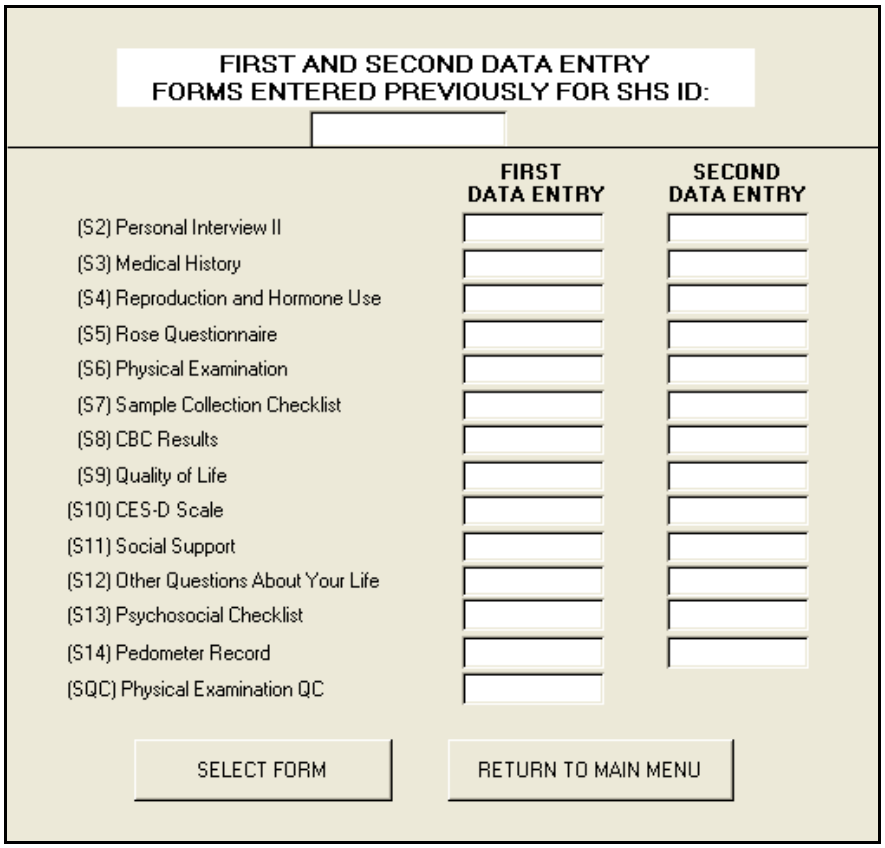
First Data Entry

After 'DATA ENTRY FIRST' is selected, the following input box appears.

After a SHS ID is entered and the 'Enter' key is pressed, the following input box is displayed.

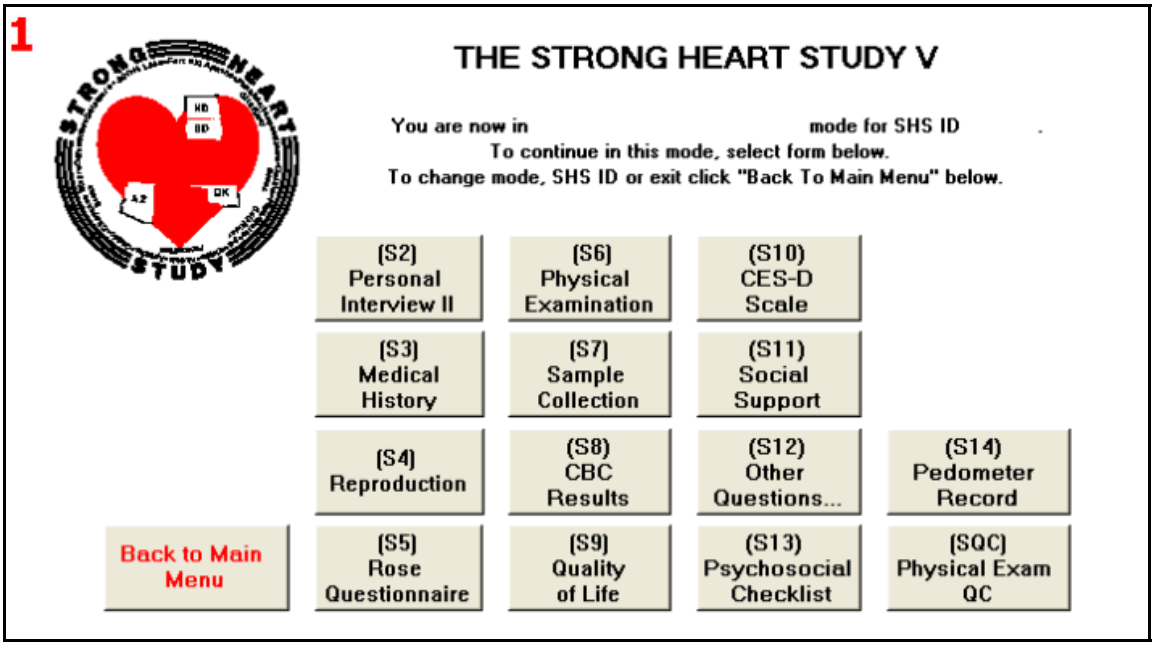


After the SHS Family ID is entered and the 'Enter' key is pressed, the following screen is displayed.

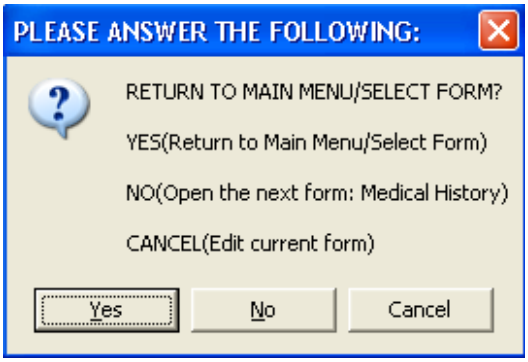


If a date is displayed in the 'FIRST DATA ENTRY' column, the form shown on the same line as the date has been entered previously on the date shown for the participant whose SHS ID appears at the top of the form.

To proceed, click the button labeled 'SELECT FORM.' The following screen is displayed.

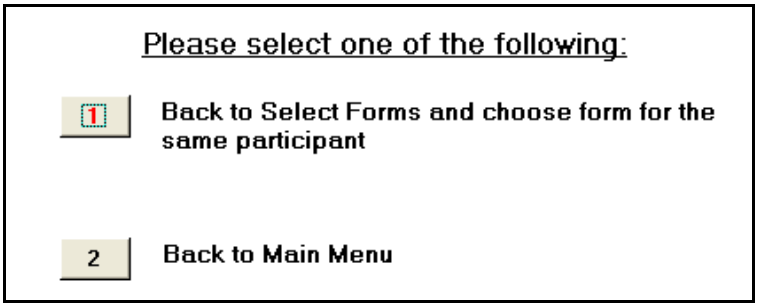


As you will see, the above screen confirms the mode (data entry or edit/browse) that was chosen from the 'MAIN MENU' and the participant's SHS ID. To begin entering data, click, e.g., the '(S2) Personal Interview II' button or any other button for forms that still need to be entered for this participant (as indicated on the screen appearing at the top of page VII-3, which shows dates that the various forms have been entered previously). During data entry, control will flow through the form as it should. At this time, the cursor cannot be moved to skip fields that require an entry. This will provide for more complete and accurate data for subsequent data analysis and a reduction in the number of errors returned to the FC. After the last field on a form is exited, the following message box will appear, allowing return to the 'Main Menu/Select' form, opening the next form, e.g., 'Medical History' form or editing the current form.

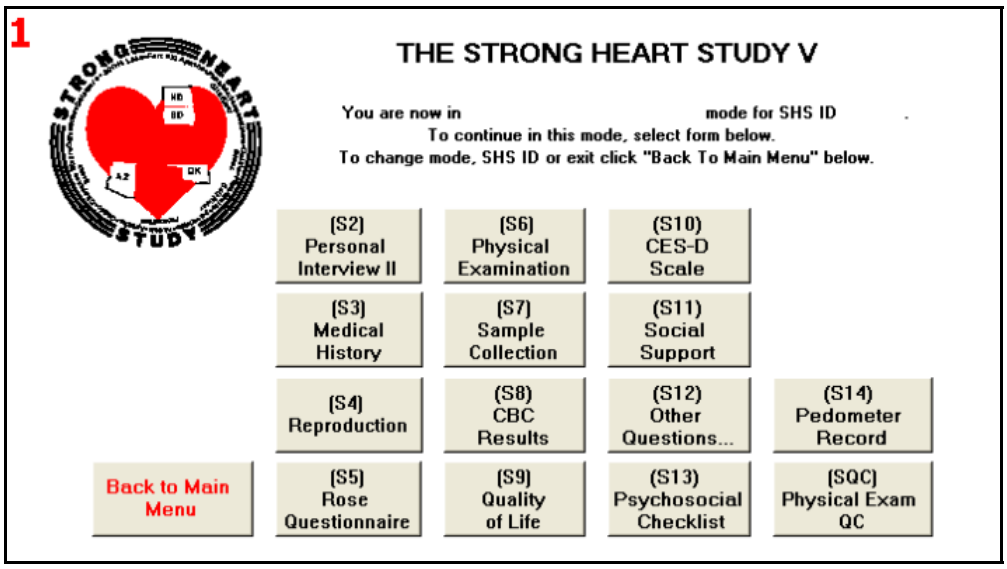


If 'Cancel' is selected, the 'Personal Interview II' form remains open in a mode that allows changes to be made. At this time, the cursor can be used to skip fields not needing change. In this mode, skip patterns do not occur; however, no data can be entered in fields that should be blank. After changes are made, if necessary, the form can be exited either by exiting the last field on the form or by selecting the 'Close Form' button in the top left-hand corner of the form.

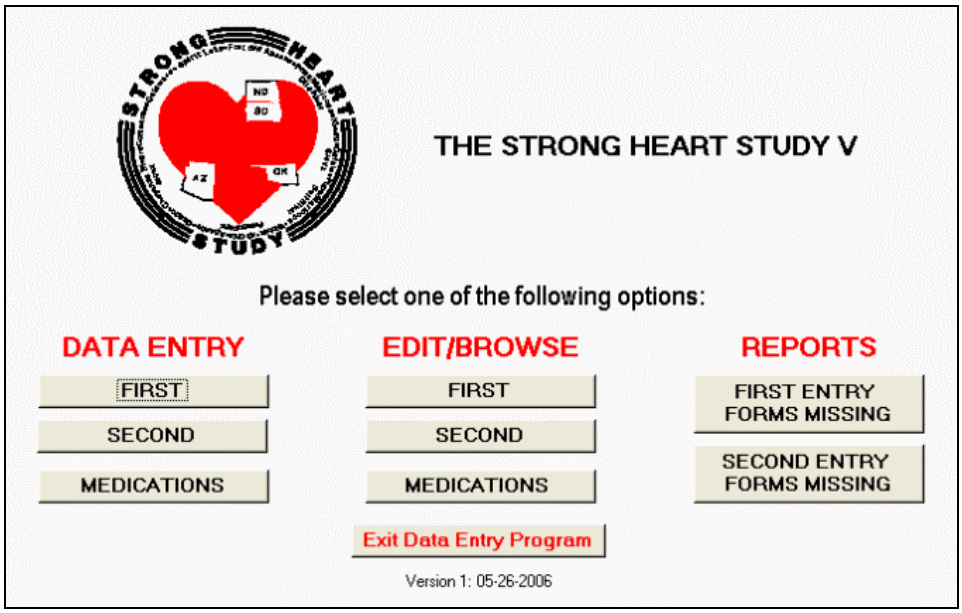
If ‘Yes’ is selected on the screen that appears in the middle of page VII-4, the following screen appears.



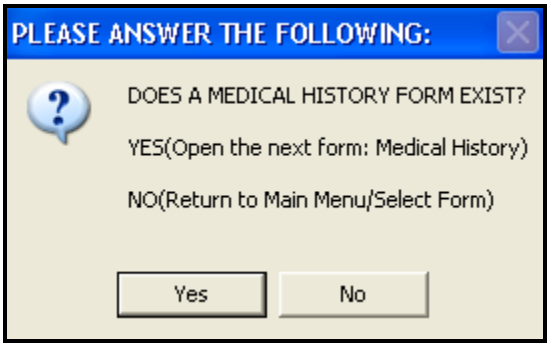
If ‘1’ is selected from the above screen, the following screen appears.



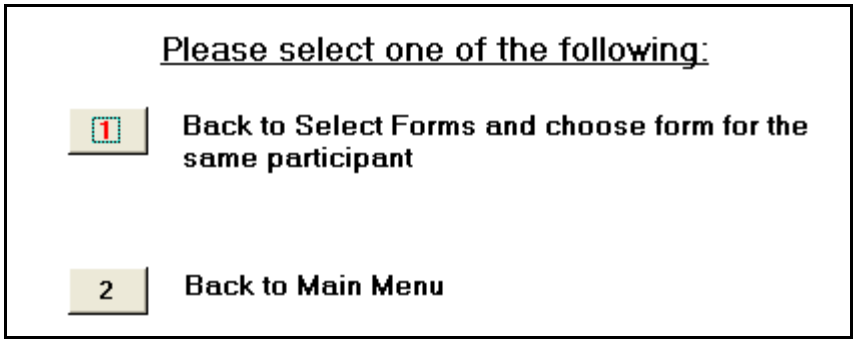
If ‘2’ is selected from the above screen, the following screen is displayed.



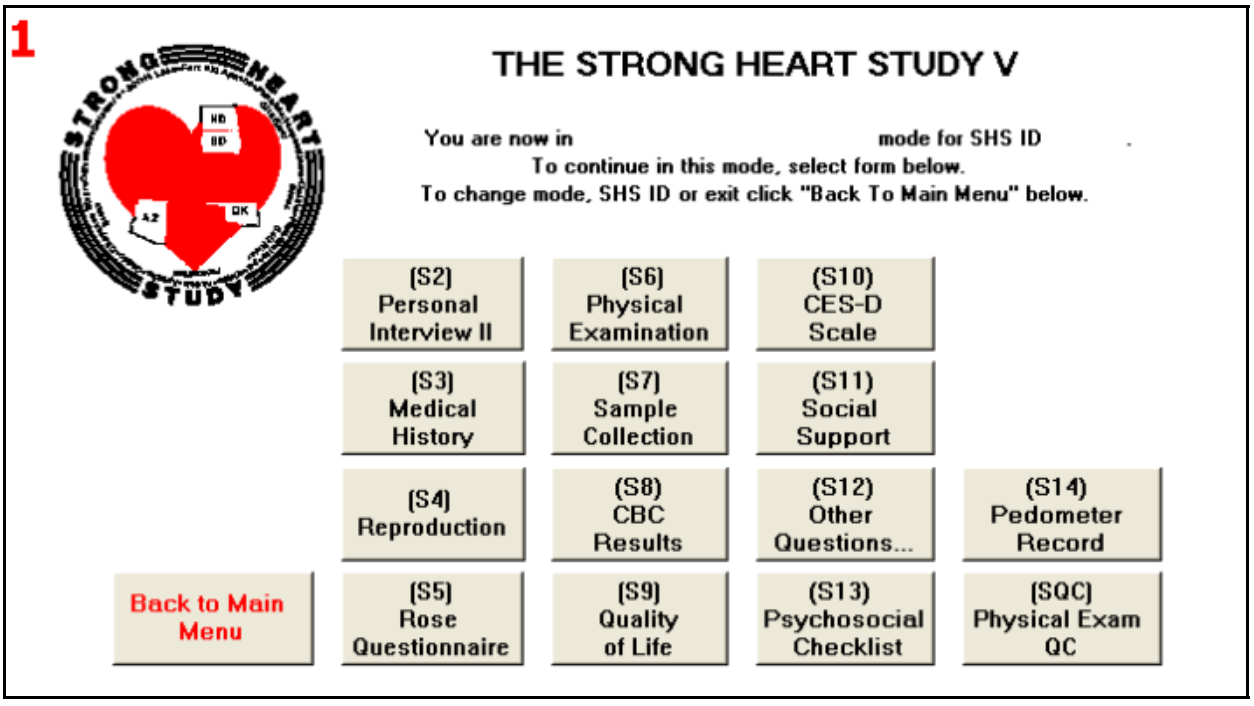
If ‘No’ is selected on the screen that appears in the middle of page VII-4, the following screen appears.



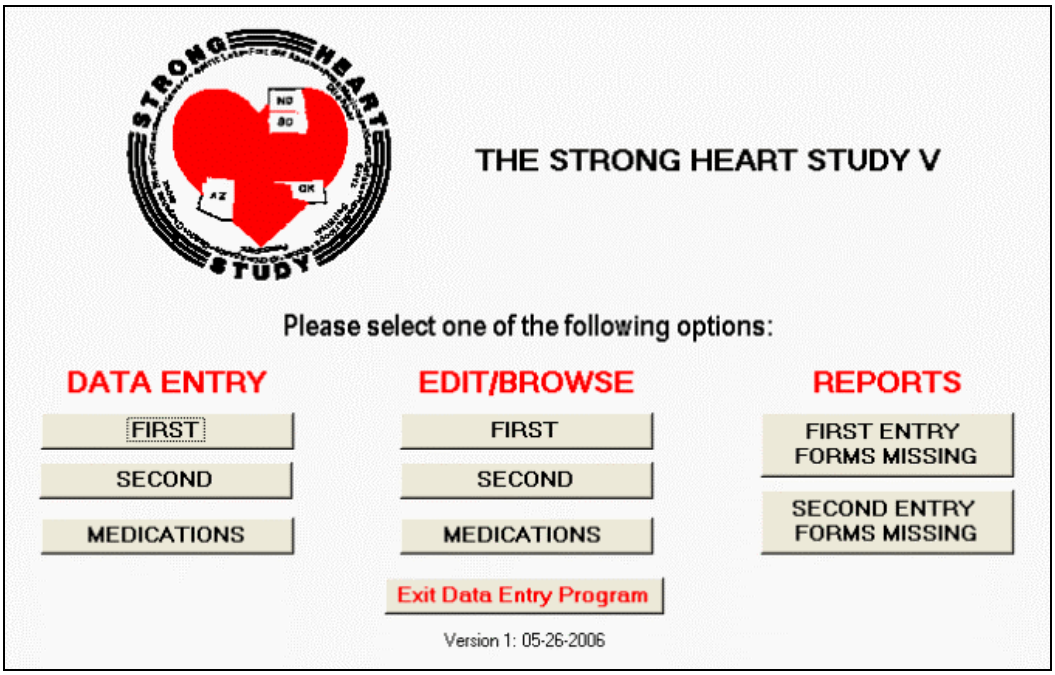
This allows the opportunity to verify the physical existence of the form to be opened. If ‘Yes’ is selected, the next form indicated will be opened in data entry mode. If ‘No’ is selected, the following screen appears.



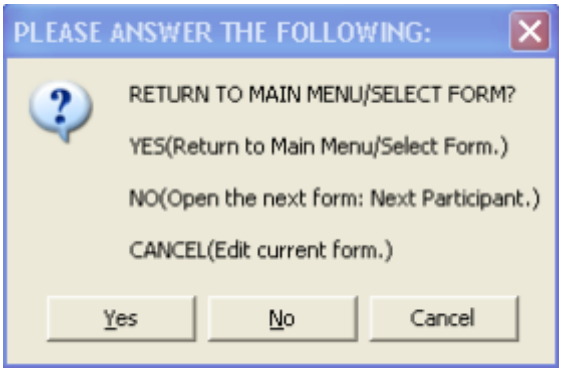
If ‘1’ is selected on the above screen, the following screen appears.



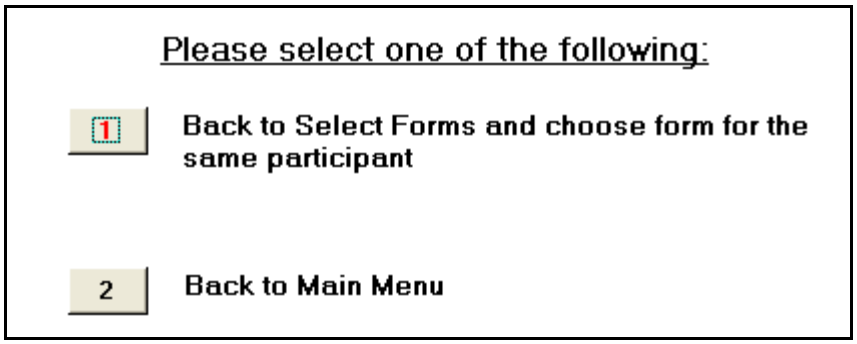
If ‘2’ is selected on the screen shown in the middle of page VII-6, the following screen appears



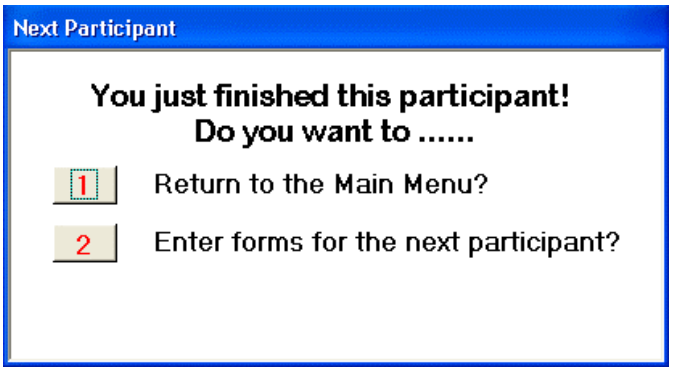
After the last field on the last form (Seven-Day Pedometer Record or Physical Examination QC) is exited, the following screen is displayed.



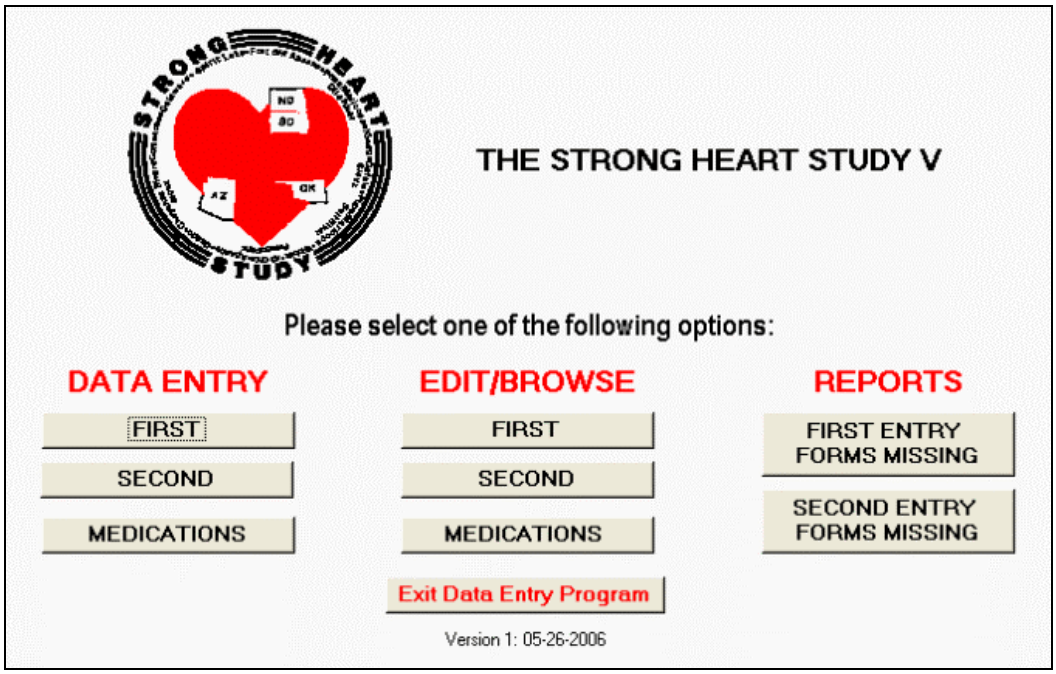
If ‘Cancel’ is selected, the current form remains open for editing. If ‘Yes’ is selected, the following screen is displayed.



If ‘No’ is selected, from the screen in the middle of page VII-7, the following screen appears.



If ‘1’ is selected from the above screen, the following screen appears.



If ‘2’ is selected, the data entry process starts for the next participant, as indicated in the instructions for ‘FIRST DATA ENTRY’ on page VII-2.

Second Data Entry

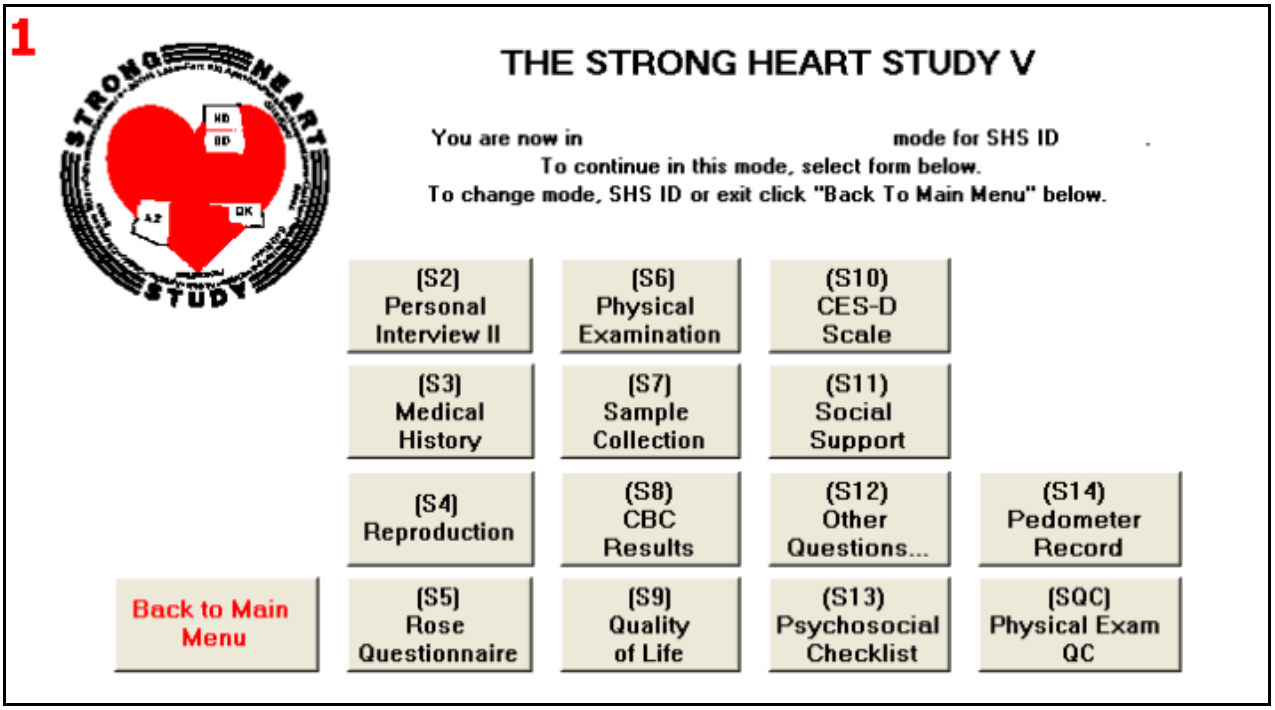
The process of entering data for 'DATA ENTRY SECOND' is identical to that for 'DATA ENTRY FIRST,' starting with the instructions on page VII-2. Because the second data entry screens are identical to the first data entry screens, a red '2' appears in the top left-hand corner of the second data entry forms to differentiate the two.

Edit/Browse

When 'EDIT/BROWSE FIRST OR SECOND' is selected from the 'MAIN MENU,' the following input box appears.

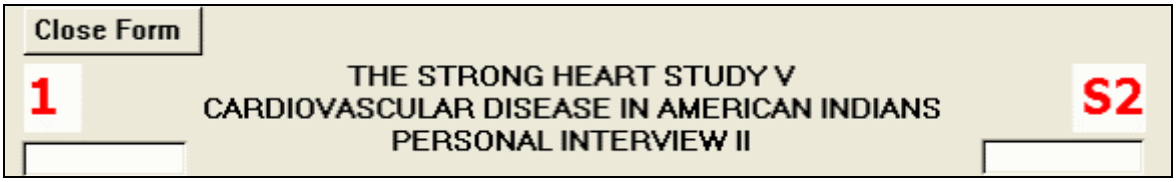
After a SHS ID is entered and the 'Enter' key is pressed, the following screen appears. The screen confirms that you are in the first or second edit/browse mode and the SHS ID of the participant.

The 'SELECT FORM,' shown below appears, with either a red '1' or '2' in the top left-hand corner, depending on the entry chosen.

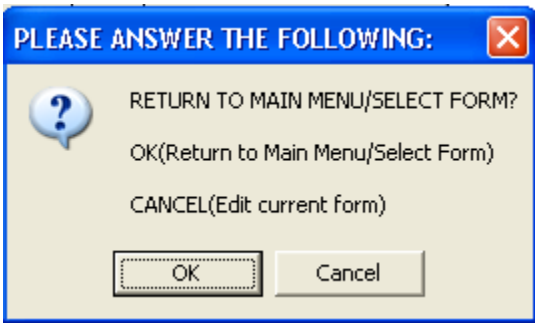


After the form is selected, the form opens, displaying the data entered for the specific participant.

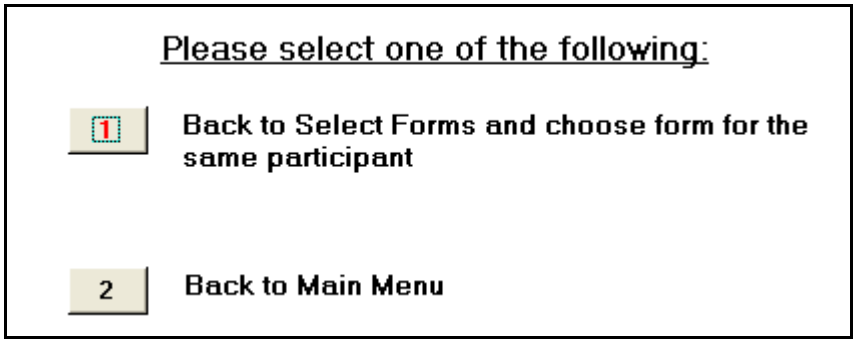
After corrections have been made, the form can be closed either by exiting the last field on the form or by clicking the 'Close Form' button in the top left-hand corner of the form, as shown below.



Both methods produce the following screen.



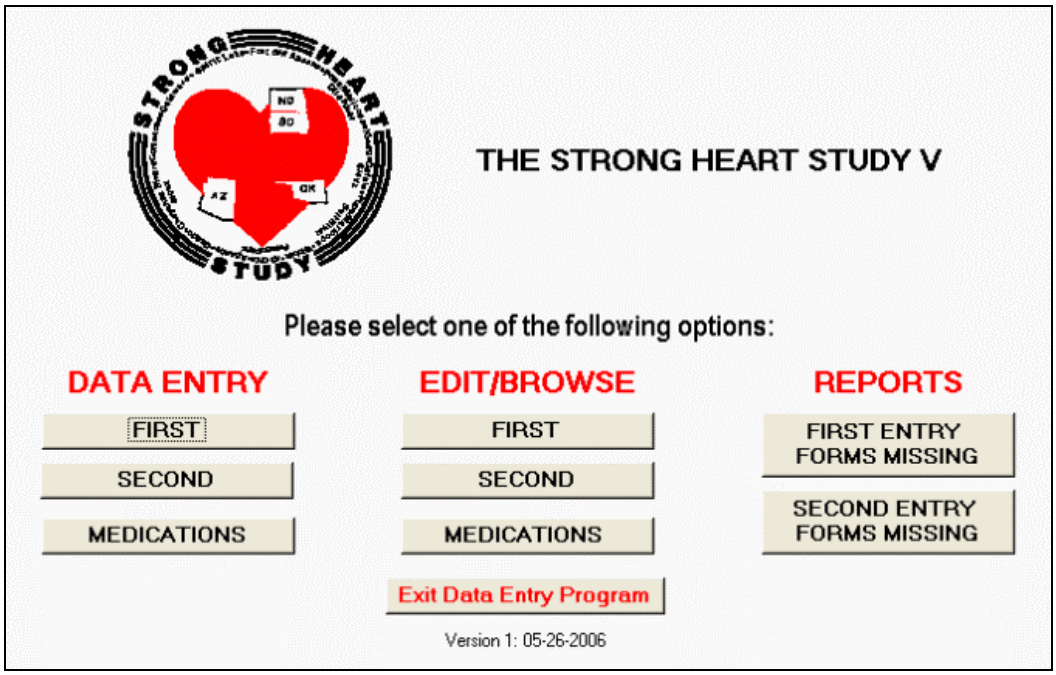
If 'OK' is selected, the following screen appears.

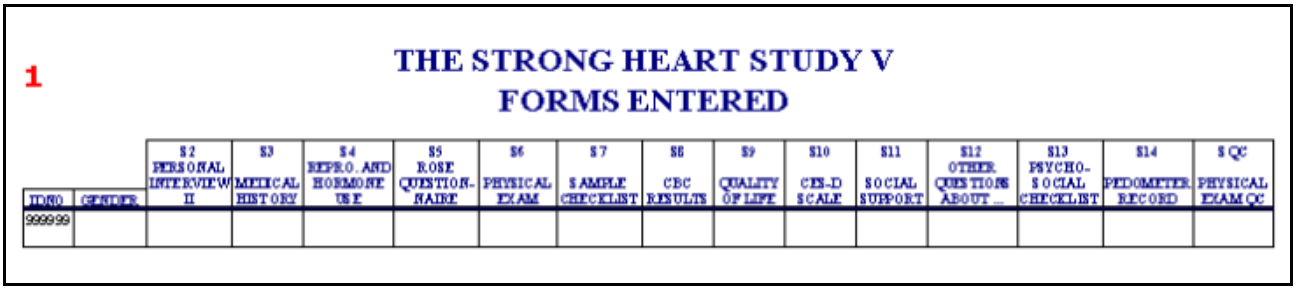


If 'Cancel' is selected, the current form remains open for any necessary changes.

Reports

To view and/or print a report of first or second forms entered, click on 'REPORTS FIRST FORMS ENTERED' or 'REPORTS SECOND FORMS ENTERED' on the 'MAIN MENU,' shown below.





The red 1 or 2 in the upper left corner confirms that the report is for first or second data entry. If 'Gender Mismatch' is indicated in the 'Gender' column, this means that there is a discrepancy between the gender entered on the Personal Interview II form and that entered on the Medical History form.

Making Corrections

In order to produce a data entry program that is user-friendly and selective about the data entered, skip patterns and message boxes have been added. Unfortunately, the same features that are intended to help the data entry operator can be a source of frustration when one is trying to correct errors, unless you follow these suggestions.

We will discuss two different situations--a data entry error noticed **BEFORE** exiting the field and an error noticed **AFTER** exiting the field in question.

1) **BEFORE** exiting the field, if in data entry mode or edit/browse mode:

   Solution: Use the backspace key to remove the error and enter the correct value.

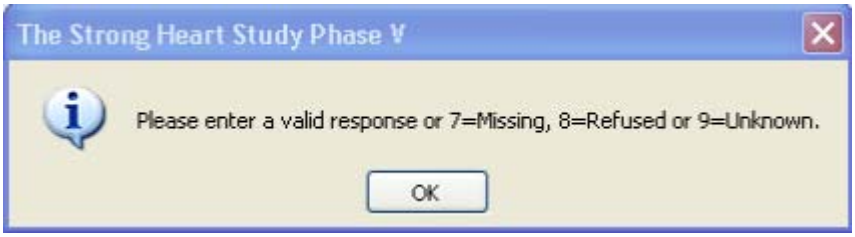
2) **AFTER** exiting the field in data entry mode:

   Solution: Continue entering the remainder of the form, exiting the last field on the form. At this time 'Edit Current Form' can be selected, leaving the form open for editing. If the field to be changed is visible, place the I-bar in the field and click to make the correction. **In this mode, the vertical scroll bar, the cursor or the 'Enter' key can be used to select another field.** When editing is completed, the form can be exited either by exiting the last field on the form or by clicking the 'Close Form' button located in the top left-hand corner of the form. If the error is noticed after the form is closed, make a note of it and correct it after completing all of the forms for that participant.

3) **AFTER** exiting the field in edit/browse mode:

   Solution: Place the I-bar back in the field and click to make the correction. **In this mode, the vertical scroll bar, the cursor or the 'Enter' key can be used to select another field.** When editing is completed, the form can be exited either by exiting the last field on the form or by clicking the 'Close Form' button located in the top left-hand corner of the form.

If a field that requires an entry is left blank or a field contains an incorrect value, one or both of the following message boxes may appear:



The first message box indicates that the field being exited cannot be left blank, and the second indicates that an invalid response was entered. Select 'OK' on the message box, and when control returns to the form, enter a valid response.

Data Entry Codes

In some cases, the participant responding to a question may not know the answer or refuse to answer the question. Some questions have these options listed while others do not. For those that do not, the **interviewer** should indicate these responses by putting a question mark for unknown or drawing two lines through the box for refused. Since the data entry program will not allow the operator to use these symbols, codes which can be used instead have been developed. It was not possible to use the same code for every type of field (e.g. text, numeric, etc.), but the codes were made as consistent as possible. Finally, if a question is not answered and there is no indication that the participant did not know or refused, this should be classified as missing. The following is a list of data entry codes by variable type.

Text variables (questions that have options listed or are not quantitative)

OR

Numeric variables (questions requiring quantitative information, such as measurement data):

7, 77 or 777 = Missing
8, 88 or 888 = Refused
9, 99 or 999 = Unknown

Time variables (questions requesting the time of an event):

00:07 = Missing
00:08 = Refused
00:09 = Unknown

Date variables (questions requesting the date of an event):

01/01/1007 = Missing
01/01/1008 = Refused
01/01/1009 = Unknown

Note: If only the year is known, use 06/30/year.
If only the month and year are known, use month/15/year.

If the variable type for the field being worked with is unknown, leave the field empty and press 'Enter.' This will cause a message box to appear indicating that the field cannot be left blank, and it will also indicate which codes are appropriate for the field. Select 'OK' and enter the appropriate response.

Guidelines for First Data Entry and Second Data Entry

To reduce the likelihood that a data entry error will be repeated during second data entry, first data entry and second data entry should not be done by the same person. It is understood that this is not possible at all FCs. If the same person is performing both first data entry and second data entry, following are two suggestions:

1) For the same participant, do first data entry and second data entry at least a day apart.

OR

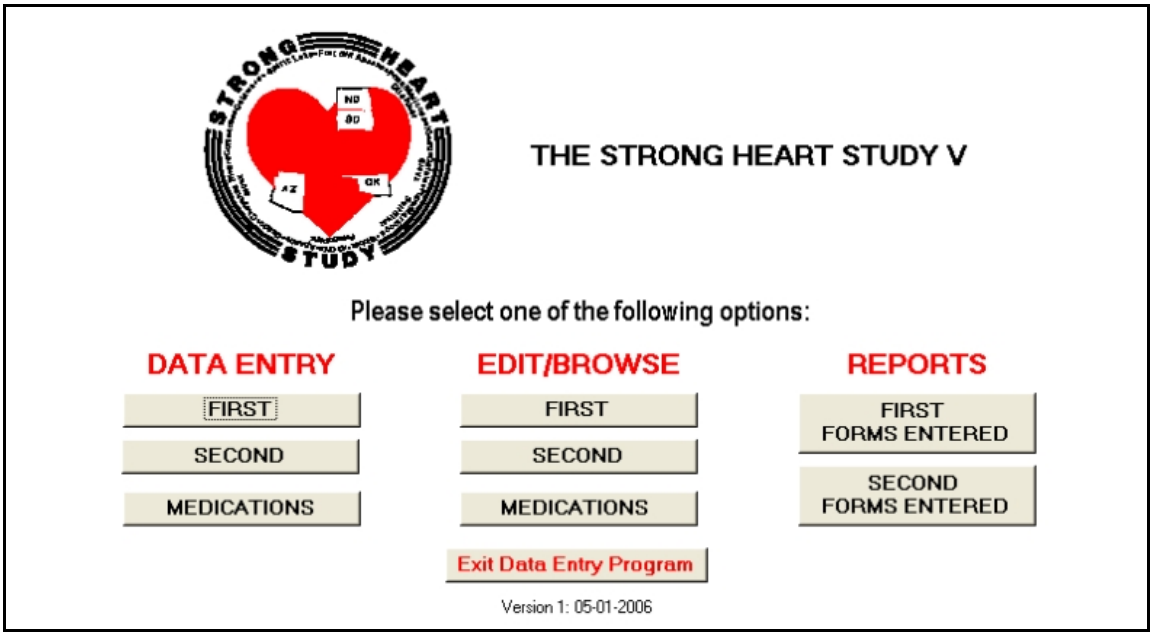
2) If both first data entry and second data entry must be entered on the same day and there are data for more than one participant:

   i) Do first data entry for all of the participants, then
   ii) Do second data entry for all of the participants in the same order that data entry was performed.

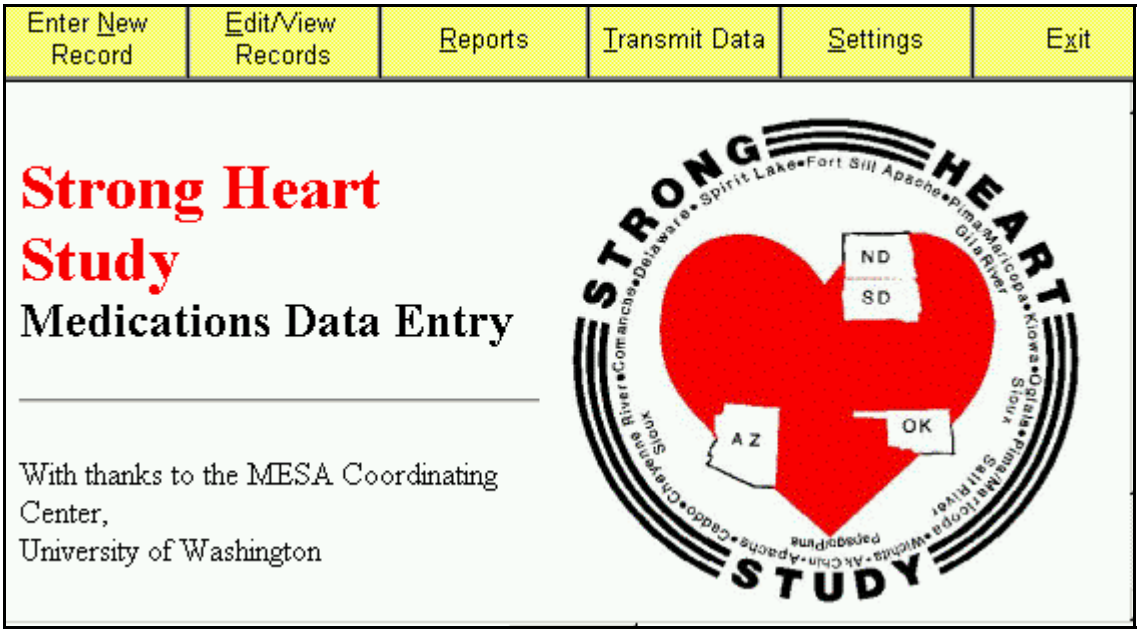
Medications

Data Entry

To enter the medications data, select 'DATA ENTRY MEDICATIONS' from the SHS 'MAIN MENU.'

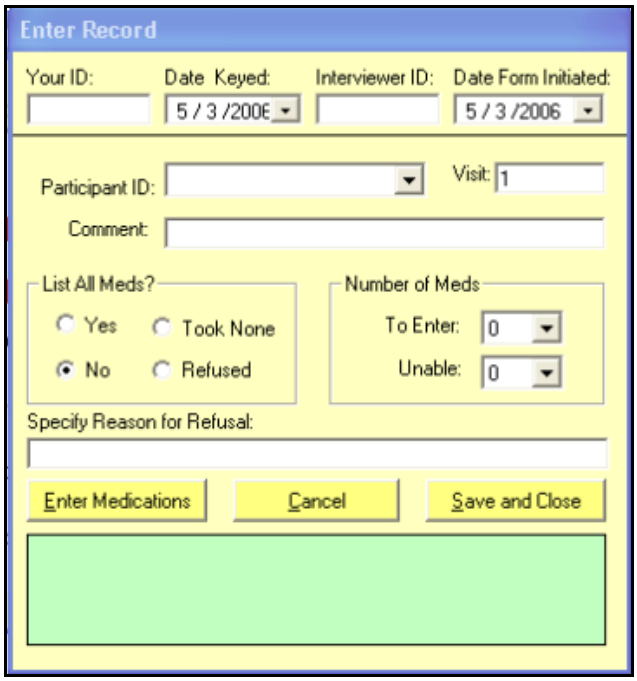


After 'Data Entry Medications' is selected, the following screen appears.



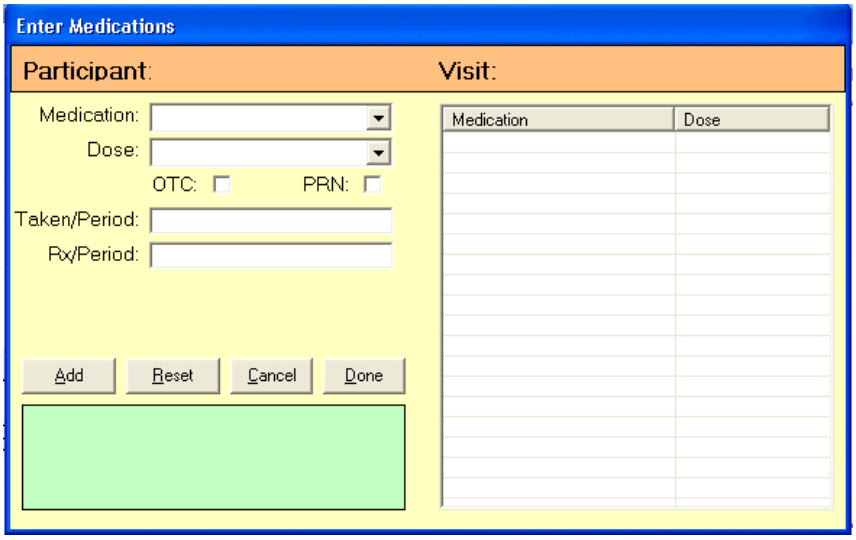
Ignore the 'Reports,' 'Transmit Data' and 'Settings' buttons. This Medication Data Entry Program was modified from the MESA study for use in the SHS. These buttons are specifically for MESA. **Do not click any of them**. If one is accidentally selected and error messages pop up, click on the 'Exit' button in the top right-hand corner of the screen to return to the 'Main Menu' and start over again.

To enter new medications, click the 'Enter New Record' button in the top left-hand corner of the Medication Data Entry 'Main Menu.', after which the following screen appears.



'Your ID' = Data Entry Code
'Date Keyed' = defaults to the current date and can be skipped
'Interviewer ID' = Interviewer Code (page 3 of medications form)
'Date Form Initiated' = Interview Date (page 3 of medications form) if not entered, the date this form is entered will be assigned
'Participant ID' = SHS ID
'Visit' ignored, because the SHS does not use this
'Comment' = to record comments (page 3 of medications form), specifically to record use of any home remedies
'List All Meds' = Yes or Took None in most cases
'Number of Meds' = total number of medications to be entered, both prescription and over-the-counter (OTC) medications, used to cross-check the number of medications entered first
'Specify Reason for Refusal' = if participant refuses to provide medications information, enter reason here
'Enter Medications' for a list of medications
'Cancel' returns to Medication Data Entry Main Menu without saving data entered
'Save and Close' returns to Medication Data Entry Main Menu, after saving data entered

If the 'Enter Medications' button is selected from the above 'Enter Record,' screen the following screen appears.



When the medication name is entered, type in the first few letters. The medication menu will scroll down to match the medication name being typed. Click the dose that matches the strength listed on the paper form. If the correct strength cannot be found, choose '---,' if it appears in the list; otherwise, choose the closest dose. Medication codes assigned for this particular medication will not be affected. If the medication is the same, with a different package, strength or brand, it will have a different NDC code, but the Class Code will be the same. In the SHS, the Class Code is used primarily to determine treatment; therefore, it is perfectly OK to do this.

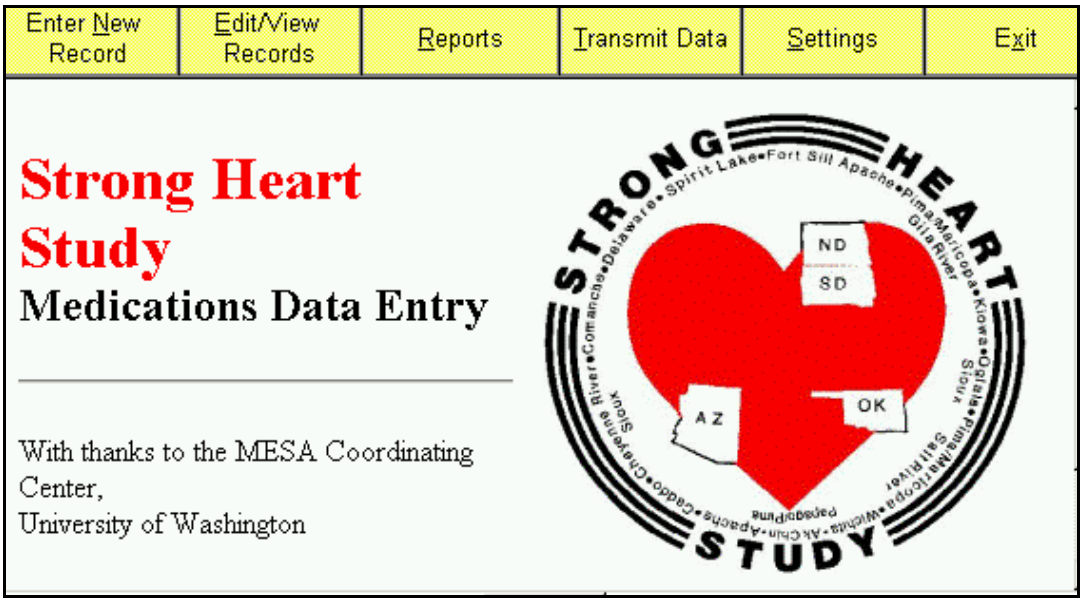
Do not type the medication name too fast, especially when the medication name is long. The program only identifies the first thirteen characters of the medication name. If the typing is too fast, the pointer will roll back to the top of the menu, as if a match cannot be found, and the medication name must be retyped.

If a match cannot be found, check the spelling with your Field Coordinator. If the spelling is correct and still a match cannot be found, click 'Add' to complete the data entry. Keep a log of these unmatched medications and send the log to the CC once a month. The CC will check with MESA investigators in Seattle to solve the problem.

Put a check in the correct box to indicate if this is an over-the-counter (OTC) medication. The next three boxes are for entering the number of doses taken in what time period; check the 'PRN' box, if the medication is taken 'as needed.' Click the 'Update' button. The medication will be added to the list on the right-hand side. Repeat this process for all the remaining medications. After all medications have been entered, click the 'Done' button; all entries will be saved.

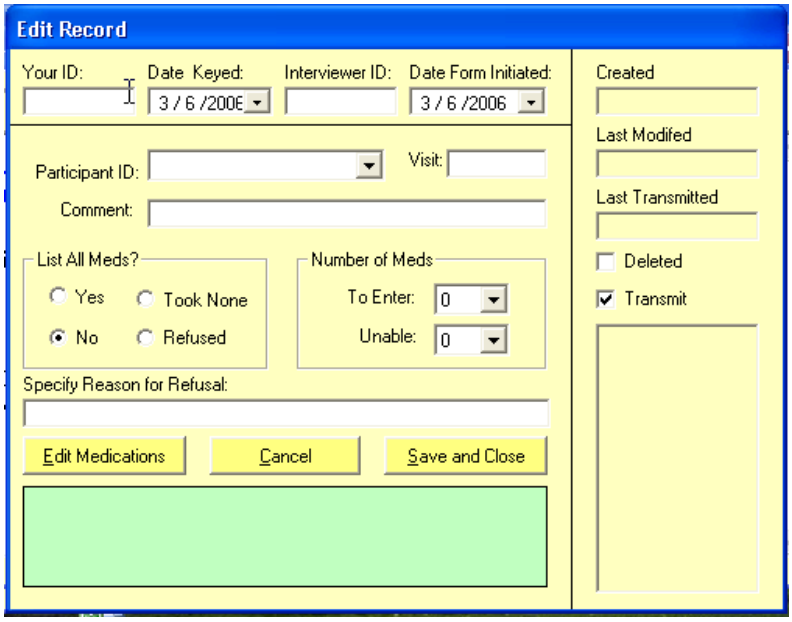
Edit Browse

If 'EDIT/BROWSE MEDICATIONS' from the SHS 'MAIN MENU' is selected, the following Medication Data Entry Program 'Main Menu' appears.



As in data entry, **ignore the 'Reports,' 'Transmit Data' and 'Settings' buttons**. This Medication Data Entry Program was modified from the MESA study for use in the SHS. These buttons are specifically for MESA. **Do not click any of them**. If one is accidentally selected and error messages pop up, click on the 'Exit' button in the top right-hand corner of the screen to return to the 'Main Menu' and start over again.

To edit medications, click the 'Edit/View Records' button, after which the following screen appears.



'Your ID' = Data Entry Code
'Date Keyed' = defaults to the current date and can be skipped
'Interviewer ID' = Interviewer Code (page 3 of medications form)
'Date Form Initiated' = Interview Date (page 3 of medications form) if not entered, the date this form is entered will be assigned
'Participant ID' = SHS ID
'Visit' ignored, because the SHS does not use this
'Comment' = to record comments (page 3 of medications form), specifically to record use of any home remedies
'List All Meds' = Yes or Took None in most cases
'Number of Meds' = total number of medications to be entered, both prescription and over-the-counter (OTC) medications, used to cross-check the number of medications entered first
'Specify Reason for Refusal' = if participant refuses to provide medications information, enter reason here
'Enter Medications' for a list of medications
'Cancel' returns to Medication Data Entry Main Menu without saving data entered
'Save and Close' returns to Medication Data Entry Main Menu after saving data entered

To return to the SHS 'Main Menu,' click the 'Exit' button in the top right-hand corner of the Medication Data Entry 'Main Menu.'

Data Clean Up

Data will be stored at the CC as it is entered (form-by-form), so there will be no need for separate backup or transmission procedures at the FC computers. Opportunities to edit previously entered data through the online Data Entry program will be limited, as CC staff will "sweep" all raw data on a weekly basis, Mondays before 12:00 Noon Central Time -- moving them from the online entry database into first-stage cleaning (see below).

The CC will be responsible for identifying: missing forms, orphan records (records which do not belong to any participant according to the SHS ID listed on the form), incomplete forms, discrepancies between 'First Data Entry' and 'Second Data Entry' and values which appear to be unreasonable. The FCs will be responsible for providing information to the CC so that the aforementioned problems can be rectified.

Data clean up will occur in two stages.

Stage One: Raw data are examined at the CC. Incomplete items and discrepancies between 'First Data Entry' and 'Second Data Entry' are listed and sent to the FCs via email. The Field Coordinators will fax copies of the form with correct information circled and all confidential information marked off and participant SHS ID written on it within five working days. The CC will make corrections to the database.

Stage Two: Statistical checks will be performed to identify unreasonable values. These items will be listed and sent to the FC. FC personnel will perform verification of the suspect data. A response (fax, as detailed under stage one) is expected within five working days.

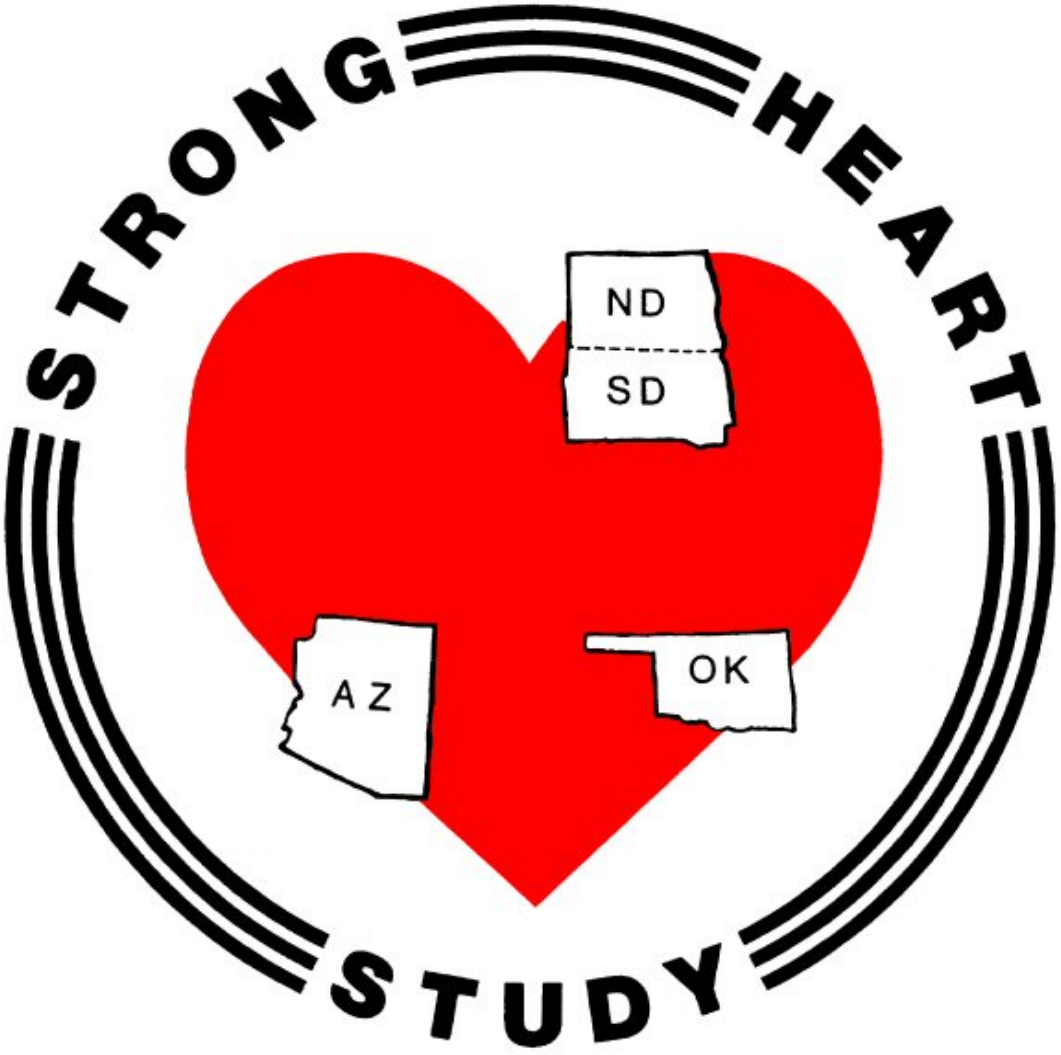
Upon completion of both stages, cleaned records will be appended to the Main Database. Please note that the Main Database will be used to perform analyses for reports and publications. Therefore, if a FC were to identify any data entry errors after data clean up has been completed; they must notify the CC promptly.

In cases where there are many data entry errors found in stage one of data clean up, the CC may request that changes to a specific record be made at the FC and said records be reentered through the online Data Entry program.

If You Have Questions

So that your questions can be answered efficiently, please address your queries to the following CC personnel:

Data Entry Programs - Martha Stoddart, MS
Data Clean Up - Debra Gates
Forms - Jeunliang Yeh, MPH, PhD
Data Entry On-line Server
Log-ins or Terminal Services
(FC computer) client program - Yiming Wang, MS



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Eight

PSYCHOSOCIAL QUESTIONNAIRES

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Eight

PSYCHOSOCIAL QUESTIONNAIRES

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME VIII

PSYCHOSOCIAL QUESTIONNAIRES

Table of Contents

1. RATIONALE FOR PSYCHOSOCIAL QUESTIONNAIRES

Studies of Psychosocial Factors

Over the last twenty years, scientists and clinicians alike have been looking at the relationship between psychosocial factors and health outcomes. To date, there has been increasing recognition among the medical community that psychosocial factors (e.g., depression, anxiety, social isolation, and spirituality) contribute to many forms of disease. One of the most well documented areas in this research has been in the associations between psychosocial variables and cardiovascular disease.

The idea that psychosocial variables could affect health is not a new concept. In 1628, while describing the circulatory system, William Harvey noted that emotions affect the heart. William Osler, often described as the father of internal medicine, described the typical heart disease patient as "a keen and ambitious man, the indicator of whose engine is always at full speed ahead." (Clay, 2001). Since then, our knowledge of the effects of psychosocial variables and disease outcome has increased considerably. Depression, anxiety, and social support are each related to outcomes after the onset of heart disease, and several intervention studies have shown efficacy in psychosocial intervention improving both the outcome and the quality of life of individuals suffering from heart disease (Clay, 2001) Posttraumatic stress disorder (PTSD) is more common among many American Indian populations (Beals, Manson et al. 2005; Beals, Novins et al. 2005) than others in the U.S.; further, PTSD has been shown to be related to cardiovascular disease among American Indians (Sawchuk, Roy-Byrne et al. 2005). While some of these psychosocial factors appear to be environmentally created, others appear to have a genetic component. Eysenck (1982) concluded through the study of twins separated at birth, "that genetic factors contribute something like two-thirds of the variance in major personality dimensions". Loehlin and his colleagues followed 400 children who were brought up in either biological or adoptive families and concluded adopted children primarily resembled their biological parents in personality characteristics, even though they had never been in contact (Loehlin, Willerman, & Horn, 1987). These implications both in health outcome and genetic implications justify the use of psychosocial instruments in Phase V of the Strong Heart Study. The Strong Heart Study provides a rare opportunity to continue to look at how these factors contribute to both the physical and psychological outcomes of an American Indian population.

The forms are designed to be self-administered. Participants can choose not to answer specific questions, however, SHS staff should check all the forms to make sure sections have not been inadvertently missed. The following questionnaires are administered to all Phase V SHS participants: Quality of Life – SF-12; CES-D depression scale; Social Support, Posttraumatic Stress Screening Scale, Generalized Anxiety Screening Scale, Spirituality, and Fatalism.

REFERENCES

Clay, R. A. (2001). Research to the heart of the matter. *Monitor on Psychology*, 32, 1, 42-45.

Beals J., Manson S.M., Whitesell N.R., Spicer P., Novins D.K., Mitchell C.M., et al. Prevalence of DSM-IV disorders and attendant help-seeking in two American Indian reservation populations. (2005) *Archives of General Psychiatry, 62,* 99-108.

Beals J, Novins DK, Whitesell NR, et al. Prevalence of mental disorders and utilization of mental health services in two American Indian reservation populations: Mental health disparities in a national context. *American Journal of Psychiatry*. 2005;162(9):1723-1732.

Eysenck, H. J. (1982). *Personality Genetics and Behavior*. New York: Praeger.

Loehlin, J. C., Willerman, L., & Horn, J. M. (1987). Personality resemblance in adoptive families: A ten-year follow-up. *Journal of Personality and Social Psychology*, 53, 961-969.

Sawchuk CN, Roy-Byrne P, Goldberg J, Manson S, Noonan C, Beals J, Buchwald D The relationship between post-traumatic stress disorder, depression and cardiovascular disease in an American Indian tribe. Psychol Med. 2005 Dec;35(12):1785-94.

2. QUALITY OF LIFE - SF-12 Form

The SF-12 Health Survey Questionnaire will be used again in Phase V of the Strong Heart Study. The SF-12 replaces the SF-36, which was used in Phases II and III of SHS. The main reason for using the SF-12 instead of the SF-36 is to save time by using this shorter version of the Health Survey questionnaire. The SF-12 version generates two summary measures, physical health and mental health, describing health-related quality of life. These two summary scores, the physical component (PCS-12) and the mental component (MCS-12) outcome scores, are compatible to those generated by the SF-36 and have been validated in various populations.

Analyses of the Phase II SF-36 scale have now been published (Beals, Welty et al. 2006). This was a first step and focused on whether or not the SF-36 worked well in the SHS populations–and it did. Interestingly, however, the physical and mental health dimensions were more highly related to one another than in many other samples; this may reflect a more holistic view of health.

Subjective health, or how people see their own health, is increasingly recognized as an important factor in whether people take the necessary steps to either prevent health problems or to seek services for such problems. The SF-12 is an important measure of subjective health. Further, recent research has suggested that, to some degree, measures such as the SF-12 may tap genetic predispositions (Romeis, Heath et al. 2005).

See Form S9, Volume 3, Appendix C.

REFERENCES

Beals J, Welty TK, Mitchell CM, Rhoades DA, Yeh JL, Henderson JA, Manson SM, Buchwald DS. Different factor loadings for SF36: the Strong Heart Study and the National Survey of Functional Health Status. J Clin Epidemiol. 2006 Feb;59(2):208-15.

Romeis JC, Heath AC, Xian H, Eisen SA, Scherrer JF, Pedersen NL, Fu Q, Bucholz KK, Goldberg J, Lyons MJ, Waterman B, Tsuang MT, True WR Heritability of SF-36 among middle-age, middle-class, male-male twins. Med Care. 2005 Nov;43(11):1147-54.

3. CENTER FOR EPIDEMIOLOGICAL STUDIES DEPRESSION SCALE (CES-D)

Depression and Health A vast research literature exists establishing to varying extents the relationship between depression and health. Measurements of depression can be useful to assess the association of depressive symptoms with health risk behavior, prevalence and incidence of cardiovascular disease, and also to evaluate the effect of health status or CHD on mood states.

Assessment of Depression The Center for Epidemiologic Studies of Depression Scale (CES-D) scale was originally developed as a general measure of depression (Radloff, 1977). It is a 20-item self-report instrument designed by the National Institute of Mental Health to measure current level of depressive symptomatology, and especially depressive feelings. While the items were chosen (from 5 previously used depression scales) to represent all major components of depressive symptomatology, the CES-D measures demoralization and psychologic distress, as well as depression. The major components of depressive symptomatology include: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, loss of appetite, sleep disturbance, and psychomotor retardation. Items are rated on a 4-point scale indicating the degree of their occurrence during the last week. The scales range from "rarely or not at all" to "most of the time." The scale can distinguish between clinical groups and general community groups. Although it is usually scored continuously, there are various cutoff scores for clinical depression, with reasonable associations between cutoff scores and a clinical diagnosis (Beals et al, 1991).

CES-D Utilized by Similar Studies The CES-D is the standard scale used in numerous large-scale studies including the Honolulu Heart Program, the Inter-Tribal Heart Project (Menominee, Red Lake & White Earth), Cardia, and the Stanford Coronary Prevention Project.

Reliability and Validity The CES-D has been found to have both adequate test-retest reliability, and internal consistency. The internal reliability (Cronbach's Alpha) of the CES-D is 0.89 (Radloff, 1977).

Administration Designed for self-administration or interview format.

Caveat: As with any SHS data, the user should carefully consult the manual and forms for the phase(s) of SHS involved. The SHS website provides online forms (annotated with variable names) and manuals for each phase showing how the data were scored. Please note that for the CES-D form, the numbering of questions differed slightly in the early phases compared to the later phases.

CES-D Scoring

The original CES-D is a 20-item form. Please note that the first question on the SHS Phase V CES-D form is NOT a CES-D question, per se. This question is un-numbered, asks "How is this questionnaire administered?", and is NOT included when computing the CES-D score for a participant. In the cohort exams, this item was numbered question 1, thus changing the SHS CES-D question numbers relative to the original 20-item CES-D questionnaire. Note also that the question "During the past year, I have felt depressed or sad" was added by SHS to this form. This added question (question number 21 in the Family study and number 22 in the cohort exams) also must **NOT** be included when computing the total score for the CES-D form.

To date, SHS investigators using the CES-D data limited their analyses to complete forms only (no skipped, refused, missing answers). Instructions in the literature indicate that no CES-D form having more than one missing answer should be used. It should be noted that the SHS CES-D form data entry included entry into the database of the number 9 as an indicator for a missing, etc answer.

Inspection of the CES-D form from any phase of SHS will demonstrate that the answers to each of the 20 CES-D items are always scored as follows:

Rarely or none of the time (less than 1 day) = 1
Some or a little of the time (1-2 days) = 2
Occasionally or a more moderate amount of the time (3-4 days) = 3
More or all of the time (5-7 days) = 4
Not applicable = 9

Once all records including the number 9 for any question are eliminated (or addressed according to the analysis plan), there are three additional steps to scoring the 20-item version of the CES-D:

1. The scores 1 through 4 in the data file for each of the 20 items in this instrument should be transformed to the traditional CES-D form values of 0, 1, 2 or 3. There are four exceptions (nos. 4, 8, 12, and 16) which are "reverse-scored" items where the transformation must be 1 to 3, 2 to 2, 3 to 1, and 4 to 0.

Specifically, the four items requiring reverse-scoring transformation are:

4. I felt that I was just as good as other people.
8. I felt hopeful about the future.
12. I was happy.
16. I enjoyed life.

2. Once you have transformed the value for each item, compute a total, adding the values for each of the 20 items. The resulting score should range between 0 and 60. (Reminder: Do not compute a total if there is more than one missing answer (blank entry or 9) (blanks and 9s must be removed from the data file). However, computer programs to impute missing data can be used.)

3. A high score on the CES-D indicates a high level of distress. A score of 16 may suggest a clinically significant level of psychological distress. It does not necessarily mean that the participant has a clinical diagnosis of depression. In a general population, about 20% would be expected to score in this range (16 or higher). (Reminder: Item #21 ("During the past year, I have felt depressed or sad") on the SHS form is not a part of the CES-D scale and must be interpreted separately.)

Score Interpretation: The CES-D is a general measure of depression. It has been used as a screening measure in some studies (e.g., Lyness et al, 1999). However, Lyness used a scoring system of 1-4 (instead of the usual 0-3), with a score of 36, 41, and 43 having been used as markers for possible major depression. Comparable scores would be 16, 21, and 23 when using the traditional 0-3 scoring system. None of this work has been done with American Indians.

Rather than asking staff to score the CES-D, we suggest that each participant be given a referral list. Those listed on the referral list should be available locally, have expertise in mental health, and have agreed to be listed. Participants can then decide for themselves whether or not to approach those on the referral list. In very rare cases, a participant may appear visibly distressed in answering these questions; in such circumstances, the staff member should cease asking the questions and offer the referral list immediately. The staff member should then note in the chart that the referral list and a verbal offer of a referral had been given to the participant.

Assessment of Depression by the Strong Heart Study In a pilot test of the psychosocial forms performed in Phase II, the CES-D questionnaire was administered to about 200 SHS participants in Oklahoma and about 350 in the Dakotas. In Phase III, the CES-D was only administered to SHS participants in Oklahoma. Analysis of the Phase II CES-D data from one of the Dakota Center Tribes showed that males and females were similar on psychological, health-related, and cultural behaviors (Plaud et al, 1998). Family history of diabetes was associated with depression (Plaud et al, 1997). Further analyses of the results of SHS data on depression are planned.

See Form S10, Volume 3, Appendix C.

REFERENCES

Beals J, Manson SP, Keane EM, & Dick RW. Factorial structure of the Center for Epidemiological Studies-Depression scale among American Indian College students. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*. 1991; 3: 623-627.

Lyness JM, Caine ED, King DA, Cox C, Yoediono Z. Psychiatric Disorders in Older Primary Care Patients. *Journal of General Internal Medicine.* 1999;14: 249-254.

Plaud JJ, Schweigman K, Welty TK. Health and depression among American Indians: Psychosocial data from the Strong Heart Study Phase II. *International Journal of Rehabilitation and Health*. 1997; 3:51-59.

Plaud JJ, Schweigman K, Welty TK. Health-related and cultural gender differences in an aging Northern Plains Indian Population. *Journal of Clinical Geropsychology*. 1998; 4:111-118.

Radloff L. The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychosocial Measurement*. 1977; 1: 385-401.

4. SOCIAL SUPPORT

Definition of Social Support

Definitions of social support include objective and subjective elements of social support from the ability to gain tangible (instrumental) support from friends (such as a car ride), to appraisal or advice and also emotional support. Cobb emphasizes that the individual believes he/she is esteemed, cared for and loved and belongs to a network that fosters communication and mutual obligation.

Early Work on Social Support

Some of the early work on social support focused on communities in transition. Cassel notes that individuals involved in rapid change of culture or stress (change in social support) may be more susceptible to disease. One study by Cassel and Tyroler noted that 1st generation workers who moved from rural communities had more health problems than second generation workers, who they theorized were not so much in transition and were more familiar with life in a factory town. Marmot, studying Japanese men and controlling for the usual cardiovascular risk factors, noted that 5 out of 6 measures of social assimilation with western culture correlated with increased prevalence of CHD (controlling also for culture of upbringing). However, there were some limitations with this study as it was cross-sectional. Bruhn, Phillips and Wolf noted members of the community of Roseto Pennsylvania in the years 1955-1965 had low rates of CVD compared to other surrounding communities. These lower rates of CVD were felt to be related to differences in communities and social cohesion; it was predicted that loosening of family ties and community cohesion would be accompanied by an increase in CVD - and this is exactly what happened.

Given the social disruption endured by American Indian tribes over the last few hundred years, it would not be surprising that changes in social support/culture may contribute to health problems. However, there are few such studies examining the relationship between social support and health in American Indians. A number have addressed the issues in non-Indians, indicating a correlation of social support to later CVD or mortality.

Social Support and Mortality

Berkman and Syme examined mortality in 6928 people in the Alameda County study. They used a social network index based on general categories of marriage, contacts, church membership, and membership in other groups and weighted questions to form an index score. The age adjusted relative (mortality) risk for those who had the fewest social connections (based on their social network index score) was 2.3 for men and 2.8 for women.

House and colleagues in 1982 in the Tecumseh Study (N=2554) looked at different types of social contacts and assessed overall mortality. They prospectively examined categories of social contact, involvement in organizations, social activities, and passive solitary pursuits. Results controlled for age, CAD, FEV1 and smoking and appeared significant primarily in men, with protective factors being marriage, frequency of meeting of volunteer organizations, and frequency of attending social activities-sporting events/lectures.

Orth-Gomer and Johnson (1987) in Sweden used a social interaction index, which encompassed frequency and type of visits with family members, friends, neighbors and coworkers to prospectively assess mortality and CVD mortality in 17,433 people. Controlling for age, smoking, exercise and chronic illness yielded a risk estimate of 1.36 (p=.024) for increased mortality with a low social interaction score. When controlling for cardiovascular disease instead of chronic illness in the model, the analysis yielded a similar risk estimate of 1.37 with p=.07.

Kaplan et al (1998) studied 13,301 people from North Karelia, Kuopio and Eastern Finland using a social connections index that yielded a score and included categories of marital status, frequency of visiting friends/relatives, number of homes visited, meetings, clubs, with the dependent variable being all-cause death or CVD/IHD. Adjusting for age, geographic location, cholesterol, blood pressure, BMI, smoking, family history of CVD, urban/rural and education, and comparing the lowest quintile to all others, all-cause death revealed an OR of 2.0, death from CVD an OR of 1.8, and IHD an OR of 1.72.

Hanson and others in studying "Men born in 1914 in Malmo Sweden" examined an N=621 with univariate results indicating an elevated mortality risk in three categories: adequacy of social support, availability of emotional support and marital status but not for material or informational support, adequacy of emotional support, adequacy of social influence, contact frequency or social anchorage.

In an HMO study of 2603 that examined mortality along with incidence of disease, Vogt et al used a tool that evaluated social network scope, the size of the network, and frequency of contact. Adjusting for age, sex, SES, smoking, and subjective health at baseline, they found that decreased mortality was strongly associated with network scope and different network domains, i.e., different types of relationships; also, size of network and frequency of contact were significantly associated with decreased risk. When examining IHD, network scope was correlated with decreased risk but otherwise none of the social support measures correlated with rates of IHD, HTN, CA, or CVA. The authors suggested social networks might be more important in supporting recovery than in preventing incidence of new disease.

Penninx et al evaluated more varied types of social support in a longitudinal study of mortality that included structural support networks and functional receipt of social support (including two subcategories, one of instrumental social support - help with meals, chores, rides etc., and one of emotional support received - how often during the previous year they talked to a network member about personal experiences and feelings). Also, perceived support - sense of loneliness was measured. With an N=2829, and adjusting for age, sex, education, specific

diseases, physical limitation, self rated health, alcohol and smoking, they found that high instrumental support actually predicted a higher risk of mortality; those with emotional support had about 1/2 the risk of dying and those with the highest levels of loneliness had 1.89 higher risk of death.

These results suggest that social networks or types of social contacts seem to be important in relation to health, and that instrumental support (loans, car rides) may not be a major contributor to ameliorating health risks. Furthermore, some studies indicated that perceived emotional support may also play an important role in mediating the reduced risk of mortality.

The social support questions here were used in the American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project (AI-SUPERPFP). This large study was conducted in both the Northern Plains and in the Southwest (Beals, Manson et al. 2003); tribal confidentiality promises do not allow the tribes to be publicly mentioned. This measure derived from two sources: the National Comorbidity Study (NCS; Kessler et al., 1994) and the American Indian Vietnam Veterans Project (AIVVP) (National Center for Posttraumatic Stress Disorder and the National Center for American Indian and Alaska Native Mental Health Research 1996; Beals, Manson et al. 2002). The NCS measures were selected, in large part, so that one could compare data to that of a national sample. The AIVVP measures, on the other hand, are more reflective of an integrated quantitative/qualitative approach to measure. All items were reviewed and edited by focus groups of American Indian participants.

The questions selected encompass various types of social support, including perceived emotional support, social networks, tangible and negative social support. Negative social support may be contributory to poor health outcomes in many Indian communities.

See Form S11, Volume 3, Appendix C.

REFERENCES

Beals J, Manson SM, Mitchell CM, Spicer P, The AI-SUPERPFP Team. Cultural specificity and comparison in psychiatric epidemiology: Walking the tightrope in American Indian research. *Culture, Medicine and Psychiatry.* 2003;27:259-289.

Berkman, L. F., & Syme, S. (1979). Social Networks, Host Resistance And Mortality: A Nine-Year Follow-Up Study Of Alameda County Residents. American Journal Of Epidemiology, 109(2), 186-204.

Bruhn, J. G., Phillips B., Wolf S. (1974) Social readjustment and illness patterns. Comparison between first, second and third generation Italian-Americans living in the same community. J Psychosom Med., 16, 387-394.

Cassel, J. (1976). The Contribution of the Social Environment to Host Resistance. American Journal of Epidemiology, 104(2), 107-123.

Cassel, J., Tyroler HA. (1961). Epidemiological studies of culture change: I. Health status and recency of industrialization. Arch Environ Health 3:25-33.

Cobb, S. (1976). Social support as a moderator of life stress. Psychosomatic Medicine, 38(5), 300-314.

Cohen S, Mermelstein R, Kamarck T and Hoberman HM. (1985) Measuring the functional components of social support. In Social support: Theory, research, and applications. (pp.73-94). Edited by Sarason IG, Sarason BR. The Hague, The Netherlands, Martinus Nijoff.

Eyler, A. A., Brownson, R. C., Donatelle, R. J., King, A. C., Brown, D., & Sallis, J. F. (1999). Physical activity social support and middle and older aged minority women: results from a U. S. study. Social Science & Medicine, 49(6), 781-9.

Hanson, B. S., Sven-Olof, I., Janzon, L., & Lindell, S.-E. (1989). Social Network And Social Support Influence Mortality In Elderly Men. American journal of Epidemiology, 130(1), 100-111.

House, J. S., Robbins, C., & Metzner, H. (1982). The Association Of Social Relationships And Activities With Mortality: Prospective Evidence From The Tecumseh Community Health Study. American Journal of Epidemiology, 116(1), 123-140.

Kaplan, G. A., Salonen, J. T., Cohen, R. D., Brand, R. J., Syme, S., & Puska, P. (1988). Social Connections And Mortality From All Causes And From Cardiovascular Disease: Prospective Evidence From Eastern Finland. American Journal of Epidemiology, 128(2), 370-380.

Lee ET, Welty TK, Fabsitz R, Cowan LD, Le N, Oopik AJ, Cucchiara AJ, Savage PJ and Howard BV. (1990) The Strong Heart Study, A study of cardiovascular disease in American Indians: Design and methods. Am J of Epidemiol. 132:1141-1155

Marmot, M., & Syme, S. (1976). Acculturation and coronary heart disease in Japanese-Americans. Journal of Epidemiology, 104(3), 225-247.

Orth-Gomer, K., & Johnson, J. V. (1987). Social network interaction and mortality. Journal of Chronic Disease, 40(10), 949-957.

Penninx, B., van Tilburg, T., Kriegsman, D., Deeg, D., Boeke, A., & van Eijk, J. (1997). Effects of Social Support and Personal Coping resources on Mortality in Older Age: The Longitudinal Aging Study Amsterdam. American Journal of Epidemiology, 146(6), 510-519.

Spangler, J. G., Dignan, M. B., & Michielutte, R. (1997). Correlates of tobacco Use among Native American women in western North Carolina. Public Health Brief, 87(1), 108-111.

Vogt, T. M., Mullooly, J. P., Ernst, D., Pope, C. R., & Hollis, J. F. (1992). Social Networks As Predictors of Ischemic Heart Disease, Cancer, Stroke And Hypertension: Incidence, Survival And Mortality. Journal of Clinical Epidemiology, 45(6), 659-666.

Social Support – background material for questions from the AI-SUPERPFP

Dohrenwend, B. P. (1982). Psychiatric Epidemiology Research Interview (PERI): PERI Marital dissatisfaction scale. New York, Columbia University, Social Psychiatry Research Unit.

Kessler, R. C., K. A. McGonagle, et al. (1994). "Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Study." Archives of General Psychiatry 51: 8-19.

Kulka, R. A., W. A. Schlenger, et al. (1988). Contractual report of the findings from the National Vietnam Veterans Readjustment Study. Research Triangle Park, NC, Research Triangle Institute.

Spanier, G. B. (1976). "Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads." Journal of Marriage and the Family 38: 115-128.

Zimet, G. D., N. W. Dahlem, et al. (1988). "The Multidimensional Scale of Perceived Social Support." Journal of Personality Assessment 52: 30-41.

Source Documents:

Beals J, Manson SM, Shore JH, Friedman M, Ashcraft M, Fairbank JA, Schlenger WE. The prevalence of posttraumatic stress disorder among American Indian Vietnam veterans: disparities and context. J Trauma Stress. 2002 Apr;15(2):89-97.

National Center for Posttraumatic Stress Disorder and the National Center for American Indian and Alaska Native Mental Health Research. *Matsunaga Vietnam Veterans Project.* White River Junction, VT: National Center for PTSD; September 1 1996.

NCS Social Support. Kessler, R.C., McGonagle, K.A., Zhao, S., Nelson, C.B., Hughes, M., Eshleman, S., Wittchen, H., & Kendler, K. (1994). Lifetime and 12- Month Prevalence of DSM-III-R Psychiatric Disorders in the United States. Archives of General Psychiatry, 51, 8-19.

5. POSTTRAUMATIC STRESS DISORDER (PTSD)

American Indian populations are exposed to more trauma than many other Americans. For instance, mortality statistics indicate greater risk for these populations than others for death from unintentional injuries and violence (U. S. Department of Health and Human Services 2001). Indian participants report both more types of traumatic events and greater frequency of events (Manson, Beals et al. 1996; National Center for Posttraumatic Stress Disorder and the National Center for American Indian and Alaska Native Mental Health Research 1996; Ritsher, Struening et al. 2002; Manson, Beals et al. 2005). Therefore, it is not surprising that the constellation of problems associated with such events, encapsulated by the DSM diagnosis(American Psychiatric Association 1994) of PTSD is found at higher rates in some Indian populations.(Manson, Beals et al. 1996; Beals, Manson et al. 2002; Beals, Manson et al. 2005; Beals, Novins et al. 2005)

Recent research has indicated that psychiatric disorders such as major depression are risk factors for cardiovascular disease (Bankier and Littman 2002; Schnittker 2005; Simon and Von Korf 2006). More recently the role of PTSD and cardiovascular diseases has also received attention (Sawchuk, Roy-Byrne et al. 2005). Given the symptoms of hyper-excitability, increased vigilance, and overall anxiety associated with this disorder, PTSD promises to be an important risk factor for cardiovascular disease. Preliminary analyses of data collected by the American Indian and Alaska Native Programs at the University of Colorado support this hypothesis (Sawchuk, Roy-Byrne et al. 2005) and additional research is in progress. However, this research is all cross-sectional, thus, addition of PTSD items to Phase V of the SHS will provide a critical next step in understanding the relationship between PTSD and cardiovascular disease.

PTSD describes the symptoms some people have after experiencing or witnessing a horrible event. The symptoms are broken out into 3 types: re-experiencing or reliving the event; avoidance of places, people or things that might remind the person of the trauma, and increased vigilance or arousal. These reactions have to last at least a month to qualify as being PTSD.

The measure being used here comes from the same study as the anxiety measure to be used in Phase V of SHS. The PTSD measure has 6 items. The first asks whether or not the person has experienced a trauma. While examples of possible traumas are provided (victim of violent crime, seriously injured in an accident, being assaulted, seeing someone seriously injured or killed, or being the victim of a natural disaster), the participant is not asked to describe the event at all. If they have experienced a trauma, the remaining 5 questions ask about: 1) reliving the experience, 2) being less interested in things, 3) problems sleeping or concentrating, 4) avoiding places or things that remind one of the trauma, and 5) whether some of these problems have lasted more than 1 month.

Staff may be worried about a participant's reactions to these questions. Most people, even those with PTSD, will answer them with no problem. However, staff should be prepared with a list of referrals (see example) in case a participant wants to talk to someone about their trauma and symptoms.

See Form S12, Volume 3, Appendix C.

REFERENCES

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth edition (DSM-IV)*. Washington, DC: American Psychiatric Association; 1994.

Bankier B, Littman AB. Psychiatric disorders and coronary heart disease in women -- a still neglected topic: review of the literature from 1971 to 2000. Psychother Psychosom. 2002 May-Jun;71(3):133-40.

Beals J, Manson SM, Shore JH, Friedman M, Ashcraft M, Fairbank JA, Schlenger WE. The prevalence of posttraumatic stress disorder among American Indian Vietnam veterans: disparities and context. J Trauma Stress. 2002 Apr;15(2):89-97.

Beals J., Manson S.M., Whitesell N.R., Spicer P., Novins D.K., Mitchell C.M., et al. Prevalence of DSM-IV disorders and attendant help-seeking in two American Indian reservation populations. (2005) *Archives of General Psychiatry, 62,* 99-108.

Beals J, Novins DK, Whitesell NR, et al. Prevalence of mental disorders and utilization of mental health services in two American Indian reservation populations: Mental health disparities in a national context. *American Journal of Psychiatry.* 2005;162(9):1723-1732.

Manson SM. The wounded spirit: A cultural formulation of post-traumatic stress disorder. *Culture, Medicine and Psychiatry.* Dec 1996;20(4):489-498.

Manson S.M., Beals J., Klein S., Croy C.D., and the AI-SUPERPFP Team. (2005) The social epidemiology of trauma in two American Indian reservation populations. *American Journal of Public Health, 95.* 851-859

National Center for Posttraumatic Stress Disorder and the National Center for American Indian and Alaska Native Mental Health Research. *Matsunaga Vietnam Veterans Project.* White River Junction, VT: National Center for PTSD; September 1 1996.

Ritsher JB, Struening EL, Hellman F, Guardino M. Internal validity of an anxiety disorder screening instrument across five ethnic groups. Psychiatry Res. 2002 Aug 30;111(2-3):199-213.

Sawchuk CN, Roy-Byrne P, Goldberg J, Manson S, Noonan C, Beals J, Buchwald D The relationship between post-traumatic stress disorder, depression and cardiovascular disease in an American Indian tribe. Psychol Med. 2005 Dec;35(12):1785-94.

Schnittker J Chronic illness and depressive symptoms in late life. Soc Sci Med. 2005 Jan;60(1):13-23.

Simon GE, Von Korff M. Medical co-morbidity and validity of DSM-IV depression criteria. *Psychol Med.* Jan 2006;36(1):27-36.

U. S. Department of Health and Human Services. *Mental health: Culture, race, and ethnicity*. Rockville, MD: Public Health Service, Office of the Surgeon General; 2001.

6. ANXIETY

Generalized Anxiety Disorder is commonly associated with stress and, although the research is still formative, anxiety is thought to increase the risk for cardiovascular disease. Furthermore, those with CVD are thought to be at increased risk for Generalized Anxiety Disorder (Bankier and Littman 2002; Bankier, Januzzi et al. 2004; Barger and Sydeman 2005).

Generalized Anxiety Disorder is the label given to those who worry excessively most of the time. Furthermore, people with Generalized Anxiety Disorder feel that they cannot control

this worry, and many are fatigued, irritable, have difficulty concentrating, muscle tension, and disturbed sleep. Finally, in order to receive a formal diagnosis of Generalized Anxiety Disorder, the affected person must describe his/her daily life as being affected (impaired) by the symptoms (American Psychiatric Association 1994).

We ask only 3 questions about anxiety, tapping the essential components: persistent worry, difficulty controlling anxiety, and impairment due to the anxiety. This measure was developed in the context of a large study that included American Indians – and it worked well in that sample (Ritsher, Struening et al. 2002).

See Form S12, Volume 3, Appendix C.

REFERENCES

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth edition (DSM-IV)*. Washington, DC: American Psychiatric Association; 1994.

Bankier B, Januzzi JL Littman AB The high prevalence of multiple psychiatric disorders in stable outpatients with coronary heart disease. Psychosom Med. 2004 Sep-Oct;66(5):645-50.

Bankier B, Littman AB. Psychiatric disorders and coronary heart disease in women -- a still neglected topic: review of the literature from 1971 to 2000. Psychother Psychosom. 2002 May-Jun;71(3):133-40. Review

Barger SD and Sydeman SJ Does generalized anxiety disorder predict coronary heart disease risk factors independently of major depressive disorder? J Affect Disord. 2005 Sep;88(1):87-91.

Ritsher JB, Struening EL, Hellman F, Guardino M. Internal validity of an anxiety disorder screening instrument across five ethnic groups. Psychiatry Res. 2002 Aug 30;111(2-3):199-213.

7. SPIRITUALITY

Research in the general population has described prospective relationships between religious affiliation and religiosity with mortality, morbidity, and coping with physical illness (Jarvis and Northcott 1987; Levin and Schiller 1986; Idler and Benyamini 1997; Koenig, Hays et al. 1999; Koenig, Larson et al. 2001). Work from the University of Colorado has demonstrated the importance of broadening the conceptualization of religiosity in Indian communities to a more general measure of spirituality. This research has shown that the general spirituality measure is related to the SF-36 (Beals, Welty et al. 2006) and help-seeking behaviors for alcohol and drug problems (Beals, Novins et al. 2006) The inclusion of this measure in SHS V allows important extensions of this research into understanding the role of spirituality in the treatment of physical illnesses.

Four questions are asked about spirituality. The first asks generally how important spirituality is in one's life. Another asks about the amount of time spent on spiritual or religious

practices, while a third asks how important it is to the participant that his or her child participates in religious or spiritual practices (for those without children, this question asks them to answer as if they had children). The final question is about seeking comfort through spiritual or religious means.

A couple of comments are in order about these questions. Once again, focus groups of American Indian people helped develop them. They do not require someone to believe in the Christian God, for example, but are also appropriate for Christians. Also, these questions are quite general and do not ask anything specific about the person's religious or spiritual practices. But, given the sensitivity of this type of question, we remind participants that they can skip over anything they want to.

See Form S12, Volume 3, Appendix C.

REFERENCES

Beals J, Novins DK, Whitesell NR, Mitchell CM, Manson SM, The AI-SUPERPFP Team. Help-seeking for substance use problems in two American Indian reservation populations. *Psychiatric Services.* 2006 Apr;57(4):512-20.

Beals J, Welty TK, Mitchell CM, Rhoades DA, Yeh JL, Henderson JA, Manson SM, Buchwald DS. Different factor loadings for SF36: the Strong Heart Study and the National Survey of Functional Health Status. J Clin Epidemiol. 2006 Feb;59(2):208-15.

Idler EL and Benyamini Y Self-rated health and mortality: a review of twenty-seven community studies. J Health Soc Behav. 1997 Mar;38(1):21-37.

Jarvis GK and Northcott HC Religion and differences in morbidity and mortality. Soc Sci Med. 1987;25(7):813-24.

Koenig HG, Hays JC, Larson DB, George LK, Cohen HJ, McCullough ME, Meador KG, Blazer DG. Does religious attendance prolong survival? A six-year follow-up study of 3,968 older adults. J Gerontol A Biol Sci Med Sci. 1999 Jul;54(7):M370-6.

Koenig HG, Larson DB, Larson SS. Religion and coping with serious medical illness. Ann Pharmacother. 2001 Mar;35(3):352-9.

Levin JS and Schiller PL 1986 Religion and the Multidimensional Health Locus of Control scales. Psychol Rep. 1986 Aug;59(1):26.

8. FATALISM

Sometimes people feel that, regardless of what they do, things are going to happen to them. This sense of "what's going to happen, will happen" is called fatalism. Although one can be fatalistic about both positive and negative things, recent research has focused on the role of

fatalism in health, and in particular, if one thinks that, regardless of what one does, s/he will get diabetes or heart disease, that person is likely to be less motivated to exercise, watch their diet, etc. (Davison, Frankel et al. 1992; Mayo, Ureda et al. 2001; Egede and Bonadonna 2003).

Three questions are included here on fatalism about diabetes were recommended by Dr. Felicia Hodge. She conducted a study of Diabetes Wellness Talking Circles in four Northern Plains Indian communities, which found that diabetes fatalism decreased among Northern Plains American Indians who participated in Talking Circles, compared with those who did not. In order to prevent diabetes and CVD, it is important to assess fatalism and overcome it at both the individual and community levels.

See Form S12, Volume 3, Appendix C.

REFERENCES

Davison, C., S. Frankel, et al. (1992). "The limits of lifestyle: re-assessing 'fatalism' in the popular culture of illness prevention." Soc Sci Med **34**(6): 675-85.

Egede, L. E. and R. J. Bonadonna (2003). "Diabetes self-management in African Americans: an exploration of the role of fatalism." Diabetes Educ **29**(1): 105-15.

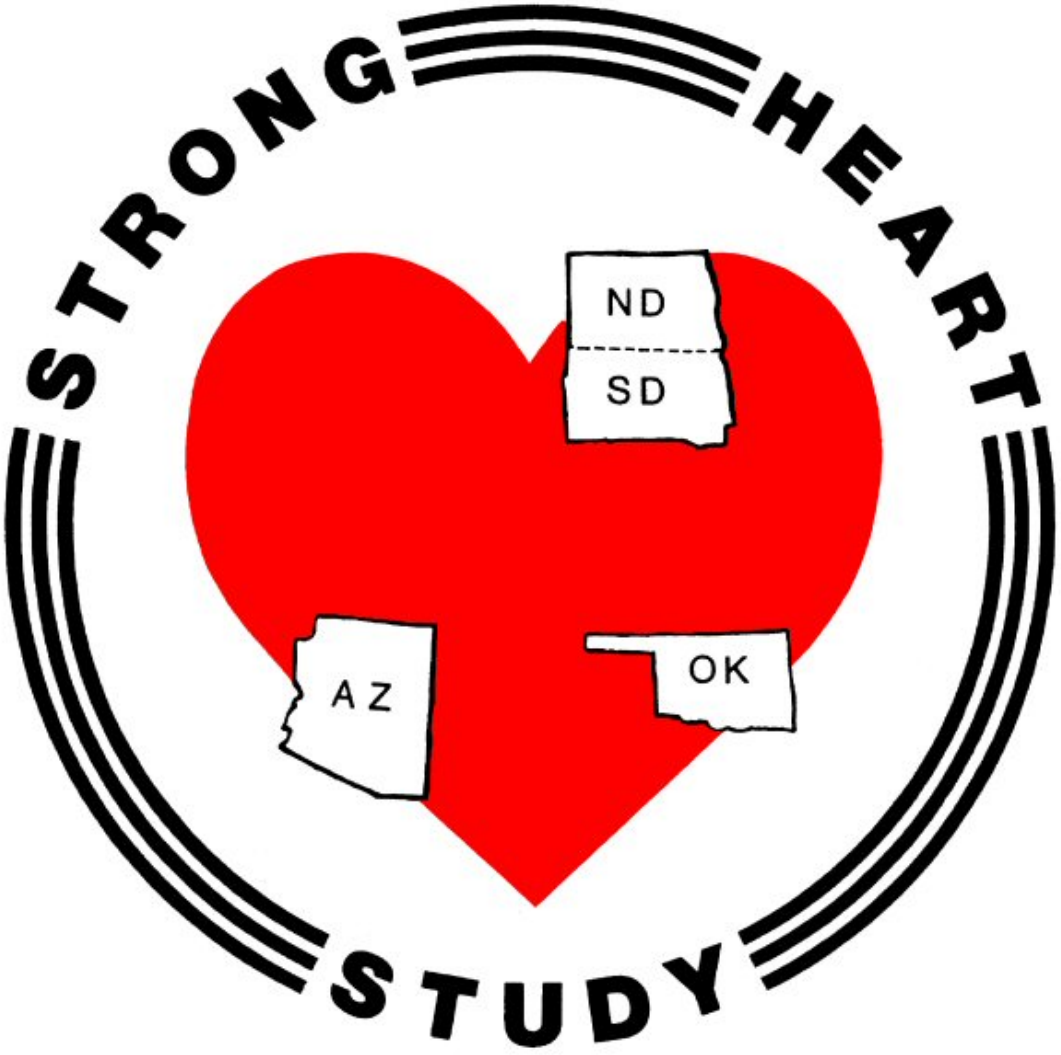
Mayo, R. M., J. R. Ureda, et al. (2001). "Importance of fatalism in understanding mammography screening in rural elderly women." J Women Aging **13**(1): 57-72.

9. PSYCHOSOCIAL FACTORS QUESTIONNAIRES CHECKLIST

Reason for Incomplete Psychosocial Instruments Form

Rationale: There has been some concern that the administration of psychosocial questionnaires during Phase V will make participants uncomfortable, or not be understood, or stress the time resources of the Strong Heart Study field staff. This form is to be completed for all participants in regard to their completion of the battery of psychosocial questionnaires, in order to improve understanding of the barriers to doing this type of research in the field with American Indians.

See Form S13, Volume 3, Appendix C.



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Nine

BLOCK FOOD FREQUENCY QUESTIONNAIRE

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Nine

BLOCK FOOD FREQUENCY QUESTIONNAIRE

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME IX

BLOCK FOOD FREQUENCY QUESTIONNAIRE

Table of Contents

Instructions for completing the Strong Heart Study Food Frequency Questionnaire (FFQ)

What is an FFQ?

A Food Frequency Questionnaire is a tool for estimating usual nutrient intake over the past year. The FFQ may not have all the foods you eat, but it has enough to help you describe well your usual intake. We are interested in more than what you ate yesterday. Instead, the FFQ asks you to describe your usual patterns of eating, on average, over the past year. It asks two questions about each of 125 food items, how often you ate those foods, and then how much you ate each time. Your FFQ booklet should include a portion size picture guide, these instructions, and a description of several American Indian Foods.

What all will I be asked?

The FFQ usually takes about 35 – 40 minutes to complete. You will be asked how often you eat 125 foods – breakfast foods, fruits, vegetables, breads and grains, meats, main dishes, snacks, sweets and beverages. There are a few summary questions on page 6. On page 7, you are asked which types of foods (low-fat, low-carbohydrate, etc.) you usually eat. Last, you are asked what kinds of vitamins and other supplements you usually take.

What do I do?

An electronic scanner reads your answers into a computer file. Use a #2 pencil, mark only one answer for each part of each question, fill the "bubble" completely and neatly, and make no other marks on your answer booklet. Bring the entire booklet back to your Strong Heart Study interviewer.

Start by writing your name in the box on the first page. Your interviewer will most likely fill in the Study ID number and your measured height and weight, and then guide you through the first few items. Write in today's date, your age, sex and pregnancy status, then fill-in the correct bubbles. Read the instructions on the first page together, and keep an eye out for more help in blue boxes as you go along.

Foods are divided up a little differently on an FFQ than in every-day life. Read all the way to the end of each food question so you will know what to include. Start with the American Indian foods on the back of the booklet, bottom of the page. Then turn to page 2 and continue throughout the rest of the FFQ. Don't include the same food in more than one question.

How often?

For each item, choose the one best "how often" answer for you. Pick the one that best describes your intake on average over the whole year. For three fruits – cantaloupe, strawberries, and watermelon – you are asked about your usual intake in the few months they are "in season".

How much?

If you eat less or more than the portion sizes listed in the questionnaire, choose the closest answer to your usual portion size. Use the portion size pictures as a guide to how much is in an "A", "B", "C", or "D" portion size. The pictures show you food amounts in two ways – spread out on plates, or, for soupy foods, in bowls.

When you get to beverages, you will be asked the number of glasses, bottles or cans. "One glass" is 8 ounces (1 measuring cup) for most of the things you would pour from a larger container into a glass. For a few items usually sold in 12 ounce cans or served in big glasses, like iced tea, sports drinks, or Kool-Aid, "one glass" means 12 ounces. A wine glass is 6 ounces (3/4 measuring cup), and "cup" of coffee or tea is 9 ounces.

Answer all the questions

Unless the questionnaire tells you to SKIP to another section, give an answer for every item, even if it is "Never" or "Don't eat it". Please check for missing answers and fill them in.

Thank you for completing the Strong Heart Study FFQ

Strong Heart Study Phase V

Food Frequency Questionnaire

Interviewer Instructions for the 2006 Questionnaire

(Based on Block 2005)

CONTENTS

Block Dietary Data Systems
15 Shattuck Square, Suite 288
Berkeley, CA 94704
Phone or fax: 510-704-8514

Food Frequency Questionnaire

Mechanics

Use # 2 pencil	To ensure that the scanner reads correctly, the questionnaire must be completed using a #2 pencil. A hard pencil may produce too light a mark, and may be scanned as missing.
No other marks on questionnaire	Comments or notes should not be written on the questionnaire, as they may confuse the scanner. Comments must be on a separate page.
Bubble completely	Fill in the answer bubbles completely. Do not simply make a checkmark or an "X" over the bubble.
One bubble per answer	Never mark two bubbles for the same answer -- both will be lost as an error.
No staples	Staples would have to be removed, and if inadvertently not removed would damage the scanner. Marks left by staples can interfere with the scanner reading of tracking marks, booklet number marks or page number marks, and necessitate someone copying over the entire questionnaire.
No extra pages	Do not insert any extra pages or papers with notes on them into the booklet, or attach yellow stickies. If not noticed prior to scanning, they might interfere with the scanning.
No folds	Do not fold the questionnaire.
No 3-hole punch	Holes might interfere with the scanning process.

General Instructions

Introducing the Food Questionnaire	Provide a transition from the other parts of the questionnaire to the Food Questionnaire section, with a phrase such as the following: "Now I'd like to ask you some questions about the foods you usually eat." Do not use phrases that include the word "diet", as some respondents may think we mean "dieting", rather than simply their usual food habits. Do not spend too much time at this initial introduction.
Read questions as written	The words are not optional. Do not paraphrase. Do not omit any words. For example, "in season" is an essential part of the prompt for the foods in which it is used. Some foods that may be unfamiliar to you are being marketed nationally; do not omit them. Read the entire question before answering; there may be foods at the end of the list that need to be included.

Respondent questions

If respondent asks a question for clarification, and you know the answer because it is in this manual, you may give her the answer; it is not necessary to reread the entire question. For example, in the general question "How often do you use fat or oil in cooking?" If respondent asks, "Does that include butter I put on bread?" you may answer "No, just fat or oil you may use while cooking the food", without rereading the whole question.

Introducing the Food List

Read the introduction to the food list, on the first page:
"1. ***HOW OFTEN****, on average, did you eat the food during the past year?"*

After the last sentence you should point to the questionnaire, and prompt: "is it "Never", "A few times per year", "Once per month", "2-3 times per month", "Once per week", "2 times per week", "3-4 times per week", "5-6 times per week", or "Every day"."

Continuing with the introduction, read the next section:
"*How much did you usually eat of the food?*

- *Sometimes we ask how <u>many</u> you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.*
- *Sometimes we ask "how much" as A, B, C, or D. LOOK AT THE ENCLOSED PICTURES."* At this point, you should hand them the page of portion size pictures, and continue with the introduction: *"For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat."*

The respondent can use either the plates or the bowls to choose her serving size, but generally, she should refer to the bowl pictures for foods that are usually eaten in bowls (breakfast cereal, soups...), and the plate pictures for foods that are usually eaten on plates. Note that there is no "A" bowl. Finally, if you refer to the portions as A, B, C, or D, it will encourage the respondent to refer to them that way, thus speeding up the process.

Foods not on the food list

The food list represents the most important nutrient sources in most people's diets. It does not and is not intended to include all possible foods that people ever eat. Thus, it is likely that some foods that a person eats will not be on the list. Do not attempt to force unmentioned foods into categories by guessing at their similarity.

Instructions About the <u>Frequency</u> Part of the Food Questions

Importance of frequency

Although portion size improves the accuracy of the nutrient estimates, the interviewer should be aware that <u>frequency</u> of consumption is much more important than exact portion size in determining long-term usual intake.

Frequency categories

Note the frequency categories at the top of the columns. On some pages these are also repeated at the bottom of the columns, and you should use the colored bars to help guide the eye. Be careful to mark the right column, since being off by a column can make a big difference in the nutrient estimate.

Although you will ask the question in an open-ended way ("How often do you eat..."), encourage the respondent to give her answers in terms of one of the predefined categories. Respondents easily get the idea, and will quickly learn to give answers in the categories shown.

Should I read all the response categories?

In this Food Questionnaire, the answers are all in categories, such as "Less than once per week", "1-2 per week", ... "4+ per day". In most cases it is not necessary to read the response categories every time, although you may do so if the respondent is hesitating or unclear. Instead, you will first show the respondent an example of the type of categories you will be using to record her answers. Then, you will simply ask the question in an open-ended way, wait for a response (such as "5 times a week"), and record it in the appropriate category.

Wording of the frequency questions

It is not necessary to say "How often do you eat ...." for every food. You can repeat the introductory phrase from time to time, but most often you should just read the next food, without the "How often...." This will make the interview go a little faster, be less boring, and perhaps encourage the respondent to pick up the pace. Similarly, avoid repetitively saying "(name of food). How often do you eat that?" It is okay to say that occasionally to vary the wording and pace, but not for every food. Do not, however, just say "Do you eat ..."; this unnecessarily lengthens the interview, because then if the respondent says "yes" you still have to ask the "How often" question.

How often vs. How many

There is a potential confusion between how often and how many, particularly for the fruits. Make sure to keep them separate for the respondent. For example, when you ask "bananas", some respondents may say "I eat two a week"; this could lead to double-counting if you marked "2/wk", then asked "how many" and she said "2". So if respondent is answering fruits as "I eat two a week", explain that you will ask "How many each time" in a subsequent question; right now, you want her to tell you "how often" per week, meaning "how many days", not how many bananas per week.

Always get the frequency ("How often") before asking about portion size ("How much" or "How many"). While the respondent is thinking about her answer to "How often", do not interrupt with any mention of portion size. Do not point to the portion size pictures until after you know her answer to "How often".

Seasonality

Three foods say specifically "in season". The respondent should give the frequency with which that food is consumed, just in the few-month period when it is in season. All other foods require an estimate of average year-round frequency of consumption. If the respondent eats some of these "year-round" items more in one season than another, the reported frequency should still be a rough average over the whole year. For example, if respondent says "I eat apples 3-4 times a week now that they're in season", you should say something like, "Please try to estimate how often that would average out to over the whole year."

If the respondent is unable to do the conversion herself, then the interviewer may use the following chart to estimate for her.

Average use in season	Conversion	Average use year-round
Every day	Shift 3 columns to left	Twice per week
5-6 times per week	Shift 3 columns to left	Once per week
3-4 times per week	Shift 3 columns to left	2-3 times per month
2 times per week	Shift 2 columns to left	2-3 times per month
Once per week	Shift 2 columns to left	Once a month
2-3 times per month	Shift 2 columns to left	A few times per year
Once a month	Shift 1 column to left	A few times per year
A few times per year	Shift 1 column to left	Never
Never	No change	Never

Buying in bulk

Some respondents will say something like "I buy a gallon and then drink it until I'm done with it", and then she doesn't drink it so frequently for the subsequent time period. Again, you should ask her to try to average her intake over the whole year. Something like, "Please estimate how many glasses per day or per week you think you drink, on average over the whole year."

Items with more than one food

For example, "Fresh apples or pears". Do not try to get separate estimates of either frequency or portion size for the two foods. Just ask the respondent to answer their frequency for that group of foods. And don't worry about the two foods having different sizes; just ask the respondent to pick the woodblock model that best approximates how much he/she usually eats of that group of foods.

Frequency answers that overlap the response categories	If the respondent answers with a range that does not fit exactly into one of the available categories, ask the respondent to choose which of the available categories is closer to how often she uses that item. For example, look at the "general questions" on page 1 of the Questionnaire. Suppose you ask the respondent, "How often do you use fat or oil to in cooking?", and she answers "four or five times a week." You would then say, "Would it be closer to "3-4 times per week" or "5-6 times per week"?
"Never" frequency	Use the "Never" column for any foods either literally never eaten, or eaten by the respondent less than once per year. They will be counted as zero.
Frequency answers with different wording	Apply common sense. "Less than once a year" or "3-4 times in my life", code as "Never" without further probing. If respondent says, "A couple of times a month", code as "2-3 times per month". If respondent says "Hardly ever", ask "Would that be less than once per year?"; if respondent indicates "Yes", code as "Never".

Instructions about the Portion Size Part of the Food Questions

Portion size is EASY in this interview	Ask the portion size before moving on to frequency of the next food. You don't need to worry about converting to half cups, ounces, etc. You just mark the bubble corresponding the respondent's portion size choice: "A" = 1st bubble "B" = 2nd bubble "C" = 3rd bubble "D" = 4th bubble
Wording of the portion size questions	It is not necessary to make a full sentence out of the portion size section each time. I.e., do not say, for every food, "When you have ..., about how much/many do you have each time?" For the "how manys"", just say "How many teaspoons", etc. For the "How much's, you can say "How much each time?" and point to the pictures; or, after a while, just say "A, B, C or D?"; or you can say "Which bowl?"
"XXL"	If the respondent says that his/her usual portion is larger than the largest model (which corresponds to the fourth bubble), record the answer as the fourth bubble.

How important is portion size?

Although portion size will definitely improve the accuracy of the answers, you should not permit the respondent to spend undue time on the portion size answers. This section should move along quite quickly, with a breezy "How many" or "A, B, C or D?"

Note on Beverage "portion sizes"

The portion size part of the beverages section is designed to capture the *number* of glasses, bottles, cans, etc. that the respondent usually drinks, on the days she drinks the beverage.

Rather than asking an additional question about *the size* of the beverage that the respondent drinks, to simplify administration of the questionnaire several standard sizes of bottles, cans, etc. are listed in the portion sixe section for several beverages.

For the beverage items listing portion size in "glasses", one glass is assumed to be an 8 oz. serving, for the following beverages:
milk, breakfast shakes, tomato/V8 juice, 100% juices, all other fruit juices, Hi-C, drinks containing some juice, and water.

A 12 oz. glass or bottle is assumed for the following beverages:
iced tea, Kool-Aid and sports drinks.

A 6 oz. glass is assumed for wine.

A 9 oz. cup is assumed for coffee and tea.

These portion sizes are provided as clarification for you, the interviewer, so that you will be able to answer questions if the respondent asks. **The interviewer does not need to offer the respondent this information, but if she asks,** you may respond to questions using the information provided here.

Correct wording for asking the portion size questions

Each food has a correct wording for asking the portion size question ("how many", "how much" etc), and a recommended portion size model to use. The correct wording is given in the column just preceding the portion size bubbles. The cue about the correct wording is in the words underneath the portion size bubbles.

SUMMARY OF HOW TO ASK PORTION SIZE

What is under the portion size bubbles:	How to ask the question:
A number	Ask "HOW MANY?" and get an answer in number of items.
A-B-C-D	Ask "HOW MUCH?" and get an answer as A-B-C-D referring to the pictures.
"How many" questions	Ask "How many each time" or sometimes just "How many". Use the unit that is the name of the food (e.g., "bananas") or that is shown in the "Portion Size" column (e.g., 'slices", 'teaspoons", "bowls"). Code response according to respondent's answer ("1", "2", "3", etc). For example, examine "Bananas": ask portion size in an open-ended way, as "How many, each time?" You then record the answer in the appropriate bubble, "1/2", "1", "2". If the number reported is larger than shown for any of the bubbles, use the fourth bubble. Acceptable phrasing: "How many bananas, each time?" "How many, each time?" "How many, on the days you eat them?" Occasionally, "How many" is awkward; so for "Cantaloupe", it would be "Do you eat 1/8, 1/4 or 1/2 a cantaloupe each time?"
"How much" questions	Ask "How **much** each time, A, B, C or D?", or just "A, B, C or D?", or "Which picture, A, B, C or D?" Code A-B-C-D as 1st bubble, 2nd bubble, 3rd bubble, 4th bubble, without any kind of conversion, calculation or interpretation. For example, examine "Watermelon, in season": In the "How Much" section, you see "A,B,C,D". For these foods, indicate the portion size pictures and ask the respondent to choose the picture closest to her usual portion. Again, **the respondent may use either the plates or the bowls to give his/her answer**. Acceptable phrasing: "How much each time? A, B, C, or D?" "Which of these pictures is closest to your usual portion?" "Which picture is closest to the amount you usually eat?" Eventually, you could say simply "A, B, C or D?"

Q by Q (question by question) – Introduction

Respondent ID Number	The ID number must always be filled in. This is the only way it will be possible to connect the nutrient estimates with the right individual. Write in the respondent's study ID and be sure the correct bubbles are filled in completely and accurately.
Today's date	The date the questionnaire is completed. Write in date and fill correct bubbles completely.
Sex	"Sex" must be answered. The analysis program will use it to evaluate reasonableness of nutrient estimates.
Breast feeding	This is not used by the nutrient analysis program, but may be useful as a categorical variable.
Age	Age must always be filled in, and bubbled in. The analysis program uses it to evaluate reasonableness of nutrient estimates.
Weight	This is not used in the nutrient analysis calculations. However, if printed output is requested, it is reported in the printed output, and advice on desirable weight may be generated. The bubbles should be filled in, not just written in at the top.
Height	This is not used in the nutrient analysis calculations. However, if printed output is requested, it is reported in the printed output, and advice on desirable weight may be generated. The bubbles should be filled in, not just written in at the top. Note that the first bubble is for height in feet, and the second bubble is for inches. In case of A1/2 inch", round down.
Name	This item will not be entered into the database. Anything written in this space is ignored by the scanner.

Introducing the Main Food List

Read the introduction to the food list, on page 1:
*"1. **HOW OFTEN**, on average, did you eat the food during the past year?"*

After the last sentence you should point to the questionnaire, and prompt: "is it "Never", "A few times per year", "Once per month", "2-3 times per month", "Once per week", "2 times per week", "3-4 times per week", "5-6 times per week", or " Every day"."

Continuing with the introduction, read the next section: "*How much did you usually eat of the food?*

- *Sometimes we ask how <u>many</u> you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.*
- *Sometimes we ask "how much" as A, B, C, or D. LOOK AT THE ENCLOSED PICTURES."* At this point, you should hand them the page of portion size pictures, and continue with the introduction: *"For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat."*

The respondent can use either the plates or the bowls to choose her serving size, but generally, she should refer to the bowl pictures for foods that are usually eaten in bowls (breakfast cereal, soups...), and the plate pictures for foods that are usually eaten on plates. Note that there is no "A" bowl. Finally, if you refer to the portions as A, B, C, or D, it will encourage the respondent to refer to them that way, thus speeding up the process.

The **time frame** that it covers is 'the past year or so". This is deliberately a little vague, because it is not expected that anyone could remember exactly what they ate during exactly the past year. The idea is just to get a usual pattern -- their current diet at this point in their life. Some people raise the objection, "Oh, I can't even remember what I ate yesterday; how could anyone answer what they ate in the past year?" If respondents have this concern, it's important to make clear to them that the idea is not to remember, but to think about their usual pattern of frequency. For example, they don't have to remember how many times they had eggs in the past year. Instead, what they can tell you with reasonable accuracy is, "Oh, I have eggs about twice a week."

For some items, people may indicate that they have changed their habits in the past year. In that case, ask "Do you expect that this is a lasting change?" If the new habit appears to be lasting and stable, she should report on the new pattern rather than the former pattern.

Food List, continued …	In all the examples given below for foods, you should not probe for information about any of the clarifications discussed here. These are provided as clarification for you, the interviewer, so that you will be able to answer questions if the respondent asks. **Read the questions exactly as written. Do not re-word, or leave things out.** But you may respond to questions, using the information provided here.

Q by Q -- Breakfast items, dairy

Breakfast sandwiches <u>with eggs</u>, like Egg McMuffins	Include egg sandwiches on biscuits, croissants, or English muffins, whether fried, scrambled, poached or boiled. The defining ingredient is the eggs, for the cholesterol content. Thus, do not count egg sandwiches made with egg substitutes.
Other eggs, … scrambled, boiled. omelets (<u>not</u> egg substitutes	Include real eggs when eaten as eggs, including scrambled, boiled, fried. Also, include deviled, or egg salad or quiche (which is mainly egg). Do not count eggs used in cooking, such as in cakes, custards, etc. Do not count Egg Beaters, egg substitutes, or if only egg whites are eaten. The main point is the cholesterol, so if they scramble, for example, one egg yolk and two egg whites, just count the number of yolks.
Breakfast sausage, including in sausage biscuits	This includes breakfast-type items, but not sandwich-type cold-cuts, not main meal items like Italian or Polish sausage, and not hot-dog type sausages like German hot dogs. Turkey sausage may be included here.
Bacon	Includes bacon eaten at any time, including BLT sandwiches, not just with breakfast.
Pancakes, waffles, French toast, Pop Tarts	With or without butter or syrup. Syrup will be added automatically.
Cooked cereals like oatmeal, grits or cream of wheat	This refers to all cooked cereals, including cream of wheat, cream of rice, and less common types like kasha, as well as those mentioned.

Cold cereals, ANY KIND, like corn flakes, fiber cereals, or sweetened cereals	Frequency with which respondent eats any cold cereal. Toward the end of the questionnaire, we will ask about which kinds of cereal.
Milk or milk substitutes on cereal	Ask about milk on cereal only if cereal is eaten. Ask the question just like any other, "how often do you use...", if the respondent eats cereal; do not just assume that the frequency will be the same as the frequency of cereal. (Some people eat cereal plain, as a snack.) Frequency: For most people, this will be the number of days per week or month that they eat any kind of cereal with milk. Some respondents may say "every time". Do not code this as "every day". Rather, look back at her cereal frequencies and remind her of how often she said she eats cereal; then ask her, 'so, about how often do you use milk on cereal, per week?"
Yogurt, frozen yogurt	Include all varieties, with or without fruit, regular or low-fat, sweetened or artificially sweetened. Do not code the fruit in yogurt separately as fruit. Toward the end of the questionnaire, we will ask about which kinds of 'ice cream', such as whether regular or low-fat items.
Cheese, sliced cheese, or cheese spread, including on sandwiches	Include all types, regular or low-fat, hard cheese or soft cheese, natural or processed, including cream cheese. This refers specifically to cheese eaten as cheese. It should not include cheese eaten in lasagna, pizza, etc. Those foods will come later. Toward the end of the questionnaire, we will ask about which kinds of cheese, such as whether regular or low-fat items.

Q by Q – Fruits

In this section, the number of times per month or week refers to number of days per month or week. For example, the respondent eats bananas on about two days a week. Then, the portion size section provides the location where the respondent can tell you how many pieces of that fruit she eats, on the days she eats them.

Seasonality: Among the fruits, 7 of the items refer to intake "year round", and 3 of the items refer to food intake "in season". If any of these "year-round" foods are eaten more in one season than another, ask respondent for her best estimate of a year-round average.

It is essential to read the "in season", and respondent should report the frequency with which that fruit is eaten when it is in season (refer to the 'seasonality" section above for a detailed discussion). Do not probe for length of season.

Jams and jellies should not be counted as servings of fruit. Fruit in yogurt does not count as servings of fruit.

All-year-round fruits

Bananas	All kinds, all sizes.
Apples or pears	All kinds, all sizes; includes pears, or Asian pears. Discourage respondents from trying to do math, adding up separately their apples and their pears. An intuitive average is fine.
Oranges or tangerines	**All kinds, all sizes; includes tangerines, tangelos, mandarin oranges. (Orange juice is a later item.)** If respondent only uses oranges to make juice, tell her to wait and count that as orange juice. If she sometimes eats them as oranges and sometimes as juice, just get frequency of "as oranges" in the fruit section, and then later get the "as juice" in the juice section.
Grapefruit	All kinds, all sizes.
Peaches or nectarines, fresh	Frequency is average year-round frequency of consumption, of FRESH fruit.
Other fresh fruits … grapes, plums, honeydew, pineapple	Frequency is average year-round frequency of consumption, of FRESH fruit.
Canned fruit like applesauce, fruit cocktail, or dried fruit like raisins	Frequency is average year-round frequency of consumption.

In season (summer) fruits

Cantaloupe, in season	The focus here is on cantaloupe. Other melons should be counted only if they are deep orange like cantaloupe. Do not include honeydew or other non-orange melons. Report frequency only for the few months when they are "in season".
Strawberries, in season	Fresh only. Report frequency only for the few months when they are "in season".
Watermelon, in season	Fresh only. Report frequency only for the few months they are "in season".

Q by Q – Vegetables

When starting the vegetable page, be sure to read the introductory sentence at the top, so that they know to include frozen, canned, etc. All vegetables consumed, whether fresh, frozen, canned or in stir-fry, should be included here if the amount equals at least the "A" size portion picture. Vegetable soups and vegetable or vegetable-beef stew are separate items, and the vegetables from those items should not be reported separately under the particular vegetable. Small "incidental" amounts that may be included in salads or mixed dishes should not be reported separately under the particular vegetable, unless the amount is equal to at least a half cup. Most of the vegetables must be answered in terms of the portion size pictures; do not let them answer in ounces.

Broccoli	Includes cooked or raw. Includes items from salads only if the amount comes to at least the size of a half cup, and then only the frequency that this vegetable itself is actually eaten, not just the frequency that salad may be eaten.
Carrots, or mixed vegetables or stews containing carrots	Includes cooked or raw. Include items from salads only if the amount comes to at least the size of a half cup, and then only the frequency that this vegetable itself is actually eaten, not just the frequency that salad may be eaten. Does not include carrots eaten in mixed dishes such as soup or stew, as those items are captured elsewhere.
Corn	Fresh, frozen or canned. As with year-round fruits, ask the respondent to estimate a year-round average, if eaten more in season. Remember that people may eat corn on the cob when it is in season, but eat canned or frozen corn during the rest of the year. One ear of corn equals approximately a "B" or medium serving.

Green beans or green peas	Green beans refers to canned, frozen, fresh, or in salad bars, but not to dried-type peas like black-eye peas, split peas. Green peas (canned, frozen, fresh, or in salad bars) are also be counted in this category.
Spinach (cooked)	Includes cooked spinach only. Spinach salad should be recorded under Green salad".
Mustard greens, turnip greens, collards	This refers specifically to the dark-green, strong-flavored greens. Beet greens, for example, may be counted here. However, lighter-green leafy vegetables such as celery tops should not be counted here.
Sweet potatoes, yams	All types. Do not include the sweet potatoes eaten in pies; that question is asked later.
French fries, fried potatoes, hash browns	Include home or restaurant fries, "home fries", "hash browns" and "tater tots".
Potatoes <u>not</u> fried...	Include all forms of potatoes except fried. Do not include potatoes eaten in soups or stews, as those are captured elsewhere.
Cole slaw, Cabbage, Chinese cabbage	Includes raw or cooked cabbage, including Chinese cabbage, and cole slaw whether homemade or from a restaurant.
Green salad, lettuce salad	Includes all kinds of green salad that include some lettuce, whether mostly of iceberg lettuce or of other types of lettuce, and regardless of whether other vegetables are sometimes eaten in it. Spinach salad should be recorded here also.
Raw tomatoes	Includes tomatoes eaten in alone or in salad. <u>Does not include</u> tomato sauces, which are captured under "spaghetti", etc. Does not include the tomatoes in tomato or vegetable soups, which are captured under that item. The portion size refers to 1/4, 1/2... of a medium tomato.
Salad dressing	All types, creamy or not, including oil & vinegar. Program will assign a regular or low-fat type later in the questionnaire.
Any other vegetable...	Includes any vegetable not already mentioned.
Refried beans or <u>bean</u> burritos	Burritos which have meat should NOT be recorded here. Record them under the "Tacos, burritos item on page 4."

Pinto beans, black beans, chili with beans, baked beans	With or without meat. This includes all dried-type beans, regardless of whether they're mentioned here or not, such as navy beans, red beans, etc. Do not include pea or bean soups; these are asked later.
Vegetable stew (without meat)	Any type of vegetable stew, canned or home-made.
Vegetable soup...	Any type of vegetable soup that has a lot of carrots, or has a tomato base.
Split pea, bean or lentil soup	Any type of pea, bean or lentil soups may be counted here.
Any other soup... chicken noodle, … ramen	This is the catch-all for all other forms of soup, whether creamed or not.
Pizza...	All forms, all sizes, all toppings.
Spaghetti... with tomato sauce	This item should include only those pasta dishes that are eaten with tomato sauce. It can include mixed pasta items such as raviolis. The defining characteristic is the tomato sauce. When asking this question, emphasize the words "with tomato sauce".
Macaroni and cheese	**Cheese dishes without tomato sauce** This item should not include any pasta dishes that are eaten with tomato sauce. Therefore, you must be careful to correctly say "without tomato sauce", not "with". This includes only dishes that commonly have a fair amount of cheese, such as macaroni and cheese, certain Mexican dishes that have a lot of cheese, Welsh rarebit, etc. Incidental sprinkle cheese often used on spaghetti does not make it count as a cheese dish. Cheese sandwiches should be counted in the earlier "cheese" item, where number of slices can be indicated.
Other noodles … pasta salad … sopa seca	This item includes all other pasta dishes that do not contain substantial tomato sauce or substantial cheese. These dishes can include some meat, fish or poultry, for example, pasta with white clam sauce (not red), or pesto sauce.
Tofu or tempeh	Refers to "fresh" tofu such as is normally served in Chinese restaurants, or bought in the refrigerator section of supermarkets. Includes all consumption, whether at home or in a restaurant. Includes regular tofu, and fermented or dry, spiced, or koritofu. Count "vegetarian hot dogs" under the next item, "meat substitutes made from soy".

Meat substitutes, such as ...	This includes all meat substitutes, such as "veggie-burgers", or "veggie hot dogs".

Q by Q -- Meats and main dishes

Do you ever eat chicken, meat or fish?	IF NO, SKIP TO … "**BREADS**" If meat of any kind is eaten even a few times per year, do not skip this section.
Hamburgers, cheeseburgers, ...	All sizes, at home or in a restaurant. Does not include the ground beef used in spaghetti, lasagna or pizza. Only hamburgers, etc. made with beef are to be included here. Turkey burger should not be coded here, but should be included under "chicken or turkey, roasted or broiled".
Hot dogs, or sausage like Polish, Italian or chorizo ...	All forms, including chicken/turkey.
Lunch meat ... bologna, sliced ham, ….	Lunch meats, all types. Ham refers to slices as for sandwiches; ham eaten as a roast or as the entree for a main meal should be reported under "pork". Do not include small amounts eaten on pizza, etc.
Meat loaf, meat balls	Include ground beef or mainly beef ground meat mixtures used in meatballs, meat loaf, or ground meat kebabs. If ground meat is mainly turkey or chicken, include under "Roasted or broiled chicken or turkey". If ground meat is mainly pork (not sausage), include under "Pork chops, ….."
Steak, roast beef, … sandwiches	Fresh, in frozen dinners, or on sandwiches. Do not include beef eaten as ground beef.
Tacos, burritos, enchiladas... meat or chicken	Includes beef burritos, tacos, enchiladas, tamales, or other similar dishes, that are made with meat or chicken. Bean burritos should be included in the previous section, under "refried beans or bean burritos".
Ribs, spareribs	Any type, any size.

Pork chops, roasts, ham ... (including for breakfast)	Do not include pork-based lunch meats.
Veal, lamb, deer meat	This item includes these three types of meat, or any other "game" meat (not foul).
Liver... chicken livers, liverwurst	All forms.
Pigs feet, … oxtails, tongue	This item includes the listed foods as well as any other organ meats.
Menudo, pozole, caldo de res, …	Includes Latin American, Native American, Asian, or other ethnic soups and stews with substantial amounts of beef, pork, lamb, or other red meat. Menudo, pazole, and guysava are asked separately at the end of the questionnaire. Please complete this item anyway.
Any other beef or pork dish, … beef stew, pot pie, Hamburger helper (Mixed dishes with beef or pork)	Include any mixed dish with beef, pork, veal or lamb, that has not already been counted earlier, except dishes with a lot of chilis, as a main ingredient. Red or green chili stews are asked in a later item. "Mixed dishes with chicken" is a later item.
Fried chicken...	All parts of a chicken are included (wings, thighs, breast, etc.) provided they are fried. Include McNuggets, etc.
Roasted or broiled chicken or turkey… (not fried)	Include turkey burgers or kebabs here, but not chicken/turkey eaten as part of a mixed dish.
Any other chicken dish, … Chinese chicken dishes	Includes any mixed dish with chicken that has not already been counted elsewhere.
Oysters	Any form, plain or in stew or soup.
Shellfish like shrimp, scallops, crab	All forms, including clams, mussels, squid. Include fried, grilled, sauteed, or in soups, stews or gumbos, or in pasta.

Tuna...	All forms of tuna, light meat or dark, in oil or in water, straight or in a casserole. Portion size, however, refers to the amount of tuna, and should not include any noodles, etc., eaten with it.
Fried fish or fish sandwich	Home-fried or restaurant, fast food. All types of fried fish.
Other fish, <u>not</u> fried	All other fish, after excluding fried, tuna or shellfish. Include baked, grilled, sauteed, in soups, stews, or sauces for rice, pasta or noodles.

Q by Q --Breads, etc

Biscuits, Muffins, croissants (<u>not</u> counting breakfast sandwiches with <u>eggs</u>)	Biscuits include homemade or from fast food places such as Kentucky Fried Chicken, McDonalds. Muffins include kinds such as bran muffins, blueberry muffins, etc., but do not include English muffins, which should be included under "Bagels, ...", below. Bread in "breakfast sandwiches <u>with eggs</u>" was already counted above (first food list item).
Hamburger buns, hotdog buns, hoagie buns, submarines	All types, all sizes. Include other breads used for sandwiches here also, such as French rolls and bolillos.
Bagels, English muffins, dinner rolls	Any kind, any size
Tortillas …	Includes flour and corn tortillas. Portion size is in number of tortillas each time. Do NOT include the tortillas eaten as part of a taco or burrito, as these have been counted elsewhere.
Cornbread...	Includes cornbread, corn muffins, hush puppies.
Any other bread or toast …	Includes any kind of bread that has not already been recorded, including White, French, Italian, etc., whole wheat, rye, pumpernickel, or other dark breads. The type of bread usually eaten will be recorded near the end of the questionnaire. In reporting portion size, the response is in "slices". Include bread eaten in sandwiches.

Rice, or dishes ...	This includes not only rice eaten by itself, but also as fried rice, Rice-a-roni, beans-n-rice, rice pudding, etc.
Margarine on bread or potatoes...	All forms of margarine, not butter, on bread or added to vegetables at the table. A "pat" is about one teaspoonful.
Butter on bread or potatoes...	All forms of butter, not margarine, on bread or added to vegetables at the table. A "pat" is about one teaspoonful.
Energy bars, …Power Bars, Clif, Balance, …	Also include energy gels here.
Breakfast bars, cereal bars, granola bars	These do not have to be eaten for breakfast. Count them at any time of day.
Peanuts, other nuts and seeds	Any nuts, including walnuts, etc., or seeds such as sunflower.
Peanut butter	Other nut butters may also be included in this item.
Snacks chips... popcorn (not pretzels)	These should be reported here even if respondent reports eating only low-salt or low-fat varieties. Exclude items here only if respondent eats only air-popped popcorn.
Crackers …	Saltines, or any other crackers. Any kind, regular or lowfat
Jelly, jam	Include all kinds of preserves and sweet fruit spreads or sauces. Later there is a question about low-sugar types.
Mayonnaise, sandwich spreads	All types. Later there is a question about modified types, such as low-fat varieties.
Catsup, Salsa or chile peppers	All kinds of tomato-based condiments or chile sauces.
Mustard, … soy sauce ...	Any other type of sauce, not already captured above.

Donuts	This is intended to capture any kind of doughnuts or sweet fried pastry.
Cake, ... any other pastry	All kinds of cakes or coffee cakes, home-made or packaged, including snack cakes, Danish pastries, pan dulce, etc. Toward the end of the questionnaire, we will ask about which kinds of cake, etc., such as whether regular or low-fat.
Cookies	All kinds. Cookies vary widely in size. The portion size questions refer to a medium-sized cookie, roughly the size of an Oreo cookie.
Ice cream...	All forms including ice cream bars, fast-food milkshakes, etc.
Chocolate syrup …	Include chocolate syrup or chocolate sauce added to food just before eating, such as ice cream topping or stirred into milk.
Pumpkin pie, sweet potato pie ...	Include pies or puddings made with pumpkin, winter squash, or sweet potato. However, do not double-count the frequency of sweet potato reported in an earlier item.
Any other pies...	All forms, fruit-filled or not. Include fast-food pies.
Chocolate candy, candy bars	Only chocolate-covered or chocolate-based candy and candy bars should be included here. The point is the chocolate, not just any candy.
Any other candy, <u>not</u> chocolate ...	Any sugar-based non-chocolate candy.

Q by Q – Beverages

The way portion sizes are asked differs from beverage to beverage. You may need to help the respondent catch the differences.

Glasses of milk..., <u>not</u> on cereal or coffee	This applies to glasses of milk or milk substitutes, not to milk added to coffee or cereal. Be careful that respondents do not double-count the milk they may have added to their Carnation Instant Breakfast. Include soy milk, goat milk, rice milk, low lactose, etc.; later in the questionnaire we ask what kind of milk.
Drinks like Slim Fast, ...	Include any meal supplement or replacement, such as Boost or Ensure; any dieting milkshake, such as Sego or Slim-Fast; or Instant Breakfast milkshakes like Carnation.

Tomato or V8 juice	Any tomato juice, including Clamato, etc.
Real 100% Orange juice or grapefruit juice	Canned, bottled, frozen or fresh. Do not include fruit drinks, or any drink that is not 100% orange or grapefruit juice. (Sunny Delight is not 100% juice.)
Apple juice, grape juice, …	Other real 100% fruit juice, canned, bottled, frozen or fresh. Include real juice or fruit blended into smoothies.
Hi-C,Cranberry Juice Cocktail, Hawaiian Punch, Tang	Includes drinks with or without real fruit, that contain added vitamin C.
Drinks with some juice, like Sunny Delight, Knudsen	Includes drinks with some real fruit juice, whether canned, fresh, or carbonated.
Iced tea, … Snapple, Tazo	Any kind of cold or iced tea, including instant, home-made, canned or bottled, sweetened or unsweetened. Later, we ask what type you usually drink.
Kool-Aid, lemonade, sports drinks, like Gatorade, or fruit-flavored drinks (<u>not</u> iced tea)	Other drinks, not juice, tea or sodas that do not contain real fruit juice.
Any kind of soft soft drink, … cola, soda …	Includes cola, ginger ale, pepper types, orange or grape soda, etc. Later in the questionnaire, we ask whether soft drinks are artificially sweetened (diet). If the respondent buys large bottles of soft drink (such as the standard 64 oz. bottle) and then drinks it in cups or glasses, have the respondent think about the total intake in a day as if it were purchased in other standard containers. For instance, two small glasses or 1 medium-large glass would add up to "1 can", two medium glasses or a large 'iced tea' glass equals a "1 20-ounce bottle", for 3 cups or 2 medium-large glasses in a day mark "2 cans", and for more than that mark "Big gulp or 3 cans".
Beer or non-alcoholic beer	Bottles, glasses, cans, or draft, all varieties. Portion size asks what size can or bottle they usually drink. Later the respondent can say what kind of beer.

Wine or wine coolers	All forms, including champagne, spritzers.
Liquor...	Include all forms, including whisky, scotch, gin, etc.
Glasses of water, tap or bottled	Include any kind of unsweetened water, mineral water, water with vitamins, or flavored water.
Coffee...	Include caffeinated or decaffeinated, brewed or instant.
Hot tea... <u>not</u> herbal	Any form of regular black or green tea. Exclude herbal teas.

Added to coffee or tea …

Coffee and tea are asked separately.

What do you usually add to coffee?	Choose the type that is *usually* added to coffee. If the respondent uses more than one type, have her pick the one she uses most often.
What do you usually add to tea?	Choose the type that is *usually* added to tea. If the respondent uses more than one type, have her pick the one she uses most often.
Do you usually add sugar or honey to coffee?	Refers to only real sugar or honey, not sugar substitutes. Fill in the Yes/No question. If "Yes", also fill in the number of teaspoons.
Do you usually add sugar or honey to tea?	Refers to only real sugar or honey, not sugar substitutes. Fill in the Yes/No question. If "Yes", also fill in the number of teaspoons.

Summary questions

These questions are used by the program to compare and, if necessary, adjust some of the food list responses.

Servings of Vegetables

Servings of and Fruit

Servings of vegetables, fruit: This doesn't mean "how many different kinds", and it doesn't refer to "seconds". Here, we mean how many times it shows up on your plate during the day. So green beans with lunch and squash with dinner would be 2/day; green beans with lunch and green beans with dinner would be 2/day; nothing with lunch and both squash and green beans with dinner would be 2/day.
Salad and potatoes are excluded from these questions simply to clarify which foods we are asking about.

Acceptable answers to respondent questions:

Q: "Do you mean different kinds of vegetables (fruits)?"
A: "No, just how often you eat vegetables of any kind."

Q: "Should I count second helpings as two servings?"
A: "No, this is just how often you eat vegetables (fruits) of any kind."

Q: "Give me an example of how to count them up."
A: "If you usually have some fruit with breakfast and some fruit for a snack, that would be twice a day."

Q: "What if I have a big salad with lots of stuff in it?"
A: The key is whether it would be enough of any one vegetable that they would include it in their main food list answer. For example, suppose their salad sometimes includes as much as 1/2 cup of broccoli; in the main food list, they would/should think of all times they have broccoli, including the quite substantial portion they have in big salads, and include that in their "Broccoli" answer. Therefore, if their salad contains a large enough amount of a vegetable to have been counted as a serving on the main food list, it should be so counted here.

Fat or oil in cooking

Frequency of fat or oil in cooking: Note that fat or oil use is in fry, stirfry or simmer; does not include fat used in baking. Also does not include oil used on cooking salad, and does not include butter or margarine used on bread.

What type of foods … usually eat?

In this section, we ask whether the respondent usually eats a modified form of foods, such as low-fat, low-carb/sugar, calcium-fortified, etc. We also ask about kinds of bread and tortillas, whether they are whole grain, or low-carb.

Mark only one answer for each type of food. Multiple answers will scored as "errors" and no information will be recorded.

"Don't drink" or "Don't eat" is a valid answer choice for all of the items in this section; it should be used only if the respondent also chose "Never" as the frequency for that item earlier in the questionnaire.

Have the respondent try to remember the usual or most frequent form of the food before marking "Don't know". If necessary, "Don't know" is a valid choice for respondents who not do the shopping and really do not know what type he/she consumes.

Milk	The respondent should mark the ONE type she uses most often. The program will use the answer here to choose the kind of milk to apply to the frequency of glasses of milk reported in the previous item. This answer applies to glasses of milk, not to milk added to coffee or cereal. If she drinks more than one type of milk, ask her to choose the one she drinks most often.
Slim Fast, Sego, Slender or Ensure	The program will use the answer to this question to choose the type of liquid meal, for the frequency reported earlier.
Orange juice...	The program will use the answer to this question to choose the type of orange juice to use for the frequency of orange juice reported earlier.
Soda or pop	The program will use the answer to this question to choose the type of soda or pop, for the frequency of beer reported above.
Iced tea	The program will use the answer to this question to choose the type of iced tea, for the frequency of beer reported above.
Beer	The program will use the answer to this question to choose the type of beer to use for the frequency of beer reported above.
Hamburgers or cheeseburgers	Choose the one you eat most often. The program will use the answer to this question to choose the type of hamburger to use for the frequency reported in the Hamburger, Cheeseburger question.
Hot dogs	The program will use the answer to this question to choose the fat content of the hot dogs and dinner sausage whose frequency was reported above.

Lunch meats	The program will use the answer to this question to choose the fat content of the lunch meats whose frequency was reported above.
Spaghetti or lasagna	The program will use the answer to this question to choose the meat content of the spaghetti or lasagna dishes, for the frequency reported above.
Cheese	"Cheese" here refers specifically to cheese by itself, not as part of pizza, lasagna, etc. The program will use the answer to this question to choose the fat content of cheese, for the frequency reported above.
Salad dressing	The program will use the answer to this question to choose the fat and sugar content of salad dressing, fpr the frequency reported above.
Energy bars like Power Bar, Clif, Atkins	The program will use the answer to this question to choose the fat and sugar content of energy bars, for the frequency reported above. This question should be answered based on the kind he or she eats most often.
Breakfast bars, cereal bars or granola bars	The program will use the answer to this question to choose the fat and sugar content of breakfast bars or cereal bars, for the frequency reported above. This question should be answered based on the kind he or she eats most often.
Bread	The program will use the answer to this question to choose the type of bread to apply in the nutrient analysis. This question should be answered based on the kind he or she eats most often
Tortillas	The program will use the answer to this question to choose the type of tortilla to apply in the nutrient analysis. This question should be answered based on the kind he or she eats most often
Chocolate candy or chocolate candy bars	The program will use the answer to this question to choose the fat ans sugar content of Chocolate candy for the nutrient analysis
Cookies	The program will use the answer to this question to choose the fat and sugar content of cookies, for the frequency reported above.
Cake, snack cakes, and other pastries	The program will use the answer to this question to choose the fatand sugar content of "cake, …" items, for the frequency reported above. If respondent usually eats low-fat cakes (such as Entenmann's) but eats regular-fat varieties of other foods in the item above, this question should be answered based on the food he or she eats most often.

Ice cream

The program will use the answer to this question to choose the fatand sugar content of ice cream, for the frequency reported above. Again, this question should be answered based on the type of ice cream he or she eats most often.

Jelly or jam

The program will use the answer to this question to choose the sugar content of jam or jelly, for the frequency reported above. Again, this question should be answered based on the type of jam or jelly he or she eats most often.

Beef or pork

The program will use the answer to this question to choose the fat content of these meats, for the frequency reported above.

Chicken or turkey

The program will use the answer to this question to choose the fat content of the chicken item, for the frequency reported above.

What kinds of <u>fat or oil</u> … cooking?

Mark only one or two answers. Choose the one or two most commonly consumed kinds of fat or oil. Mark the kind of fat or oil used to fry, stirfry or simmer. This question does not include fat used in baking, does not include oil used on cooking salad, and does not include butter or margarine used on bread.

Ask this question only if respondent's answer to the previous question on fat or oil was "once per week" or more often. Put some emphasis on "kinds" of fat, so the respondent understand that you are asking a different question. Do not read "Mark only one or two." Do not read the response categories. Leave it open-ended, and then fill in the appropriate box to fit the subject's answer. If respondent names only one, mark only one without further probing. If she names two, mark two. If she names more than two kinds of fats/oils, ask her which two she uses most often.

If she states, in answer to this question, "I do not use it", go back and clarify her answer to the previous question, which was "How often do you use fat or oil to fry...?"

Safflower oil or peanut oil can be marked under "Corn oil, vegetable oil".

"Crisco" refers to Crisco shortening. If subject specifies Crisco oil, mark it under "vegetable oil".

Sesame oil: If respondent reports "sesame oil", ask if she uses it in large quantities such as 1-2 tablespoons; if so, code as vegetable oil. If she only uses a few drops for flavoring, do not code as oil at all.

Cold cereals

Mark only one or two answers. Choose the one or two most commonly consumed kinds of cold cereal. The program will assign the correct amounts of carbohydrate or sugar, fiber, bran and other nutrients, for the frequency reported earlier.

"Low-carb" refers only to cereals specially formulated as low-carbohydrate, as stated on the box.
"Cheerios, …" refers to several types of cereal made with whole grains.

"Total" refers only to Total brand cereals.

"Fiber One" refers to a high-fiber cereal.

"Product 19, Complete" refers only to the Product 19 brand and Kellogg's Complete brand cereals.

"All Bran, Bran Buds" refer to high-fiber cereals.

"Other fiber cereals" refer to moderately high-fiber cereals.

"Sweetened cereals" refers to all the cereals with added sugar "frosting" or a really sweet taste. Other brand names that fit into this category include Life, Kix, Golden Grahams, and others.

"Other cold cereals" refers to all the rest of the cold cereals with no special content of fiber, sugar, carbohydrate or whole grain.

Vitamin supplements … fairly regularly

"Fairly regularly" means at least once a month.

If the respondent did not take vitamin supplements in the past year, or took them less often than once a month, she should skip to the botanical supplements question, just before the section with additonal Native American foods

Multiple vitamins

There are three different multiple vitamin types. "Prenatal vitamins" is one type, "Regular once-a-day, "Centrum or Thera" is a second type, and "Stress Tabs or B-Complex" is a third type. They should not mark two or more types unless they in fact do take two or more different types of multiple vitamins.

"Prenatal vitamins" are the kind prescribed for pregnant women. They include a very long list of nutrients, and may include higher amounts of some nutrients than other types of multiple vitamins.

What is a "Regular Once-A-Day..."? Multiple vitamins typically contain all of the vitamins (A, B1, B2, C, D, E and others) and often contain minerals (iron, zinc, calcium and others). One-a-Day, Theragran, Centrum, Centrum Silver, and any local brand (e.g., Safeway Multivits) counts here. The key characteristic is that it contains many different vitamins; it is thought to be a sort of all-round supplement, covering all the bases at least at a basic level.

What is "Stress-tabs or B-Complex type"? These will have "stress", or "B-Complex", or "High-B" in the name. They all have B vitamins at levels substantially higher than the RDA.

Single Vitamins, <u>not</u> part of multiple vitamins

In general, these are supplements where each pill contains only the one vitamin or mineral. Thus, we are asking here about single supplements that are <u>not part of multiple vitamins</u>. Don't "double count" the multiple vitamins already mentioned above.

An exception: Occasionally a pill may contain just two minerals, such as calcium & zinc. Since we don't have a place for "multiple minerals", it is okay for respondent to record the frequency of consumption under both "calcium" and "zinc" separately.

"Antioxidant combination" tablets may contain, for example, vitamin A, vitamin C, vitamin E, and beta-carotene. Since "antioxidant combination" is not asked as a seprate item, it is OK to mark the frequency and duration of each of the "antioxidant" nutrients separately in the Single Vitamins section.

Vitamin A (not beta-carotene)	For Vitamin A, it is important to note that this is "not beta-carotene". Many respondents have learned that vitamin A and beta-carotene are in some way related. However, the "Vitamin A" line is asking specifically about preformed vitamin A, also known as retinol. If they take vitamin A as beta-carotene, they should mark their frequency only under the beta-carotene line.
Beta-carotene	Includes only beta-carotene taken as a single supplement or in an antioxidant combination. Does NOT include beta-carotene included in a prenatal or once-a-day multiple vitamin already mentioned above.
Vitamin C	Includes only vitamin C taken as a single supplement or in an antioxidant combination. Does NOT include vitamin C included in a prenatal or once-a-day multiple vitamins already mentioned above. "How much" vitamin C per day will be asked below.
Vitamin E	Includes only vitamin E taken as a single supplement or in an antioxidant combination. Does NOT include vitamin E included in a prenatal or once-a-day multiple vitamins already mentioned above. "How much" vitamin E per day will be asked below.
Folic Acid, Folate	Includes only folate or folic acid taken as a single supplement, NOT folate included in a prenatal or once-a-day multiple vitamins already mentioned above.
Calcium or Tums	Includes only calcium taken as a single supplement, NOT calcium included in a prenatal or once-a-day multiple vitamins already mentioned above. If your calcium tablets include another mineral listed in this section, such as "zinc", you may mark them both.
Vitamin D, alone or combined with calcium	Includes only Vitamin D taken as a single supplement, NOT included in a prenatal or once-a-day multiple vitamin already mentioned above. If your calcium tablets include Vitamin D, you may mark them both in this section.
Zinc	Includes only zinc taken as a single supplement, NOT included in a prenatal or once-a-day multiple vitamin already mentioned above. If your zinc supplement is in a tablet containing another mineral in this section, such as "calcium", you may mark them both in this section.

Iron	Includes only iron taken as a single supplement, NOT included in a prenatal or once-a-day multiple vitamin already mentioned above. If your iron tablets include another nutrient in this section, such as "Vitamin C", you may mark them both.
Selenium	Includes only selenium taken as a single supplement, NOT included in a prenatal or once-a-day multiple vitamin already mentioned above. If your selenium supplement is in a tablet containing another mineral in this section, such as "calcium", you may mark them both.
Omega-3, fish oil, flax seed oil	Includes only omega-3 sources taken as a single supplement, NOT included in a prenatal or once-a-day multiple vitamin already mentioned above. These items are commonly available in capsules.

More information about supplements …

Be sure to answer the last question in this section, about botanical supplements, even if you do not take vitamins.

Multi-vitamins … "Once-A-Day" types that contain minerals?	This need only be filled in if respondent takes multiple vitamins. (If respondent doesn't know, the program will assume "with minerals", since that is 80% of the market.)
Vitamin C, milligrams	This need only be filled in if respondent takes vitamin C as a single supplement (not part of multiple vitamins). These are the commonly available pill sizes. Note that this refers to the total milligrams in the day, on the days respondent takes it. It is not milligrams in a pill, or milligrams in each dose.
Vitamin E, IUs	This need only be filled in if respondent takes vitamin E as a single supplement (not part of multiple vitamins). These are the commonly available pill sizes. Note that this refers to the total IUs in the day, on the days respondent takes it. It is not IUs in a pill, or IUs in each dose.
… Any of these (botanical) supplements	These are not included in the nutrient analysis. However, the results that are returned to the researcher do indicate whether the supplement was reported as having been taken at least once a week.

Additional Native American foods

These final seven food items are answered in the same way as the food items on FFQ pages 2 through 5. For each food ask about frequency "How often …" and portion "How much …".

Have the respondent use the portion size pictures to estimate the size of the serving, on the days he or she eats each food.

Recipes and pronunciation of Native American food names may differ across study sites. Let the respondent help you with the name of the food, and don't worry about the differences in recipes.

Spam	Include any kind of Spam here, like Spam-lite or "low sodium". If they were not counted earlier, include other canned luncheon meats here also.
Menudo	The most important ingredients are tripe and hominy. Include all types of menudo here, regardless of whether it has chili or onion or beef, or hominy in it. Ask respondent to answer this question even if he or she remembers this food from an earlier question.
Pazole	Include all types of pazole, or posole here, whether made with hominy or wheat, beans or meat. Ask respondent to answer this question even if he or she remembers this food from an earlier question.
Guysava	The ingredient of interest is roasted, ground corn, whether or not the dish contains other vegetables, beans or meat.
Red chili stew or green chili stew	The point of this item is the chilis. Report any stewy dish with a lot of chilis here, whether or not it contains meat, hominy or other vegetables, and no matter what kind of meat.
Indian taco	Frybread topped with any combination of ground beef, beans, cheese, lettuce, tomato or salsa. Include any kind of Indian taco here, whether it has only beans, meat and beans, or meat and vegetables. If people eat a whole one the serving size is probably 'D'.
Frybread	Include here any frybread, whether made from baking powder or yeast dough.

End of food questionnaire

Thank you for filling out this questionnaire. Please take a minute to go back and fill in anything you may have skipped.

For interviewers and supervisors:

Thank the respondent for completing the questionnaire, and ask them to stay with you just a minute while you look over the booklet (together). (Do it with the respondent if possible.)

If food questionnaire booklet has missing answers or multiple marks, ask for clarification before the respondent departs.

If the respondent is returning a photo-copied questionnaire, check it over in the same way as an original FFQ. Look over it for missing answers and multiple marks in the same way, and clarify what the respondent meant before he or she leaves, if possible.

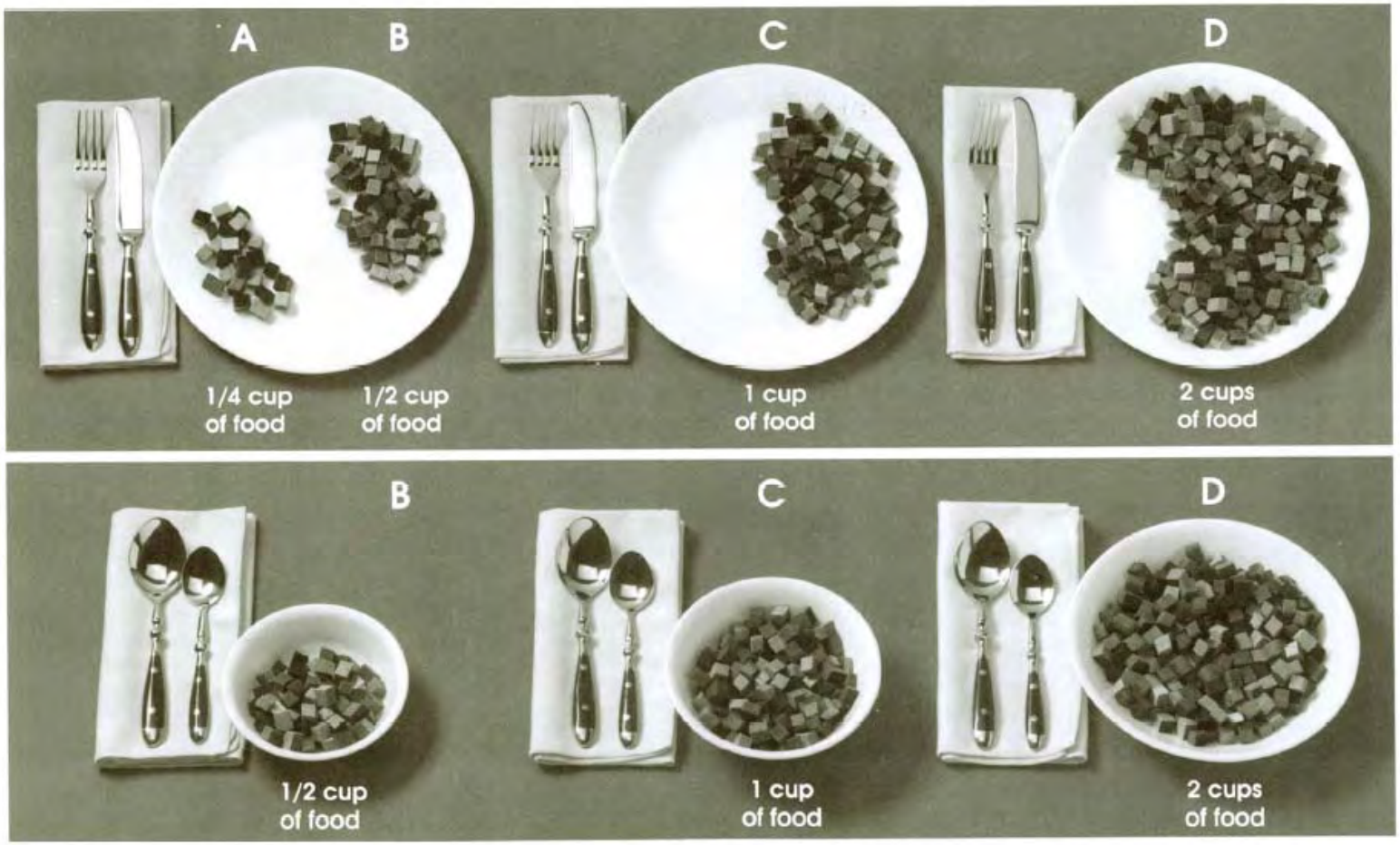
If too many items are missing, the nutrient analysis program will not run, or may not produce good estimates. If possible, contact the respondent to get responses to missing questions.

FOOD QUESTIONNAIRE

Serving Size Choices

Keep this in front of you while you are filling out The Food Questionnaire. You may use either the plates or the bowls to help you choose your serving size.

Choose A, B, C or D: **A** = 1/4 Cup of Food **B** = 1/2 Cup of Food **C** = 1 Cup of Food **D** = 2 Cups of Food



FFQ Processing Guidelines - Strong Heart Study V

****

Please fill in this checklist and send with completed questionnaires to:

Block Dietary Data Systems
15 Shattuck Square, Suite 288
Berkeley, CA 94704-1151
Phone 510-704-8514 Fax 510-704-8996

****

Send only original (blue and orange) FFQ forms

[] If respondent completed a photo-coped FFQ form, try to get complete responses while respondent is still there. All responses have to be transferred to an original form, in pencil, with bubbles well-filled

Questionnaires with missing data

[] Check for missing data. Note: Questionnaires with missing or incorrect ID numbers cannot be interpreted and information will be lost. If more than 15% of questions are not marked, questionnaire cannot be be analyzed. If possible, contact respondent for missing data.

ID field filled in

[] Fill in the bubbles in 'ID Number' with a different number for each respondent.
Note: You must create and retain list of names and corresponding ID numbers.

Marks in ink

[] Check questionnaires, go over in pencil any that were marked in ink. Erase stray marks.
Note: Forms completed in ink may be returned to you without being analyzed.

Remove portion size pictures

[] Check that portion size pictures, or other paper like post-its, have been removed.
Note: Questionnaire bubbles covered by paper cannot be read by the scanning machine.

Size of batch

[] Accumulate about 100 questionnaires before sending them for analysis. Larger batches are fine, but respondents have to wait longer for results.

Check List or cover letter

[] Include this check list or a cover letter indicating which study site collected the batch of questionnaires, so BDDS will know where to send the results and to whom to return the original questionnaires.

****

Please answer the following questions

****

Total number of completed questionnaires to be processed: _____

Study Site:	Oklahoma	Arizona	Dakotas (Timber Lake)
	[ ] Anadarko	[ ] Phoenix	[ ] Cheyenne River
	[ ] Lawton		[ ] Pine Ridge

BDDS will return original FFQs and analysis results to the name and address we have on record for each study site.

FOOD QUESTIONNAIRE

RESPONDENT ID #

TODAY'S DATE

	DAY	YEAR
Jan		
Feb		
Mar		2006
Apr		2007
May		2008
Jun		2009
Jul		2010
Aug		2011
Sep		2012
Oct		2013
Nov		2014
Dec		2015

ABOUT THIS SURVEY

This form is about the foods you usually eat.
It will take about 30 - 40 minutes to complete.
Please answer each question as best you can.
Estimate if you aren't sure.

- **USE ONLY A NO. 2 PENCIL.**
- **Fill in the circles completely, and erase completely if you make any changes.**

Please write your name in this box.

ABOUT YOU

SEX
- Male
- Female

If female, are you pregnant or breast feeding?
- No
- Yes
- Not female

AGE

WEIGHT pounds

HEIGHT ft in.

INSTRUCTIONS

There are usually two kinds of questions to answer for each food:

1. **HOW OFTEN,** on average, did you eat the food during the past year?
   *Please DO NOT SKIP any foods. Mark "Never" if you didn't eat any of the food in the question.
2. **HOW MUCH** did you usually eat of the food?
   *Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.
   *Sometimes we ask "how much" as A, B, C or D. **LOOK AT THE ENCLOSED PICTURES.**
   For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat. (If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D= 2 cups.)
3. **EXAMPLE:** This person drank apple juice twice a week, and had one glass each time.
   Once a week he ate a "C"-sized serving of rice (about 1 cup).

	HOW OFTEN IN THE PAST YEAR									HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)			
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY				
Apple juice	○	○	○	○	○	●	○	○	○	How many glasses each time	1 ●	2 ○	3 ○	4 ○
Rice	○	○	○	○	●	○	○	○	○	How much each time	A ○	B ○	C ●	D ○

PLEASE DO NOT WRITE IN THIS AREA

This section is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. We will ask you about different TYPES (low-fat, low-carb) at the end of the survey. Include all types (like low-fat, sugar-free). Later you can tell us which type you usually eat.

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Breakfast sandwiches with eggs, like Egg McMuffins	○	○	○	○	○	○	○	○	○	How many sandwiches in a day: ○ 1 ○ 2
Other eggs like scrambled, boiled or omelets (not egg substitutes)	○	○	○	○	○	○	○	○	○	How many eggs a day: ○ 1 ○ 2 ○ 3
Breakfast sausage, including in sausage biscuits, or in breakfast sandwiches	○	○	○	○	○	○	○	○	○	How many pieces: ○ 1 ○ 2 ○ 3
Bacon	○	○	○	○	○	○	○	○	○	How many pieces: ○ 1 ○ 2 ○ 3 ○ 4
Pancakes, waffles, French toast or Pop Tarts	○	○	○	○	○	○	○	○	○	How many pieces: ○ 1 ○ 2 ○ 3
Cooked cereals like oatmeal, grits or cream of wheat	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C ○ D
Cold cereals, ANY KIND, like corn flakes, fiber cereals, or sweetened cereals	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C ○ D
Milk or milk substitutes on cereal	○	○	○	○	○	○	○	○	○	
Yogurt or frozen yogurt	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C
Cheese, sliced cheese or cheese spread, including on sandwiches	○	○	○	○	○	○	○	○	○	How many slices: ○ 1 ○ 2 ○ 3
How often do you eat the following foods all year round? Estimate your average for the whole year.										
Bananas	○	○	○	○	○	○	○	○	○	How many each time: ○ 1/2 ○ 1
Apples or pears	○	○	○	○	○	○	○	○	○	How many each time: ○ 1/2 ○ 1 ○ 2
Oranges or tangerines	○	○	○	○	○	○	○	○	○	How many each time: ○ 1/2 ○ 1 ○ 2
Grapefruit	○	○	○	○	○	○	○	○	○	How much: ○ A little ○ 1/2 ○ 1
Peaches or nectarines, fresh	○	○	○	○	○	○	○	○	○	How many: ○ 1/2 ○ 1 ○ 2
Other fresh fruits like grapes, plums, honeydew, mango	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Canned fruit like applesauce, fruit cocktail, canned peaches or canned pineapple	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
How often do you eat each of the following 3 fruits, just during the summer months when they are in season?										
Cantaloupe, in season	○	○	○	○	○	○	○	○	○	How much: ○ 1/8 ○ 1/4 ○ 1/2
Strawberries or other berries, in season	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Watermelon, in season	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
How often do you eat each of the following vegetables all year round, including fresh, frozen, canned or in stir-fry, at home or in a restaurant?										
Broccoli	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Carrots, or mixed vegetables with carrots	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Corn	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Green beans or green peas	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Spinach (cooked)	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Greens like collards, turnip greens, mustard greens	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Sweet potatoes, yams	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
French fries, home fries, hash browns	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Potatoes not fried, including mashed, boiled, baked, or potato salad	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Cole slaw, cabbage, Chinese cabbage	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Green salad, lettuce salad	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Raw tomatoes	○	○	○	○	○	○	○	○	○	How much ○1/4 ○1/2 ○1
Salad dressing, any kind, regular or low-fat	○	○	○	○	○	○	○	○	○	How many tablespoons ○1 ○2 ○3 ○4
Any other vegetable, like squash, cauliflower, okra, cooked peppers	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Refried beans or bean burritos	○	○	○	○	○	○	○	○	○	How much of the beans ○A ○B ○C
Pinto beans, black beans, chili with beans, baked beans	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Vegetable stew (without meat)	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Vegetable soup, vegetable-beef soup, or tomato soup	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Split pea, bean or lentil soup	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Any other soup including chicken noodle, cream soups, Cup-A-Soup, ramen	○	○	○	○	○	○	○	○	○	Which bowl ○B ○C ○D
Pizza	○	○	○	○	○	○	○	○	○	How many slices ○1 ○2 ○3 ○4
Spaghetti, lasagna or other pasta with tomato sauce	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Macaroni and cheese	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Other noodles like egg noodles, pasta salad, sopa seca	○	○	○	○	○	○	○	○	○	How much ○B ○C ○D
Tofu or tempeh	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C
Meat substitutes like veggie burgers, veggie chicken, vegetarian hot dogs or vegetarian lunch meats	○	○	○	○	○	○	○	○	○	How many patties or dogs ○1 ○2
Do you ever eat chicken, meat or fish?	○ Yes	○ No	IF NO, SKIP TO BREADS ON NEXT PAGE							
Hamburgers, cheeseburgers, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much ○1 sm ○1 lrg ○2
Hot dogs, or sausage like Polish, Italian or chorizo	○	○	○	○	○	○	○	○	○	How many hotdogs ○1 ○2 ○3

PLEASE DO NOT WRITE IN THIS AREA

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS — SEE PORTION SIZE PICTURES FOR A-B-C-D
Lunch meat like bologna, sliced ham, turkey bologna, or any other lunch meat	○	○	○	○	○	○	○	○	○	How many slices: ○ 1 ○ 2 ○ 3 ○ 4
Meat loaf, meat balls	○	○	○	○	○	○	○	○	○	How much: ○ B ○ C ○ D
Steak, roast beef, or beef in frozen dinners or sandwiches	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Tacos, burritos, enchiladas, tamales, with meat or chicken	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Ribs, spareribs	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Pork chops, pork roasts, cooked ham (including for breakfast)	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Veal, lamb, deer meat	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Liver, including chicken livers or liverwurst	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Pigs feet, neck bones, oxtails, tongue	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Menudo, pozole, caldo de res, sancocho, ajiaco	○	○	○	○	○	○	○	○	○	Which bowl: ○ B ○ C ○ D
Any other beef or pork dish, like beef stew, beef pot pie, corned beef hash, Hamburger Helper	○	○	○	○	○	○	○	○	○	How much: ○ B ○ C ○ D
Fried chicken, including chicken nuggets, wings, chicken patty	○	○	○	○	○	○	○	○	○	How many medium pieces: ○ 1 ○ 2 pcs/6 nugts ○ 3
Roasted or broiled chicken or turkey	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Any other chicken dish, like chicken stew, chicken with noodles, chicken salad, Chinese chicken dishes	○	○	○	○	○	○	○	○	○	How much: ○ B ○ C ○ D
Oysters	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Shellfish like shrimp, scallops, crabs	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Tuna, tuna salad, tuna casserole	○	○	○	○	○	○	○	○	○	How much of the tuna: ○ A ○ B ○ C
Fried fish or fish sandwich	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
Other fish, not fried	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C
BREADS										
Biscuits, muffins, croissants (not counting breakfast sandwiches with eggs)	○	○	○	○	○	○	○	○	○	How many: ○ 1 sm ○ 1 med ○ 2
Hamburger buns, hotdog buns, hoagie buns, submarines	○	○	○	○	○	○	○	○	○	How many: ○ 1 ○ 2
Bagels, English muffins, dinner rolls	○	○	○	○	○	○	○	○	○	How many: ○ 1/2 ○ 1
Tortillas (not counting those eaten in tacos or burritos)	○	○	○	○	○	○	○	○	○	How many in a day: ○ 1 ○ 2 ○ 3 ○ 4
Corn bread, corn muffins, hush puppies	○	○	○	○	○	○	○	○	○	How many pieces in a day: ○ 1/2 ○ 1 ○ 2
Any other bread or toast, including white, dark, whole wheat, and what you have in sandwiches	○	○	○	○	○	○	○	○	○	How many slices in a day: ○ 1 ○ 2 ○ 3 ○ 4
Rice, or dishes made with rice	○	○	○	○	○	○	○	○	○	How much in a day: ○ B ○ C ○ D

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH ON THOSE DAYS — SEE PORTION SIZE PICTURES FOR A-B-C-D
Margarine (not butter) on bread or on vegetables	○	○	○	○	○	○	○	○	○	How many pats (tsp) ○ 1 ○ 2 ○ 3 ○ 4
Butter (not margarine) on bread or on vegetables	○	○	○	○	○	○	○	○	○	How many pats (tsp) ○ 1 ○ 2 ○ 3 ○ 4
Energy bars, like Power Bars, Clif bars, Balance, Luna, Atkins bars	○	○	○	○	○	○	○	○	○	How many ○ 1 ○ 2
Breakfast bars, cereal bars, granola bars (not energy bars)	○	○	○	○	○	○	○	○	○	How many ○ 1 ○ 2
Peanuts, sunflower seeds, other nuts or seeds	○	○	○	○	○	○	○	○	○	How much ○ A ○ B ○ C
Peanut butter	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2 ○ 3
Snack chips like potato chips, tortilla chips, Fritos, Doritos, popcorn (not pretzels)	○	○	○	○	○	○	○	○	○	How much ○ A ○ B ○ C ○ D
Crackers, like Saltines, Cheez-Its, or any other snack cracker	○	○	○	○	○	○	○	○	○	How much ○ A ○ B ○ C
Jelly, jam	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2
Mayonnaise, sandwich spreads	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2
Catsup, salsa or chile peppers	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2 ○ 3
Mustard, barbecue sauce, soy sauce, gravy, other sauces	○	○	○	○	○	○	○	○	○	How many tablespoons ○ 1/2 ○ 1 ○ 2 ○ 3
Donuts	○	○	○	○	○	○	○	○	○	How many ○ 1 ○ 2 ○ 3
Cake, or snack cakes like cupcakes, Ho-Hos, Entenmann's, or any other pastry	○	○	○	○	○	○	○	○	○	How many pieces ○ 1 sm ○ 1 med ○ 2 ○ 3
Cookies	○	○	○	○	○	○	○	○	○	How many ○ 1-2 ○ 3-4 ○ 5-6 ○ 7+
Ice cream, ice cream bars	○	○	○	○	○	○	○	○	○	How much ○ B ○ C ○ D
Chocolate syrup or sauce (like in milk or on ice cream)	○	○	○	○	○	○	○	○		
Pumpkin pie, sweet potato pie	○	○	○	○	○	○	○	○	○	How many pieces ○ 1/2 ○ 1 ○ 2
Any other pie including fast food pies or snack pies	○	○	○	○	○	○	○	○	○	How many pieces ○ 1/2 ○ 1 ○ 2
Chocolate candy like candy bars, M&Ms, Reeses	○	○	○	○	○	○	○	○	○	How much ○ 1 mini ○ 1 med ○ 1 lrg ○ 1 king
Any other candy, not chocolate, like hard candy, Lifesavers, Skittles, Starburst	○	○	○	○	○	○	○	○	○	How much in a day ○ 1-2 pcs ○ 1/2 pkg ○ 1 pkg

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH on the days you drink it?
Glasses of milk (any kind, including soy), not counting on cereal or coffee	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1 ○ 2 ○ 3
Drinks like Slim Fast, Sego, Slender, Ensure or Atkins	○	○	○	○	○	○	○	○	○	How many CANS OR GLASSES ○ 1 ○ 2
Tomato juice or V-8 juice	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2
Real 100% orange juice or grapefruit juice. Don't count orange soda or Sunny Delight	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2
Apple juice, grape juice, pineapple juice or fruit smoothies	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH on the days you drink it?
Hi-C, Cranberry Juice Cocktail, Hawaiian Punch, Tang	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2 ○ 3
Drinks with some juice, like Sunny Delight, Knudsen	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1/2 ○ 1 ○ 2 ○ 3
Iced tea, homemade, instant, or bottled like Nestea, Lipton, Snapple, Tazo	○	○	○	○	○	○	○	○	○	How many GLASSES OR BOTTLES ○ 1 ○ 2 ○ 3 ○ 4
Kool-Aid, lemonade, sports drinks like Gatorade, or fruit flavored drinks (not including iced teas)	○	○	○	○	○	○	○	○	○	How much IN A DAY ○ 1 glass ○ 1 20-ounce bottle ○ 2 glasses ○ 2 20-ounce bottles
Any kind of soft drink, like cola, Sprite, orange soda, regular or diet	○	○	○	○	○	○	○	○	○	How much IN A DAY ○ 1 can ○ 1 20-ounce bottle ○ 2 cans ○ Big Gulp or 3 cans
Beer or non-alcoholic beer	○	○	○	○	○	○	○	○	○	How much IN A DAY ○ 1 can ○ 2 cans ○ 3-4 cans or small pitcher ○ 5+ cans or large pitcher
Wine or wine coolers	○	○	○	○	○	○	○	○	○	How many GLASSES in a day ○ 1/2 glass ○ 1 glass ○ 2 glasses or half bottle ○ 3 glasses
Liquor or mixed drinks	○	○	○	○	○	○	○	○	○	How many DRINKS ○ 1 ○ 2 ○ 3 ○ 4
Glasses of water, tap or bottled	○	○	○	○	○	○	○	○	○	How many GLASSES ○ 1 ○ 2 ○ 3-4 ○ 5+
Coffee, regular or decaf	○	○	○	○	○	○	○	○	○	How many CUPS ○ 1 ○ 2 ○ 3 ○ 4+
Hot tea (not including herbal teas)	○	○	○	○	○	○	○	○	○	How many CUPS ○ 1 ○ 2 ○ 3 ○ 4+

What do you usually add to **coffee?** **MARK ONLY ONE:**
○ Cream or half & half ○ Nondairy creamer ○ Milk ○ None of these ○ Don't drink it

What do you usually add to **tea?** **MARK ONLY ONE:**
○ Cream or half & half ○ Nondairy creamer ○ Milk ○ None of these ○ Don't drink it

Do you usually add sugar (or honey) to **coffee?** ○ No ○ Yes IF YES, how many teaspoons each cup? ○ 1 ○ 2 ○ 3 ○ 4

Do you usually add sugar (or honey) to **tea?** ○ No ○ Yes IF YES, how many teaspoons each cup? ○ 1 ○ 2 ○ 3 ○ 4

	RARELY	1-2 PER WEEK	3-4 PER WEEK	5-6 PER WEEK	1 PER DAY	1 1/2 PER DAY	2 PER DAY	3 PER DAY	4+ PER DAY
About how many servings of vegetables do you eat, per day or per week, not counting salad or potatoes?	○	○	○	○	○	○	○	○	○
About how many servings of fruit do you eat, not counting juices?	○	○	○	○	○	○	○	○	
How often do you use fat or oil in cooking?	○	○	○	○	○	○	○	○	

PLEASE DO NOT WRITE IN THIS AREA

SERIAL # ○○○○○○○○○○○○○○○○○○○○○○○○

If you eat the following foods, what type do you usually eat? MARK ONLY ONE ANSWER FOR EACH QUESTION

Milk	○ Whole milk ○ Reduced-fat 2% milk	○ Low-fat 1% milk ○ Non-fat milk	○ Soy milk ○ Rice milk	○ Don't drink
Slim Fast, Sego, Slender or Ensure		○ Low-Carb like Atkins	○ Regular	○ Don't drink
Orange juice	○ Calcium-fortified	○ Not calcium-fortified	○ I don't know	○ Don't drink
Soda or pop	○ Diet soda, low-calorie	○ Regular	○ Don't drink	
Iced tea	○ Homemade, no sugar	○ Homemade, w/sugar	○ Bottled, no sugar	○ Bottled, regular ○ Don't drink
Beer	○ Regular beer	○ Light beer	○ Low-Carb beer	○ Non-alcoholic beer ○ Don't drink
Hamburgers or cheeseburgers		○ Hamburgers	○ Cheeseburgers	○ Don't eat
Hot dogs	○ Low fat or turkey dogs	○ Regular hot dogs	○ Don't eat	
Lunch meats	○ Low-fat or turkey lunch meats	○ Regular lunch meats	○ Don't eat	
Spaghetti or lasagna	○ Meatless	○ With meat sauce or meatballs		○ Don't eat
Cheese	○ Low Fat	○ Not Low Fat	○ Don't eat	
Salad dressing	○ Low-Carb	○ Low-fat	○ Regular	○ Don't use
Energy bars like Power Bar, Clif, Atkins	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Breakfast bars, cereal bars, or granola bars	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Bread	○ 100% whole wheat	○ Low-Carb	○ Regular	○ Don't eat
Tortillas	○ Corn	○ Flour	○ Don't know or don't eat	
Chocolate candy or chocolate candy bars	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Cookies	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Cake, snack cakes, and other pastries	○ Low-Carb, low sugar	○ Low-fat	○ Regular	○ Don't eat
Ice cream	○ Low-Carb, low sugar	○ Low-fat or ice milk	○ Regular	○ Don't eat
Jelly or jam	○ Low-Carb, low sugar	○ Regular	○ Don't use	
Beef or pork	○ Avoid eating the fat	○ Sometimes eat the fat	○ Often eat the fat	○ Don't eat
Chicken or Turkey	○ Avoid eating the skin	○ Sometimes eat the skin	○ Often eat the skin	○ Don't eat

What kinds of **fat or oil** do you usually use in cooking? **MARK ONLY ONE OR TWO**

○ Don't know, or Pam	○ Stick margarine	○ Corn oil, vegetable oil	○ Lard, fatback, bacon fat
○ Butter	○ Soft tub margarine	○ Olive oil or canola oil	○ Crisco
○ Butter/margarine blend	○ Low-fat margarine		

If you eat **cold cereals**, what do you eat? Choose one or two that you eat most often. (If you usually just eat one kind, just choose one.)

○ Low-carb cereals like Atkins, Low-Carb Special K	○ Total	○ Other fiber cereals like Raisin Bran, Fruit-n-Fiber
○ Cheerios, Grape Nuts, Shredded Wheat, Wheaties, Wheat Chex	○ Fiber One	○ Sweetened cereals like Frosted Flakes, Froot Loops
	○ Product 19, Complete	○ Other cold cereals, like Corn Flakes, Rice Krispies, Special K
	○ All Bran, Bran Buds	

What vitamin supplements do you take fairly regularly?

Multiple Vitamins. Did you take...	HOW OFTEN: DIDN'T TAKE	A FEW DAYS per MONTH	1-3 DAYS per WEEK	4-6 DAYS per WEEK	EVERY DAY	FOR HOW MANY YEARS?: LESS THAN 1 YEAR	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10+ YEARS
Prenatal vitamins	○	○	○	○	○	○	○	○	○	○	○
Regular Once-A-Day, Centrum, Theragran, "senior" vitamins or house brands of multiple vitamins	○	○	○	○	○	○	○	○	○	○	○
Stress-tabs or B-Complex type	○	○	○	○	○	○	○	○	○	○	○
Single Vitamins, not part of multiple vitamins											
Vitamin A (not beta-carotene)	○	○	○	○	○	○	○	○	○	○	○
Beta-carotene	○	○	○	○	○	○	○	○	○	○	○
Vitamin C	○	○	○	○	○	○	○	○	○	○	○
Vitamin E	○	○	○	○	○	○	○	○	○	○	○
Folic Acid, Folate	○	○	○	○	○	○	○	○	○	○	○
Calcium or Tums	○	○	○	○	○	○	○	○	○	○	○
Vitamin D, alone or combined with calcium	○	○	○	○	○	○	○	○	○	○	○
Zinc	○	○	○	○	○	○	○	○	○	○	○
Iron	○	○	○	○	○	○	○	○	○	○	○
Selenium	○	○	○	○	○	○	○	○	○	○	○
Omega-3, fish oil, flax seed oil	○	○	○	○	○	○	○	○	○	○	○

If you took Once-a-day, Centrum or Thera-type multiple vitamins, did you usually take types that
○ contain minerals, iron, zinc, etc. ○ do not contain minerals ○ Don't know

If you took vitamin C, how many milligrams of **vitamin C** did you usually take, on the days you took it?
○ 100 ○ 250 ○ 500 ○ 750 ○ 1000 ○ 1500 ○ 2000 ○ 3000+ ○ Don't know

If you took vitamin E, how many IUs of **vitamin E** did you usually take, on the days you took it?
○ 100 ○ 200 ○ 300 ○ 400 ○ 600 ○ 800 ○ 1000 ○ 2000+ ○ Don't know

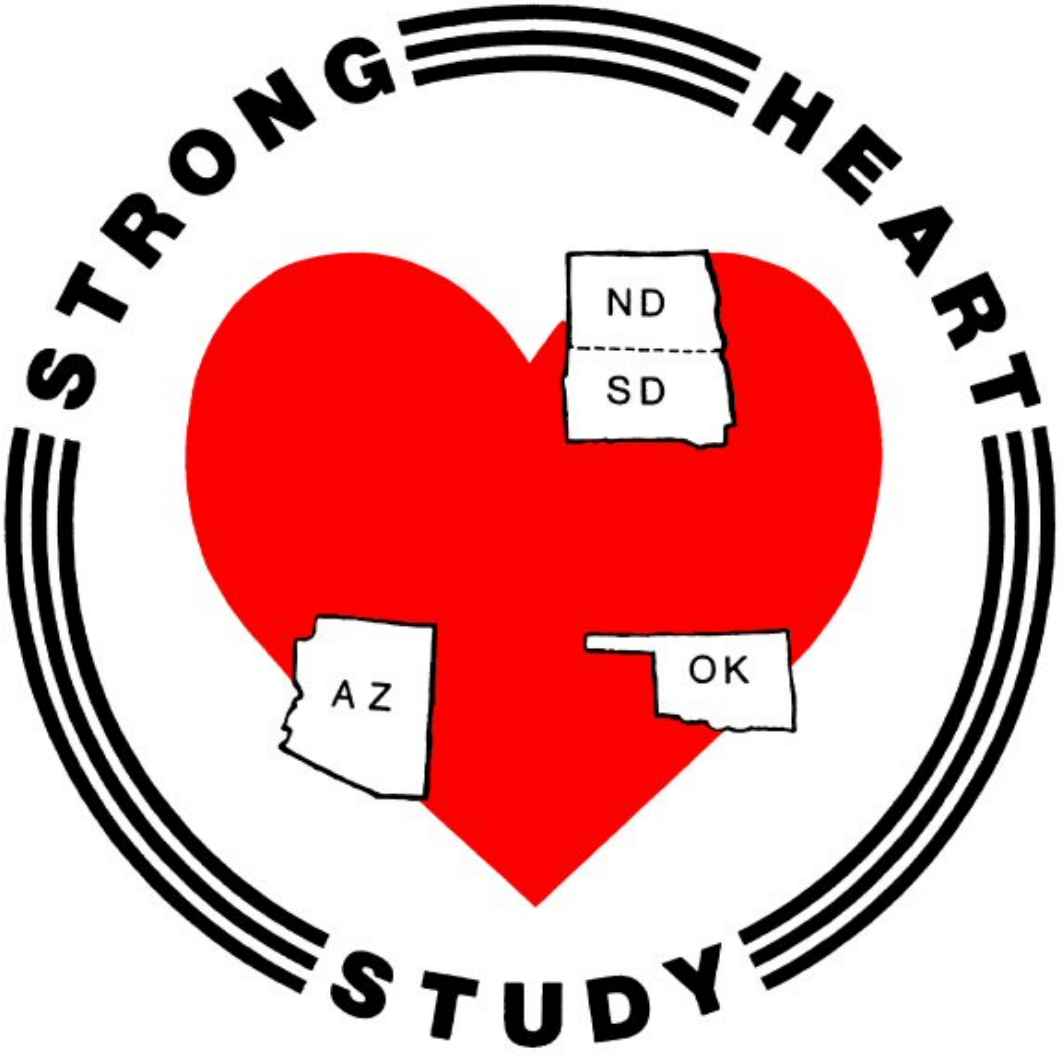
Did you take any of these supplements at least once a week?
○ Ginkgo ○ St. John's Wort ○ Echinacea ○ DHEA ○ Didn't take these
○ Ginseng ○ Kava Kava ○ Melatonin ○ Glucosamine/Chondroitin

How often do you eat each of the following foods?	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)
Spam	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Menudo	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Pazole	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Guysava	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Red chili stew or green chili stew	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Indian taco	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Frybread	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D

Thank you very much for filling out this questionnaire.
Please take a minute to go back and fill in anything you may have skipped.

PLEASE DO NOT WRITE IN THIS AREA

SERIAL #



FAMILY STUDY

Cardiovascular Disease in American Indians
(Phase V)

Operations Manual - Volume Ten

TRAINING MANUAL

THE NATIONAL HEART, LUNG AND BLOOD INSTITUTE
OF THE NATIONAL INSTITUTES OF HEALTH

THE STRONG HEART STUDY

Cardiovascular Disease in American Indians (Phase V)

Operations Manual

Volume Ten

TRAINING MANUAL

July 01, 2006

For copies, please contact

Strong Heart Study Coordinating Center

Center for American Indian Health Research
College of Public Health

P.O. Box 26901
Oklahoma City, OK 73190

VOLUME X

TRAINING MANUAL

Table of Contents

STRONG HEART STUDY

PHASE V

FAMILY STUDY

TRAINING MANUAL

SHS V – Cardiovascular Disease in American Indians, Phase V – Family Study

STAFF TRAINING AND CERTIFICATION CHECKLIST

Trainee Name _____

Task	Date of Certification	Initial
Anthropometry		
Hip		
Waist		
Arm		
Height		
Weight		
Blood Pressures		
Diet - FFQ		
Doppler Blood Pressures		
ECG		
Edema		
Impedance		
LAB		
Morbidity & Mortality Surveillance		
Pedal Pulses		
Pedometer		
Personal Interview		

SHS Phase V Family Study

Quality Control Documentation

Trainee Name _____

Activity	QC	QC	QC	QC	QC	QC	QC
Date							
Consent Form							
Personal Interviews							
Diet FFQ							
Anthropometry							
ECG							
Sitting Blood Pressures							
Impedance							
Doppler Blood Pressures							
Edema and Pedal Pulses							
Pedometer							
LAB							

INTERVIEWS

Interview Procedures

In general the rules for asking questions in structured interviews can be summarized as follows:

a. Questions must be asked according to the instructions for each form and question. Be sure to read and re-read the instructions for each questionnaire you are using, and to ask all the questions in the same way to each person interviewed.

b. Read the questions exactly as they are worded in the questionnaire. If the question is misunderstood, then it may be repeated, interchanging local terms, if necessary for understanding.

c. Read each question slowly.

d. Use correct intonation and emphasis.

e. Ask the questions in the order that they are presented in the questionnaire.

f. Ask every question that applies to the respondent (all inapplicable questions will be identified as such by skip instructions in the questionnaire).

g. Repeat questions IN FULL that are misheard or misunderstood.

h. Read all linking or transitional statements exactly as they are printed.

i. Do not add apologies or explanations for questions unless they are printed in the questionnaire.

PROBING: Probes are additional questions asked or statements made by the interviewer when the answer given by a respondent is incomplete or irrelevant. Probing has two major functions: (1) To motivate the respondent to reply more fully; (2) to help the respondent focus on the specific content of the question. It must fulfill these functions without biasing the respondent's answers. However, probes, when they are used, MUST be neutral. Probing can introduce bias, such as by summarizing your understanding of the response to the subject when an unclear response has been given, or by offering some alternative interpretations from which the respondent can choose, and this must be guarded against.

The following are NON-DIRECTIVE methods of probing:

a. Repeat the question (RQ). All that may be required to clear up a vague answer may be to repeat the question. You may begin by saying "I am not sure that I understood you, let me just repeat the question so that I can be sure to get your answer right."

b. The expectant pause. Waiting expectantly will tell the respondent that the

interviewer is expecting more information than has been provided.

c. Repeat the reply. Repeating the reply aloud while recording it may stimulate the respondent to provide more details.

d. Neutral questions or comments. Various neutral probes may be used for purposes such as clarification, specificity, or completeness: "What do you mean exactly?", "In what way?", "Could you be more specific about that?", "Anything else?", "Can you tell me more about it?"

e. Interpretation. Make sure that the question was understood, since that may be the reason for incomplete answers. You may need to ask the question again, perhaps substituting some local terms, if there is a problem in interpretation.

FEEDBACK: The provision of feedback by the interviewer to the respondent about his or her performance has been the subject of much research. Some studies have shown that the use of feedback in health-related surveys increased the amount of reporting of most events. Your decision about whether to provide feedback may depend upon the performance of the person you are interviewing and your experience in the benefits of providing feedback.

Common Interviewer Errors

We should try to minimize interviewer error during this study. The primary objectives of epidemiologic research are (1) to obtain measurements of exposure and disease variables relevant to the objectives of the study, and (2) to maximize completeness and minimize error in these measurements. The presence of an interviewer may both reduce error and increase error. It may reduce error by increasing the response rate, motivating the subject to respond well and probing to obtain complete data when the responses volunteered fall short of what is desired. The presence of an interviewer may increase error if, by his or her appearance, manner, method of administration of the questionnaire or method of recording of the responses, he or she exerts a qualitative influence on the subject's responses. Possible sources of error in the interview for data collection include (1) conditions of administration (privacy, heat, light, ventilation, freedom from distraction, lack of time, etc.); (2) interaction of the personality, sex or race of the interviewer with that of the subject; and, (3) performance by the interviewer (questioning, prompting and recording of responses).

The following are the common interviewer errors:

a. Asking errors. Omitting questions or changing the wording of questions. This may be particularly important if the interview is performed in Native language.

b. Probing errors. Failing to probe when necessary, biased probing, irrelevant probing, inadequate probing, preventing the respondent from saying all he or she wishes to say.

c. Recording errors. Recording something not said, not recording something said,

incorrectly recording response.

d. Flagrant cheating. Not asking a question but recording a response, recording a response when the respondent does not answer the question asked. These kinds of errors do occur and this has been amply documented by various studies. Cheating has been shown to be more common when the interviewer is in an uncomfortable situation with the interviewee, i.e., he/she is difficult. In such situations the question should still be asked and if the participant refuses to answer the question(s), the refusal should be documented on the form.

SHS Phase V Family Study

Training and Quality Assurance

PERSONAL INTERVIEWS

Training

Interviewers will be trained using a standardized procedure for administering each questionnaire. Training will include instructions in research interviewing techniques and in completing each form. Interviewer skill training will include:

a) adherence to the standardized protocol
b) use of non-judgmental attitudes
c) degree and nature of prompting
d) appropriate problem solving
e) proper handling of participants' comments and documenting relevant information on logs
f) post interview responsibilities

Quality Assurance

To assure consistency and accuracy and minimize interviewer variances, the study coordinator will monitor one interview during the first exam month on interviews conducted by each interviewer. For "new staff," this should be repeated each month until the Coordinator determines that the interviewer has met the standards of the study. Then, new staff members will be observed on a quarterly basis along with experienced interviewers. Should any interviewer fall short of the required standards, retraining will be required with special attention given to the problem areas. If the problem persists, the interviewer will be removed from the task of conducting interviews.

SHS PHASE V FAMILY STUDY

Checklist for Personal Interviews

The Study Coordinator will observe and tape one interview during the first exam month on interviews conducted by each interviewer and record the results below. As each procedure is carried out, indicate if it is correct by checking the "yes" or "no" column. Suggestions and comments can be written in the space provided. Quarterly observation will be followed after interviewers are certified and have demonstrated the standards of the study have been met.

Interviewer code# _____ **Date observed** _____

Observer code# _____

Establishes correct environment (for privacy and participant comfort).	Yes_____	No_____
Uses proper introduction of questionnaire and self (purpose of form/data).	Yes_____	No_____
Reassures participant: confidential_____ voluntary____ can skip Q's____	Yes_____	No_____
Reads questions exactly as written, slowly, distinctly, in a neutral tone with no omissions or rewording.	Yes_____	No_____
Reads questions in correct order following skip patterns when required.	Yes_____	No_____
Conducts interview in understandable language for participant. If in native language, uses correct translations.	Yes_____	No_____
Repeats questions in full that are misheard or misunderstood.	Yes_____	No_____
Uses neutral probes non-directively and appropriately (using pauses, repeating answers, giving ranges, etc.)	Yes_____	No_____
Handles problem solving situations with proper interventions. (This includes participants' questions.)	Yes_____	No_____
Remains nonjudgmental throughout interview.	Yes_____	No_____
Records answers correctly on forms. Edit forms before participant leaves clinic for any corrections.	Yes_____	No_____
Provides closure with participant (including expression of appreciation).	Yes_____	No_____

Comments: _____

_____

_____

_____

ANTHROPOMETRY

Procedures for Measuring Height, Weight, Waist and Hip Circumferences

1. Height and Weight

   a) Standing Body Height

   The participant stands erect on the floor or the horizontal platform with his/her back against the vertical mounted ruler, heels together and against the vertical ruler, looking straight ahead with his/her head in the Frankfort horizontal plane (the horizontal plane which includes the lower margin of the bony orbit and the bony socket containing the eye the most forward point in the supratragal notch just above the anterior cartilaginous projections of the external ear) (Figure 1). The right angle is brought down snugly but not tightly on the top of the head. A footstool is used if the examiner is shorter than the participant so that the examiner's view is level with the point of measurement on the head of the participant. The participant's height is recorded to the nearest centimeter using the rounding method. The participant is instructed to stand as straight as possible but with feet flat on the floor. (A check is made to be sure the floor is level, the wall is at a 90 degree angle to the floor, the wall is straight and the metal ruler is mounted perpendicular to the floor). A chart converting centimeters to inches is on the wall or available for use in informing the participant of his/her height in inches.

   b) Body Weight

   Before a participant is weighed, the scale is balanced so that the indicator is at zero when no weight is on the scale. The scale must be level and on a firm surface (not a carpet). The participant is instructed to stand in the middle of the platform of the balance scale (Tanita BWB-8005 Adult Digital Scale) with head erect and eyes looking straight ahead. Record the results to the nearest kilogram using the rounding method. To maintain accuracy, the scale is zeroed daily and must be calibrated with a known weight (50-lb) every month or whenever the scale is moved. To calibrate the scale, check that the 50-lb weight weighs 50 lbs. after zeroing the scale. Furthermore, the operator should make sure that an adult must weigh 50 lbs. more when standing on the scale holding the weight.

2. Supine Waist (Abdominal) Girth

An anthropometric tape is applied at the level of the umbilicus (navel) with the patient supine (Figure 2) and the participant is instructed to "breathe quietly". The measurement is made and recorded to the nearest centimeter using the rounding method.

3. Erect Hip Girth

Instruct the participant to stand erect yet relaxed with weight distributed equally over both feet. The hip girth is measured at the level of maximal protrusion of the gluteal muscles (hips) (Figure 3). Keep the anthropometric tape horizontal at this level and record the measurement to the nearest centimeter using the rounding method. Only one measurement is made. The greatest source of error for this measurement is due to not having the tape horizontal. Technician(s) should check the position of the tape to assure its correct position from both the front and back.

4. Upper Arm Circumference

The participant sits on a table or stool so that the right arm hangs freely with the right hand resting on the right knee. The observer applies the tape measure horizontally at the midpoint between the acromion and olecranon (Figure 3). Record the measurement to the nearest centimeter using the rounding method. This measurement is used to select the proper size blood pressure cuff.

A Novel Products Figure Finder tape measure is used to measure both abdominal and hip girth and the upper arm circumference.

Figure 1. Frankfort Plane for Measuring Body Height

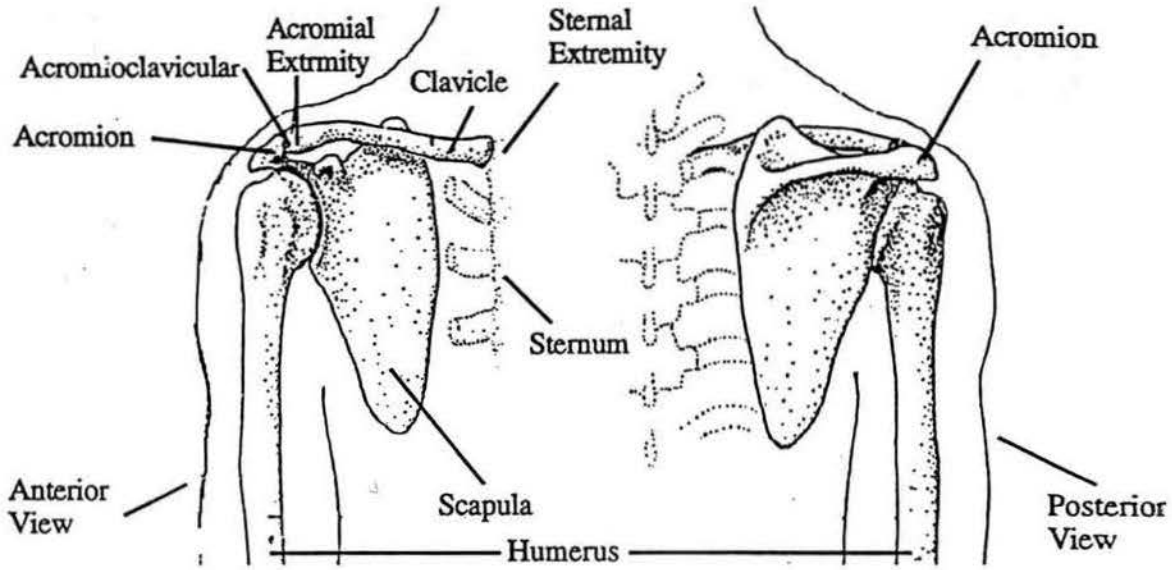


Figure 1 (a). General Description: The **scapulae**, or shoulder blades, are large, triangular, flat bones situated in the dorsal part of the thorax between the levels of the second and seventh ribs. A sharp ridge, the spine, runs diagonally across the posterior surface of the flattened, triangular body. The end of the spine projects as a flattened, expanded process called the **acromion**. This process articulates with the clavicle.

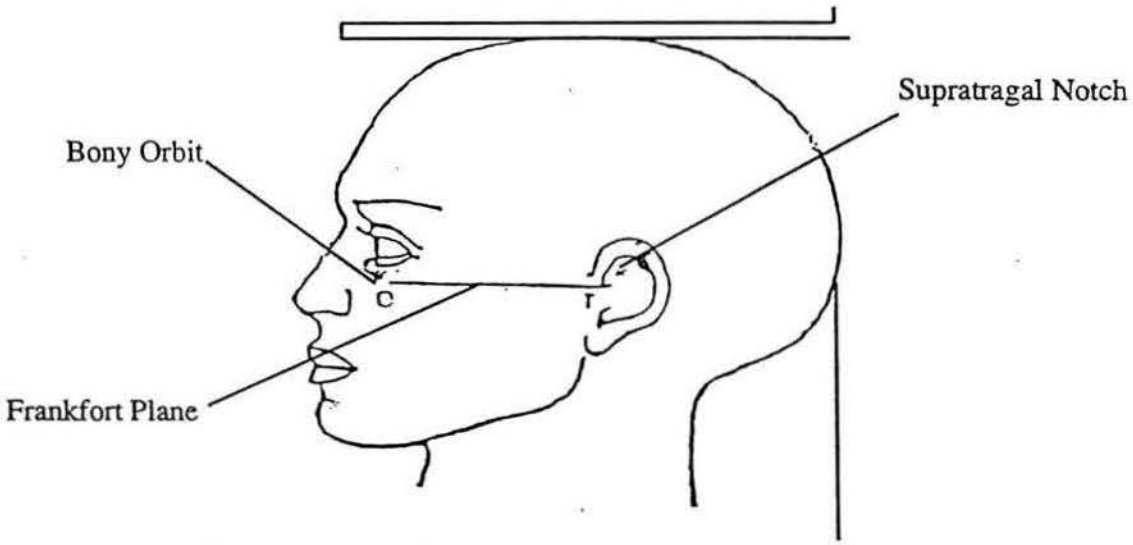


Figure 1 (b). the Frankfort Plane: The horizontal plane which includes the lower margin of the bony orbit, the bony socket containing the eye and the most forward point in the supratragal notch, the notch just above the small prominence of skin covered cartilage projecting over the meatus of the external ear.

Figure 2. Location of Waist Girth Measurement

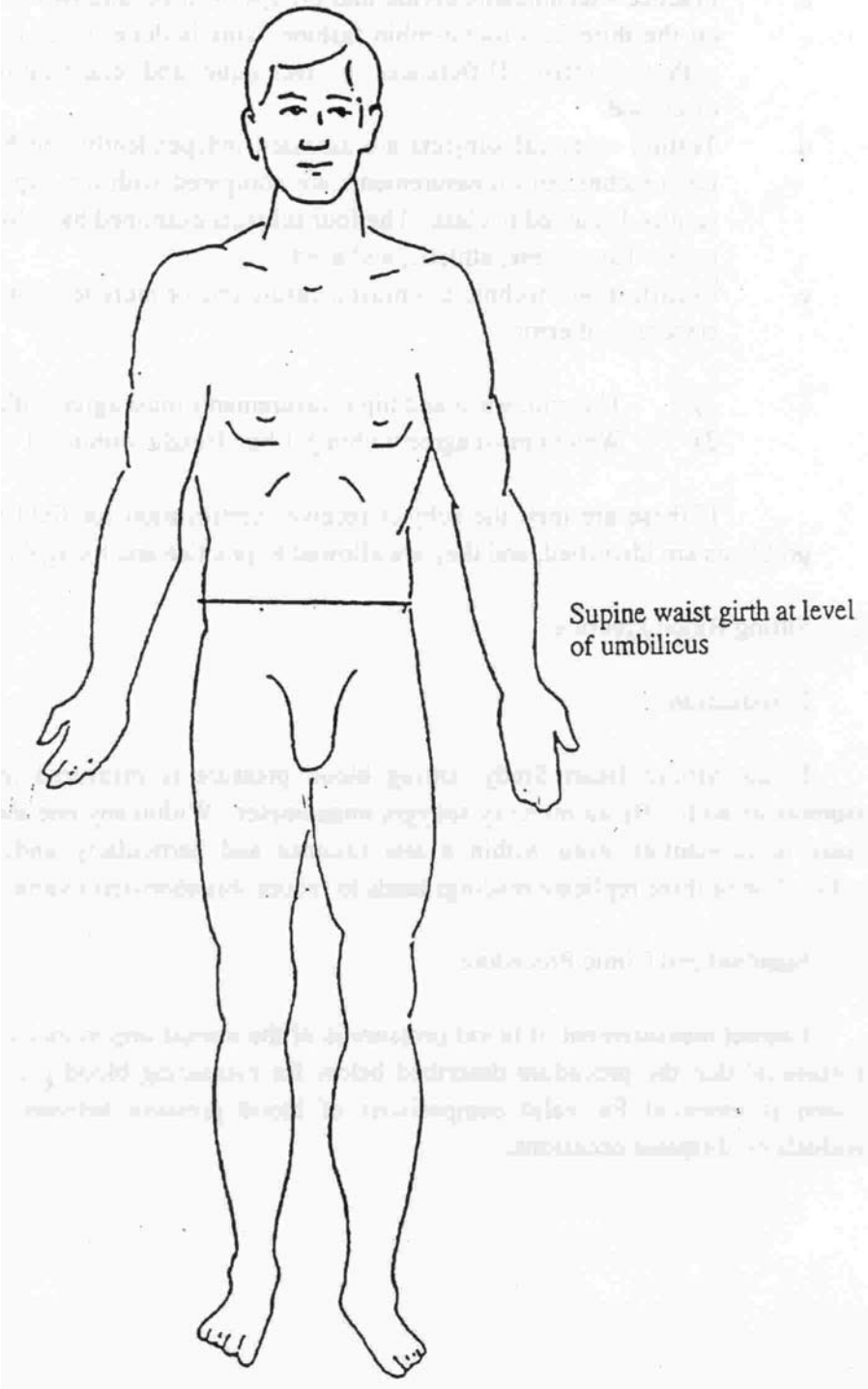
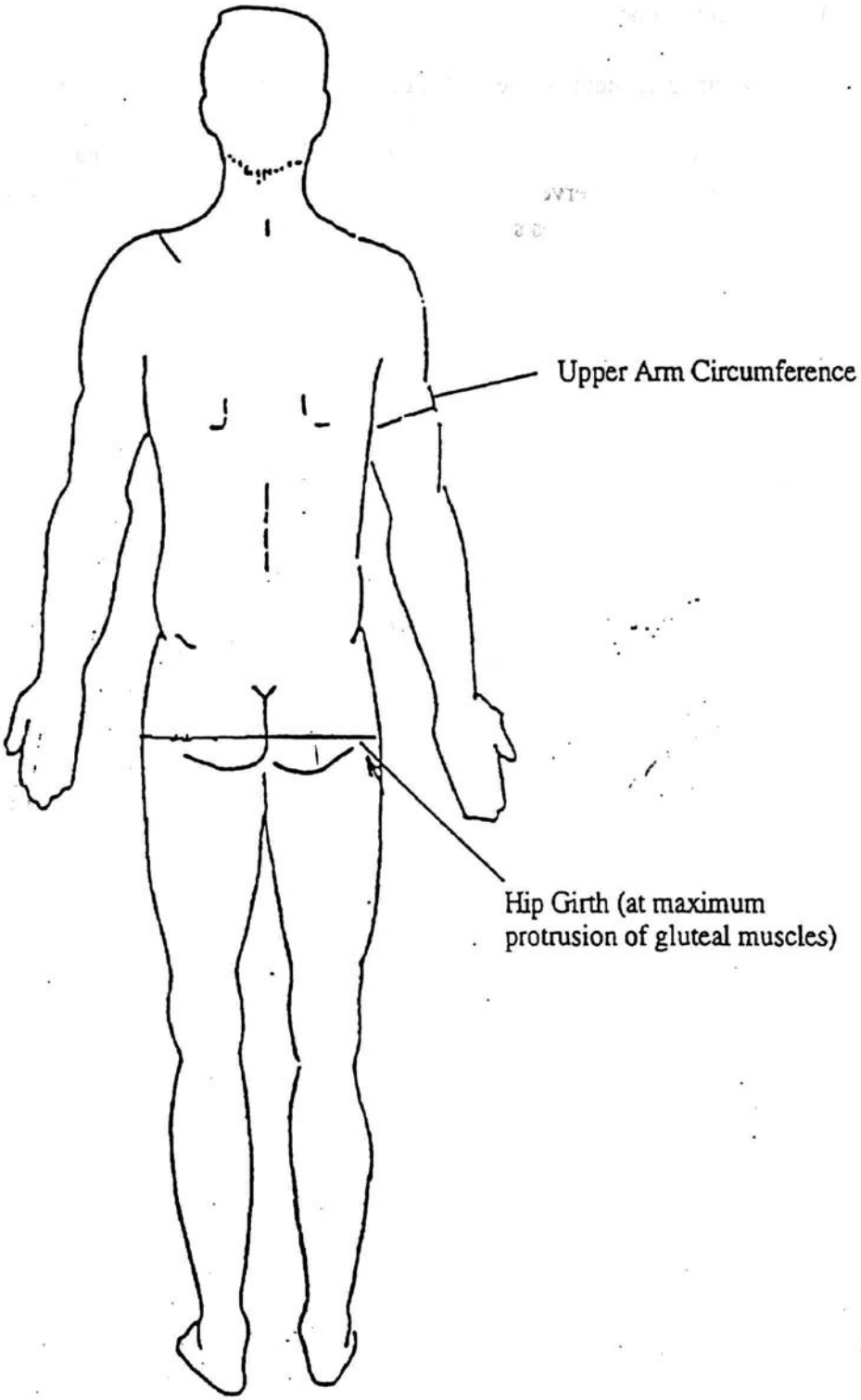


Figure 3. Location of Upper Arm, Hip, and Calf Circumference



SHS PHASE V FAMILY STUDY

Training and Quality Assurance

ANTHROPOMETRY

Training

Technician skill training will include:

a) Introduction
   - rationale for body size measurements
   - overview of technique
   - expected limits of reproducibility
   - pitfalls related to anthropometry

b) Demonstration - an expert demonstrates the proper technique of each measurement on a volunteer subject. This includes a description of proper and improper techniques, as well as how to record the data.

c) Practice - techs perform measurements on each other or on a volunteer under the observation of an experienced anthropometrist. Differences in technique and clarification of problems are discussed.

d) Testing - several subjects are assessed independently and blindly by each technician. The subjects should be from four distinctly different body type groups: lean, obese, athletic, and aged. Each tech's measurements are compared with the expert's measurements and the results are discussed with the tech.

e) Certification - technicians must measure one or more test subjects and be within the standards of error:
   1) The waist and hip measurements must agree within two cm on each subject, and the arm and height measurements must agree within one cm.
   2) The weight must agree within one kg.

Quality Assurance.

To insure consistency and accuracy, study coordinators will monitor technicians quarterly. Observation should include proper technique and accuracy within the standards of error listed above.

SHS PHASE V FAMILY STUDY

Checklist for Anthropometry

The Study Coordinator will observe each technician quarterly. If each procedure is carried out correctly, indicate so by checking the "YES" space. Results of measurements should be within standard of error:

- The waist and hip measurements must agree within two cm on each subject, and the arm and height measurements must agree within one cm.
- The weight must agree within 1 kg.

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

YES ( ) NO ( )	Tech instructs subject to remove shoes for height and weight.
YES ( ) NO ( )	Tech positions subject appropriately for height measurement.
YES ( ) NO ( )	Tech balances and zeroes the scale before subject is weighed.
YES ( ) NO ( )	Subject is weighed accurately to the nearest kg by the tech.
YES ( ) NO ( )	Hip girth is measured accurately with the tape measure placed horizontally around the maximal protrusion of the gluteal muscles.
YES ( ) NO ( )	Tech measures arm circumference accurately, rounding to the nearest cm.
YES ( ) NO ( )	Tech correctly positions subject for waist measurement.
YES ( ) NO ( )	Measure of waist taken correctly, tape position at umbilicus.

	Technician	Observer	Difference
Height	_____	_____	_____
Weight	_____	_____	_____
Hip	_____	_____	_____
Arm	_____	_____	_____
Waist	_____	_____	_____

ECG

SHS PHASE V FAMILY STUDY

Training and Quality Assurance

STANDARD ECG

Training

Technician skill training will include:

a) procedure for recording baseline ECG
b) electrode position measuring and marking
c) chest lead placement
d) limb lead placement
e) skin preparation
f) application of electrodes
g) recording the 12 - lead ECG

Standard ECG instructions are found in the appendix of Volume VI of this manual.

Quality Assurance.

The study coordinator will monitor the ECG technicians quarterly to insure accurate and consistent examinations. Observation should include evaluation of all the criteria listed above and should be recorded on the Checklist for ECGs (see below).

SHS PHASE V FAMILY STUDY

Checklist for ECGs

The study coordinator will monitor ECG technicians quarterly to assure consistent, accurate examinations. If each procedure is carried out correctly, indicate so by checking the "YES" space.

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

YES ( ) NO ( )	Subject is instructed to disrobe to the waist, lay supine in a relaxed position and to avoid movement during recording.
YES ( ) NO ( )	Chest electrodes are positioned correctly.
YES ( ) NO ( )	Limb electrodes are positioned correctly.
YES ( ) NO ( )	Skin preparation is used for poor electrode adhesion
YES ( ) NO ( )	Electrodes left in place 2-3 minutes before recording.
YES ( ) NO ( )	Subject information correctly entered into MAC 1200.
YES ( ) NO ( )	Appropriate recording of ECG performed.
YES ( ) NO ( )	Recording repeated if artifact on tracing, subject encouraged to relax.

Comments: _____

_____

_____

_____

_____

_____

BLOOD PRESSURE

Procedures for Taking Blood Pressures

1. Determine Cuffs

Proper size of the cuff is essential for accurate blood pressure measurement. Study Centers have four standardized Baum cuffs available - pediatric, adult, large adult, and thigh cuff.

The range markings on commercial cuffs overlap from size to size and do not offer a precise guideline. In the Strong Heart Study, arm size is measured and the cuff size is selected as follows:

Table 1.2 Determination of cuff size based on arm circumference (Mid humeral)

Cuff Size	Arm Circumference
Pediatric	**< 24 cm**
Adult	**24 to 32 cm**
Large Adult	**33 to 41 cm**
Thigh	**>41 cm**

2. Measurement Procedures

The sitting arm blood pressure is measured three times at each clinic visit. It takes approximately 10 minutes to make three blood pressure measurements including the initial five-minute rest. The blood pressure measurements are made early in the clinic visit sequence immediately following the reception and informed consent, and more than 15 minutes after phlebotomy.

Once the participant is given instructions and explanations and the equipment has been checked, blood pressure measurement begins. The following steps must be followed precisely.

a) If the participant indicates that there is a medical or postsurgical reason for not having the blood pressure measured on the right arm (or if the right arm is missing), reverse chairs and proceed with the left arm. Indicate on the data collection form that the left arm is used. If in doubt, or if the participant prefers not to have a blood pressure taken on either arm, consult with the supervisor.

b) Seat the participant with the right arm on the table. The bend at the elbow (ante-cubital fossa) should be at heart level. Legs should be uncrossed and head support comfortable. The participant should be able to relax the neck and shoulder muscles as much as possible.

c) Palpate the brachial artery (just medial to and above the ante-cubital fossa) and mark this location for stethoscope placement. Choose the correct cuff size and wrap the cuff on the arm with the center of the bladder over the artery. If the

participant seems particularly apprehensive, delay wrapping the cuff until after the five-minute wait.

d) Record the time. Allow a five-minute wait before taking the blood pressure. Conversation should be limited. However, a brief explanation of the procedure can be repeated at this time if necessary.

e) Connect the cuff to a standard manometer and establish the pulse obliteration pressure by slowly inflating while palpating the radial artery until pulse is no longer felt. Deflate and record the pulse obliteration pressure. Have the participant raise measurement arm for five seconds and then wait another 25 seconds with the participant's arm on the table.

f) Measurement 1: Connect the cuff to the manometer. Inflate rapidly to the pulse obliteration level + 30 mm. Holding the pressure constant with the bulb, wait 5 seconds. Place the bell of the stethoscope on the brachial artery and slowly deflate the cuff (2 mm per second) while listening. Record the 1st and 5th phases, reading the pressure in mmHg to the nearest even number. The first sound heard in a series of at least two sounds is recorded for systolic blood pressure (phase 1). The first silence in a series of at least two silences is recorded for diastolic blood pressure (phase 5), not the last sound heard. If the sounds do not cease completely, the fourth Korotkoff sound will be used. If the mercury column falls in between two scale marks at the time the first or fifth Korotkoff sound is heard, the **higher number** should be used.

g) Measurements 2 and 3: Have the participant raise measurement arm for five seconds. After waiting another 25 seconds with the participant's arm on the table, repeat the measurement in step f above and disconnect cuff.

To assure accuracy, the second and third blood pressure readings are averaged using a calculator.

If for any reason the observer is unable to complete, or has forgotten to complete any portion of the examination (and the participant is gone), draw two horizontal lines through the space(s) on the form. This is the correct way to indicate missed information. If an entire reading is missed and the participant is still sitting at the blood pressure workstation, completely deflate the cuff and start over with a replacement reading.

3. Procedure for changing the peak inflation level

Occasionally the Korotkoff sounds may be heard as soon as one places the stethoscope over the brachial pulse. If this happens, the peak inflation level used was too low. The observer immediately deflates the cuff by releasing the thumbscrew and disconnecting the cuff tube. Then have the participant hold the cuff-wrapped arm vertically for five seconds. Proceed with blood pressure measurement, starting at a new peak inflation level, 10 mmHg above the previous level.

SHS PHASE V FAMILY STUDY

Training and Quality Assurance

BLOOD PRESSURE MEASUREMENT

Training

Skill training will include:

a) Patient instruction, allowing opportunity for questions
b) Measure right arm for correct cuff size
c) Palpate brachial artery, medial to and above antecubital fossa
d) Mark pulse point
e) Wrap cuff, center of bladder over brachial pulse
f) Leave subject for five minutes of rest
g) Position subject, instruct subject on posture (sit upright with right arm bent and cuff at heart level, legs uncrossed)
h) Allow full five minutes for rest
i) Environment free of excessive noise
j) Find pulse obliteration point using standard manometer
k) Calculate peak inflation, 30 mmHg above pulse obliteration point
l) Place stethoscope in ears
m) Inflate cuff rapidly to calculated peak
n) Count full five seconds with pressure steady
o) Place bell on brachial pulse
p) Deflate cuff slowly, 2 mmHg per second
q) Deflate cuff rapidly after 2 absent sounds
r) Record reading
s) Disconnect tubes
t) Instruct subject to hold right arm vertical for full five seconds
u) Wait at least 30 seconds before proceeding to 2nd and 3rd readings
v) Average 2nd and 3rd readings, inform subject of average BP

Quality Assurance.

To insure consistent and accurate measurements, the study coordinator will observe technicians quarterly. They should demonstrate proper technique as listed above. The study coordinator should record his/her observations and comments on the BP checklist (see below). Also, quarterly, each tech should be part of a pair of techs who simultaneously measure blood pressure using a Y-tube stethoscope on a volunteer. Each tech should record their readings separately. A third tech should then transfer the readings to the Simultaneous BP Observation Form (see below) and should calculate the differences between the two sets of measurements. The standard of error is 4 mmHg for each individual measurement and 3 mmHg for the average of the three readings.

SHS PHASE V FAMILY STUDY

Checklist for Blood Pressure

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

YES ( ) NO ( ) Provide subject instruction, allowing opportunity for questions.
YES ( ) NO ( ) Measure right arm for correct cuff size.
YES ( ) NO ( ) Palpates brachial artery, medial to and above antecubital fossa.
YES ( ) NO ( ) Marks pulse point.
YES ( ) NO ( ) Places cuff correctly.
YES ( ) NO ( ) Leaves subject for 5 minutes rest.
YES ( ) NO ( ) Subject positioned correctly.
YES ( ) NO ( ) Provides environment free of excessive noise.
YES ( ) NO ( ) Finds pulse obliteration point.
YES ( ) NO ( ) Calculates peak inflation.
YES ( ) NO ( ) Places stethoscope in ears.
YES ( ) NO ( ) Inflates cuff rapidly to calculated peak.
YES ( ) NO ( ) Holds pressure steady for full 5 seconds.
YES ( ) NO ( ) Places bell on brachial pulse
YES ( ) NO ( ) Deflates cuff slowly, 2 mmHg per second.
YES ( ) NO ( ) Deflates cuff rapidly after 2 absent sounds.
YES ( ) NO ( ) Records readings.
YES ( ) NO ( ) Disconnects tubes.
YES ( ) NO ( ) Instructs subject to hold right arm vertical for full five seconds.
YES ( ) NO ( ) Waits at least 30 seconds before proceeding to 2nd and 3rd readings.
YES ( ) NO ( ) Average 2nd and 3rd readings, informs subject of average BP.

Comments: _____

_____

_____

_____

_____

SHS PHASE V FAMILY STUDY

Simultaneous Blood Pressure Observation Form

Quarterly, each technician should be part of a pair of techs who simultaneously measure blood pressure using a Y-tube stethoscope on a volunteer. Each tech should record their readings separately. A third tech should then transfer the readings to this form and should calculate the differences between the two sets of measurements. The acceptable margin of error is 4 mmHg for each individual measurement and 3 mmHg for the average of the three readings.

Technician #1 Code # / Initials _____

Technician #2 Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

	Tech #1	Tech #2	Difference
Arm circumference	_____	_____	_____
Cuff size	_____	_____	_____
Pulse obliteration pressure	_____	_____	_____
SBP #1	_____	_____	_____
DBP #1	_____	_____	_____
SBP #2	_____	_____	_____
DBP #2	_____	_____	_____
SBP #3	_____	_____	_____
DBP #3	_____	_____	_____
Average SBP	_____	_____	_____
Average DBP	_____	_____	_____

Comments: _____

_____

PEDAL PULSES AND EDEMA

Examination of Edema and Pedal Pulses

1. Ankle Edema

The socks or other foot covering are removed. The participant is examined in the supine position. Gentle but firm pressure is applied along the mid-tibia, anteriorly down to the ankle in each leg. Pitting or indentation remaining after pressure is removed constitutes definite edema. The examiner identifies the mid-point between the prominence of the medial malleolus and the inferior border of the patella. Pitting at or above that mid-point is recorded as "marked" edema. Pitting only below that point is recorded as "mild" edema. The degree of edema is based on the extent.

2. Posterior Tibial Pulse

The examiner palpates inferior to the medial malleolus of each foot. The presence or absence of arterial pulsation is recorded. If in doubt, the examiner compares with the radial pulsation.

3. Dorsalis Pedis Pulse

The superior aspect of each foot is palpated for the presence or absence of this pulse.

SHS PHASE V FAMILY STUDY

Training and Quality Assurance

EXAMINATION OF PEDAL PULSES AND EDEMA

Training

Technician instruction will include:

a) rationale for exams
b) visualization and palpation of lower extremities for edema
c) palpation of posterior tibial pulses
d) palpation of dorsalis pedis pulses

Quality Assurance

Observation of technicians should be done quarterly. Evaluation should include all of the criteria listed above and should be recorded on the Q. A. Checklist (see below).

SHS PHASE V FAMILY STUDY

Checklist for Pedal Pulses and Edema

Observation of technicians should be performed quarterly. If each step in the list below is carried out correctly, mark the "YES" space.

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

YES ( ) NO ( ) Positions subject supine.

YES ( ) NO ( ) Examines and palpates lower extremities for edema.

YES ( ) NO ( ) Records status of edema.

YES ( ) NO ( ) Palpates posterior tibial pulses, bilaterally.
(Posterior and inferior to the medial malleolus)

YES ( ) NO ( ) Palpates dorsalis pedis pulses, bilaterally.
(Superior aspect of each foot)

YES ( ) NO ( ) Records presence or absence of pulses.

Comments: _____

_____

_____

_____

_____

IMPEDANCE

Procedure for Impedance Measure

The measurement of body fat is accomplished using the Quantum II Impedance Meter, made by the RJL Equipment Company. This involves a small low frequency current that travels across the body through the extracellular fluids. The measurement of bioelectrical impedance is related to the volume of the conductor and, when expressed as impedance or conductance, is proportional to fat free mass. The participants do not feel anything when this measurement is obtained.

1. Explain to the participant why you are making the measurement.

2. Before beginning the test, be sure that the subject cable is securely attached to the RJL spectrum, have the participant remove the right shoe and sock and lie down with the right side nearest to the analyzer;

3. If the examination table is metallic, it must have a foam pad - all of the body must be on the pad.

4. For best results:

    i) Use electrodes only once.

    ii) Legs should be far enough apart so that the thighs do not touch each other. A towel may be used to prevent the legs and thighs from touching.

    iii) Hands and arms should be far enough apart so that the arms and hands do not touch the torso. A towel can be used to prevent the arms from touching the body.

    iv) No body parts should be in contact with any external metal (pins in bones will not affect the results). Jewelry should be removed from the side on which the electrodes are placed.

    v) Participant's skin should be clean, dry and warm to the touch. If the skin is oily, clean it with an alcohol swab before attaching the electrodes.

Prior to the attachment, cut the electrodes in half bisecting the foil tab. The cut edge of the electrode placed on the ankle and wrist should face toward the shoulder and thigh respectively. The cut edge of the other two may face in either direction.

4. Electrode Placement:

    i) Attach the black wires to the foot with the red clip connected to the electrode at the ankle (F1). Attach the red wires to the hand with the red clip connected to electrode at the wrist (H1).

ii) Put H1 on an imaginary line from the protruding bone of the wrist to bisect the ulnar head; make sure that the cut edge of the electrode is toward the shoulder.

iii) Put H2 just above the knuckles of the right hand or on any finger; there should be at least 5 cm difference between H1 and H2.

iv) Put F1 on an imaginary line between the protruding anklebones to bisect the medial malleolus; make sure that the cut edge of the electrode is toward the thigh.

v) Put F2 just above the toes of the right foot or on the great toe (there should be 5 cm difference between F1 and F2)

Once the electrodes have been properly attached to the subject, depress the button for "resistance" and record the resistance value on the physical examination form (S6). Then depress the button for "reactance" and record the reactance value on the S6 form.

SHS PHASE V FAMILY STUDY

Training and Quality Assurance

IMPEDANCE

Training

Technician instruction will include:

a) rationale for body composition estimate measurement
b) use of equipment and supplies needed
c) explanation to subject
d) positioning of subject
e) electrode placement
f) recording of resistance and reactance results

The complete, detailed procedure is located in Volume III of the SHS Phase V Manual.

Quality Assurance

An individual at each study center will be designated as the supervisor of the impedance measures. The supervisor will assure that each of the other operators of the instruments is re-certified quarterly by having him/her perform an impedance measure on the same subject as the supervisor. The observation of the operators should include evaluation of all criteria listed above and should be recorded on the Checklist for Impedance (see below). The measurement results should agree within 15 ohms.

SHS PHASE V FAMILY STUDY

Checklist for Impedance

The Impedance supervisor will monitor each of the other operators of the instrument quarterly. The observation of the operators should include the following criteria. If performed accurately, mark the "YES" space.

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

YES ( ) NO ( ) Explains procedure to subject.

YES ( ) NO ( ) Questions subject about recent exercise and alcohol consumption.

YES ( ) NO ( ) Asks subject to remove right shoe and sock.

YES ( ) NO ( ) Positions subject supine, with right side nearest to analyzer.

YES ( ) NO ( ) Assures that there is no skin to skin contact at axillas, thighs, abdomen.

YES ( ) NO ( ) Assures that arms are placed to subject's side without hands touching anything.

YES ( ) NO ( ) Electrodes placed correctly.

YES ( ) NO ( ) Leads connected correctly.

YES ( ) NO ( ) Records resistance and reactance.

Comments: _____

_____

_____

DOPPLER BP

Using Doppler to Measure the Ankle-Brachial Index (ABI)

1. Move the participant to the supine position

   Assist the participant in moving to the supine position on the examination table.

2. Procedure for Measuring Brachial (arm) Blood Pressure

   a) By consulting the participant's Data Form, the observer verifies that the same arm and the same cuff size are used as for the sitting blood pressure readings. If the participant had his/her sitting blood pressure taken on the right arm earlier in the clinic examination, the cuff is applied on the right arm at this time. The blood pressure cuff is applied over the brachial artery according to the instructions found in the Sitting Blood Pressure section of this manual.

   b) The observer then uses the Doppler to record the brachial pressure. The pressure recorded in the arm is used to calculate the ankle-brachial systolic pressure ratio for both lower extremities (see below).

3. Procedure for Measuring Ankle Blood Pressure

   a) Apply the blood pressure cuff.

   The appropriate ankle blood pressure cuff is applied on the right calf. The same size cuff should be used on the lower leg (calf) as the one used on the arm. In special instances, different cuff size may be used.

   At this point, a blood pressure cuff is applied above the ankle of the right leg, as shown in Figure 4 (see below). Place the cuff flat on the table (the surface marked "side to the patient" face up) with the appropriate ankle centered on the cuff. At this time disregard the "over the artery" marker. The lower edge of the cuff (from which the hoses extend) should be approximately 2 to 2.5 inches above the medial malleolus. Following the contour of the lower leg, wrap the end of the cuff with the velcro "fabric" over the ankle, as shown in Figure 5. Note that depending on the degree of tapering in this area, the cuff corner will be offset from parallel toward the knee. Holding the cuff from sliding, wrap the other end over the ankle (step 3 in Figure 5 below), again following the contour of the ankle, and secure the Velcro. Check to be sure that the corners of the cuff extending above the upper edge of the cuff are about equal: if one end extends more than the other, loosen the Velcro and adjust the wrap. Next, locate the "over the artery" marker of the cuff, and rotate the cuff so that this line is directly over the posterior tibial artery. The cuff may be rotated more easily by sliding it toward the malleolus, and after alignment, the cuff can be made snug by pulling it up toward the calf. The cuff should conform closely to the shape of the ankle, with the lower edge 2 to 2.5 inches above the malleolus.

   The posterior tibial artery is usually palpated as it courses posteriorly to the

medial malleolus. Even if the posterior tibial pulse is not palpable, the posterior tibial artery is used as the location for the marker line on the cuff for the "over the artery position". Any kinks in the tubing are removed, and any "tugging" of the tubing on the participant's leg is relieved.

b) Palpate both posterior tibial pulses and mark these locations. Apply ultrasound gel to the posterior tibial areas over the pulse or in the area shown in Figure 4.

c) Listen for the right posterior tibial pulse using the Nicolet Imex Elite 100 Doppler. If no pulse is audible or palpable, then try to use the dorsalis pedis pulse for the determination of blood pressure. If no pulse is audible, record zero for ankle blood pressure after the absence of pulses is verified by a second observer.

d) Inflate cuff to a pressure reading 20 mm higher than the "Peak Pressure" used for the sitting arm pressure (i.e., obliteration plus 50 mmHg) and utilize identical deflation techniques while listening with the Doppler. Record the first sound heard as systolic blood pressure on the physical exam form.

e) Take a second blood pressure using the same techniques, and record the second blood pressure on the Physical Examination Form.

f) Repeat this procedure to record the left ankle blood pressure.

If it appears impossible to obliterate the sounds, pump the cuff (with no break in pumping) to 250 mmHg to confirm lack of obliteration and then record 999 on the physical examination form.

To determine the right ankle-arm index, add the 2 right ankle measurements and divide by 2 to obtain the average right ankle reading. Then add the 2 right arm measurements and divide by 2. Now divide the average of the right ankle by the average of the right arm to obtain the right ankle-arm index. For the left ankle-arm index, obtain the left ankle arm average by dividing the 2 left ankle readings by 2. Then divide this left ankle average by the right arm average to obtain the left ankle-arm index. If the ratio of the ankle/arm pressure is less than 0.8 in either leg, the participant should be referred to his/her health care provider.

The observer now removes all conduction jelly. Socks and a robe or other garments are now replaced, and the participant is escorted to the next workstation.

Figure 4. Placement of the Blood Pressure Cuff on the Ankle
Step I. Positioning the Lower Leg on the Cuff

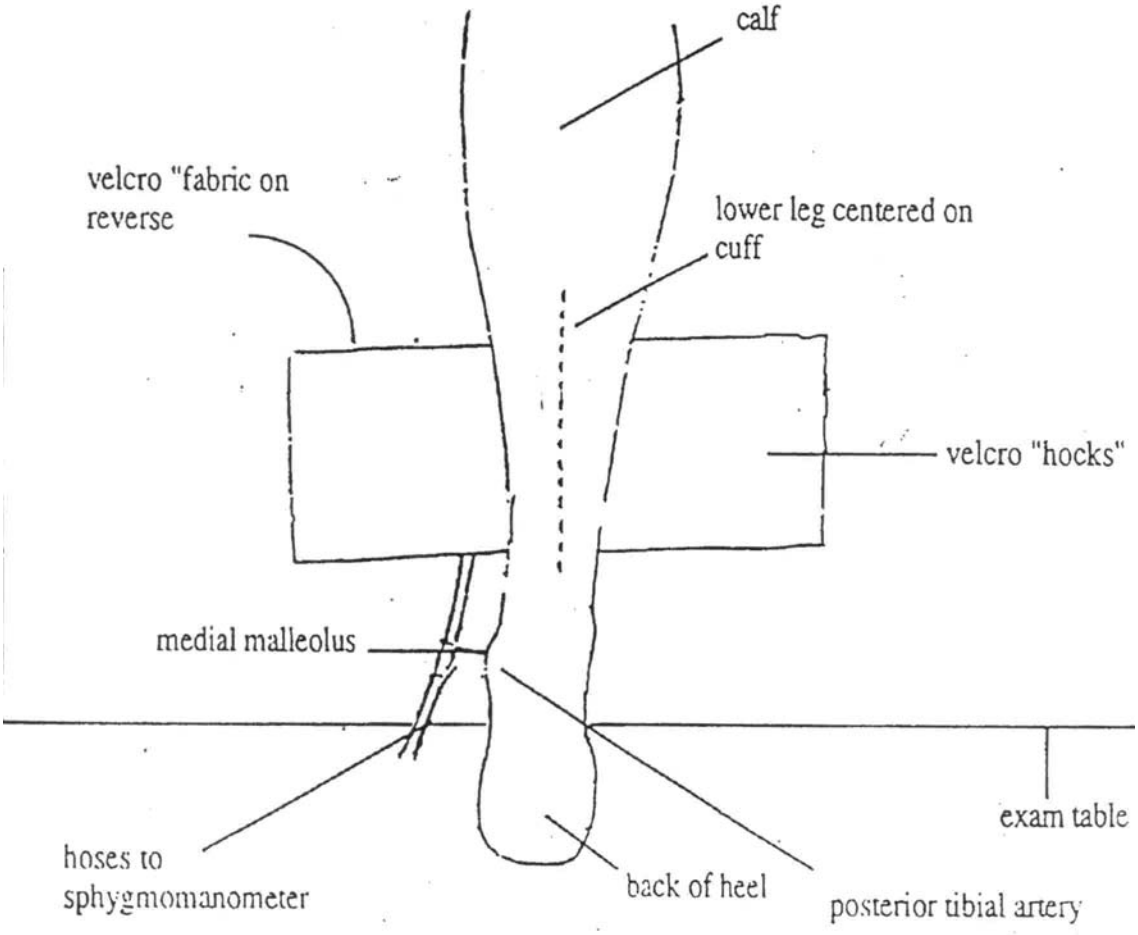
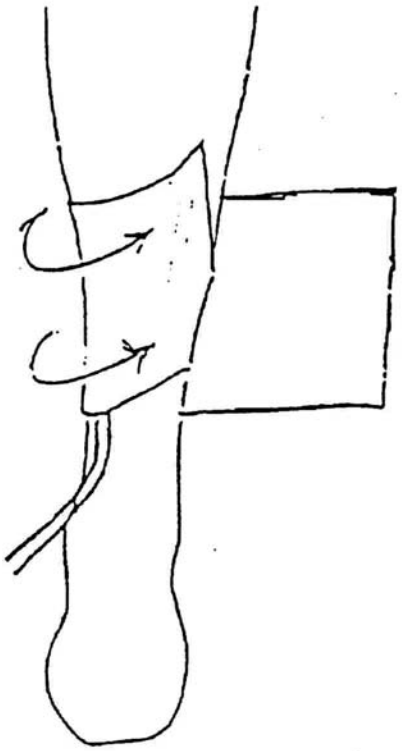


Figure 5 Placement of the Blood Pressure Cuff on the Ankle
Steps II and III: Wrapping and Securing the Cuff

Step 2. Wrap fabric end of the cuff following contour of ankle



"ears" about equal

Step 3. Wrap and secure cuff

SHS PHASE V FAMILY STUDY

Training and Quality Assurance

DOPPLER BLOOD PRESSURE

Training

Technician instruction will include:

a) rationale for ankle systolic blood pressure and Ankle-Brachial Index measurement
b) explanation to subject
c) positioning of subject
d) blood pressure cuff size selection
e) application of cuff on right arm (if sitting BP was taken on the right arm), right ankle, left ankle
f) palpation of pulse, marking location, application of ultrasound gel
g) listening for pulse using IMEX Elite 100 DOPPLER
h) cuff inflation to peak pressure (50 mmHg higher than pulse obliteration pressure of sitting right arm measurement)
i) recording of the first pulse sound
j) repeat for a second pressure
k) perform on right arm (if sitting BP was taken on the right arm), right ankle, and left ankle

Quality Assurance

Observation of technicians will be done quarterly by the Study Coordinator. Performance by the tech should include all of the criteria listed above, the evaluation should be recorded on the Checklist for Doppler Blood Pressures (see below). The tech's results should be within 4 mmHg of the coordinator's pressure results.

SHS PHASE V FAMILY STUDY

Checklist for Doppler Blood Pressures

The Study Coordinator will observe technicians quarterly. Performance by the technician should include the following steps. If each step is completed correctly, mark the "YES" space.

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

YES ( ) NO ( )	Explains procedure to subject.
YES ( ) NO ( )	Positions subject, supine.
YES ( ) NO ( )	Selects appropriate cuff size.
YES ( ) NO ( )	Applies cuff correctly - right arm (if sitting BP was taken on the right arm), right ankle, and left ankle
YES ( ) NO ( )	Palpates pulse, marks location, and applies ultrasound gel.
YES ( ) NO ( )	Listens for pulse using IMEX Elite 100 DOPPLER.
YES ( ) NO ( )	Inflates cuff to calculated peak pressure.
YES ( ) NO ( )	Records the first pulse sound.
YES ( ) NO ( )	Repeats for second pressure.
YES ( ) NO ( )	Performs on right arm (if sitting BP was taken on right arm), right ankle, and left ankle.

Comments: _____

_____

_____

	Technician	Observer	Difference
Right Arm (if sitting BP was taken on right arm)	_____	_____	_____
Right Ankle	_____	_____	_____
Left Ankle	_____	_____	_____

ACCUSPLIT PEDOMETER

THE STRONG HEART – FAMILY STUDY
GENETICS OF CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

DIRECTIONS TO PARTICPANTS FOR USING THE PEDOMETER

The ACCUSPLIT Pedometer measures movement. You are being asked to wear this pedometer EVERY DAY for a seven-day period from _____ to _____. The pedometer is worn on the hip and should be clipped to the waistband of your pants/skirt, underwear, or belt. Most importantly, the pedometer must be worn in an upright position. Please keep the pedometer firmly against your body so it does not move around freely. **DO NOT LET THE PEDOMETER GET WET** by wearing it in the rain or while bathing or swimming. Please remember to reset the pedometer to "0" (zero) when you put it on in the morning and to record the number of steps from the pedometer in your activity record when you take it off at night.

If you have any questions, please contact _____ at _____.

Front

Side

SPECIFIC INSTRUCTIONS

1. Every morning, just before you put the pedometer on, push the *YELLOW* reset button so that the pedometer resets to "0".
2. Record the time that you attached the pedometer in your pedometer record. Make sure to indicate <u>am</u> or <u>pm</u>.
3. Wear the pedometer on your hip (please see pictures above), make sure to keep it upright, and make sure that it remains firmly in place against your body.
4. **Wear the pedometer ALL DAY except when bathing, swimming, or in the rain (unless the pedometer is protected by clothing and will not get wet). If you take off the pedometer <u>for longer than 30 minutes,</u> record the length of time it was off (minutes or hours) in your pedometer record.**
5. At bedtime, take off the pedometer. Record in your pedometer record (a) the number of steps taken on the pedometer, and (b) the time you removed your pedometer. Make sure to indicate <u>am</u> or <u>pm</u>.
6. Please do not touch the *YELLOW* reset button during the day or you will erase your activity numbers.
7. **Keep the cover closed or the pedometer will not record your activity.**
8. Do not wear the pedometer in a pants, coat, or shirt pocket. The pedometer will not work correctly.
9. Please bring back or mail to us, in the self-addressed stamped envelope, the <u>pedometer record</u> after you have completed your week.
10. Please keep the <u>pedometer</u> as a token of our appreciation for your participation in the Strong Heart Family Study.

Thank you very much for your time and effort.

THE STRONG HEART – FAMILY STUDY
GENETICS OF CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

SEVEN-DAY PEDOMETER RECORD

SHS Family I.D.: |___|___|___|___|___|___|___|___|

Name: _____ SHS I.D.: |___|___|___|___|___|___|___|

REMINDER: RESET THE PEDOMETER TO "0" EVERY MORNING

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Date							
Day of week							
Time attached (am/pm) **Please circle either am or pm**	am pm	am pm	am pm	am pm	am pm	am pm	am pm
Pedometer steps at bedtime							
Time removed (am/pm) **Please circle either am or pm**	am pm	am pm	am pm	am pm	am pm	am pm	am pm
Did you take off the pedometer for any reason for longer than 30 minutes? Please circle "Y" for yes or "N" for no.	Y N	Y N	Y N	Y N	Y N	Y N	Y N
If yes, for how long (indicate minutes or hours)?							

Complete this question after completing the pedometer record.

Have your physical activity levels in the past seven (7) days been typical for you compared to your regular activity level?

Yes_____ No_____

SHS PHASE V FAMILY STUDY

Checklist for Accusplit Pedometer

Technicians should be observed quarterly administering the pedometer instructions. If each item below is carried out correctly, mark the "YES" space.

Technician Code # / Initials _____

Observer Code # / Initials _____

Date Observed _____

Instructs participant with the following information:

YES ( ) NO ( ) Explains purpose of pedometer measurement.
YES ( ) NO ( ) Must wear for seven days.
YES ( ) NO ( ) Push the reset button every AM to read “0”.
YES ( ) NO ( ) Record the current time on the activity record page.
YES ( ) NO ( ) Keep the pedometer on all day. Record length of time if taken off.
YES ( ) NO ( ) Do not get the pedometer wet.
YES ( ) NO ( ) Remove pedometer and record meter number on activity record page.
YES ( ) NO ( ) Record the time removed on activity page record.
YES ( ) NO ( ) Do not touch the button during the day.
YES ( ) NO ( ) Wear the pedometer firmly on dominant hip.
YES ( ) NO ( ) Keep the cover closed.
YES ( ) NO ( ) Do not wear in pocket or sideways.
YES ( ) NO ( ) Mail the record or bring back the record.

Comments: _____

_____

_____

_____

_____

LAB

STRONG HEART STUDY LABORATORY PROCEDURES

1.0 Safety Precautions, Universal Precautions and Personal Protective Equipment for the Handling of Blood and Working in a Laboratory Setting:

Lab testing in research is important. Your work brings new and important information to the scientific and medical community. The special equipment and skills such as attention to detail, organization and phlebotomy are critical to the success of this project. Your work on this project will probably expose you to a variety of potentially hazardous situations. The following learning modules are designed to help you keep safe on the job.

Each site should have at least one staff member who will be actively involved in this process attend the initial training session. This person, in turn will be responsible for training additional personnel at his/her facility. The training session will cover all procedures related to supplies, equipment, and preparation of log sheets, labeling, collection, processing, storage, packing and shipping of specimens.

Throughout the study, a qualified observer should regularly monitor and evaluate the work of those involved in the collection and processing of blood samples. Specific plans should be made to train new staff members at each facility. Training should include a detailed review of the Strong Heart Study laboratory manual as well as supervised practice in the application of the techniques required by the protocol.

This section will provide knowledge to protect you and others. In addition to these instructions, use commonsense on the job every day.

- Be cautious and follow procedures.
- Take your time and concentrate on what you are doing.
- Avoid contact with hazardous chemicals
- Treat unknown substances as hazardous
- Follow all equipment operating instructions
- Don't take chances
- Don't operate anything if you have not been trained on that equipment
- Follow all instructions
- Report any malfunctioning or suspicious-appearing equipment immediately
- Never pipette samples by mouth.
- Avoid direct contact with blood, sera or plasma. Cover any scratches or cuts on fingers and hands very carefully and use gloves in the handling of specimens.
- All tubes, containers and other materials exposed to blood must be disposed of in appropriately labeled waste receptacles for biohazardous materials.
- When removing stoppers from vacutainers, use a splash shield to prevent

droplets from spraying onto your skin or eyes.
- All samples should be stored in sealed containers or tubes.
- All site personnel should be informed of and guided by current OSHA and CDC guidelines particularly those concerning "Universal Blood and Body Fluid Precautions" published by the CDC.
- Immunization against Hepatitis B is highly recommended for persons drawing blood and handling biological specimens.
- Avoid working alone
- Post important phone numbers and emergency numbers prominently
- Know before an accident where to go and what to do
- Know the location of safety showers, eyewashes and fire extinguishers

Module I: Safety Precautions

This module will include the following:

- Provide knowledge to protect you and others.
- Demonstrate common procedures that will be used on the job every day.

Here are some guidelines:

- Be cautious and follow procedures.
- Take your time and concentrate on what you are doing.
- Avoid contact with hazardous chemicals
- Treat unknown substances as hazardous
- Follow all equipment operating instructions
- Don't take chances
- Don't operate anything if you have not been trained on that equipment
- Follow all instructions
- Report any malfunctioning or suspicious-appearing equipment immediately
- Never pipette samples by mouth.
- Avoid direct contact with blood, sera or plasma. Cover any scratches or cuts on fingers and hands very carefully and use gloves in the handling of specimens.
- All tubes, containers and other materials exposed to blood must be disposed of in appropriately labeled waste receptacles for biohazardous materials.
- When removing stoppers from vacutainers, use a splash shield to prevent droplets from spraying onto your skin or eyes.
- All samples should be stored in sealed containers or tubes.
- All site personnel should be informed of and guided by current OSHA and CDC guidelines particularly those concerning "Universal Blood and Body Fluid Precautions" published by the CDC.

- Immunization against Hepatitis B is highly recommended for persons drawing blood and handling biological specimens.

Emergencies can happen, so be prepared:

- Avoid working alone
- Post important phone numbers and emergency numbers prominently
- Know before an accident where to go and what to do
- Know the location of safety showers, eyewashes and fire extinguishers

Some of the equipment in the areas you will be working is reviewed below:

- **Glassware** like vacutainers can break, causing chemical and cut hazards. Some of the chemicals contained in the vacutainers are EDTA and heparin. Although serious hazards are unlikely if exposed, still follow procedures if an accident occurs. To avoid contact, use the right type of glassware for each job, and discard chipped or cracked vacutainers in an approved receptacle. Don't force anything made of glass.
- **Electrical equipment** always carries the potential of shock or fire. Don't touch it with wet hands or while standing on a wet floor. Report any shocks, and don't attempt to do repairs if you haven't been trained.
- **Centrifuges** and other equipment with moving parts can catch your clothing or open up suddenly, showering you with dangerous material. Keep clothing or long hair away from them. Make sure the load is balanced, the top is locked down, and the equipment has stopped before you open it.

Module II: Personal Protective Equipment

This module will include the following:

- Proper use of protective clothing.
- First-aid instructions

Let protective equipment work for you.

For this aspect of the study, always use assigned protective clothing and equipment. Always check that it is in good condition before putting it on. For this study the following are required:

- **Goggles or side shield safety glasses** to protect against splashes or flying objects are required any time you are working with specimens or

performing phlebotomy.

- **Gloves** must be worn to protect against any chemicals or exposure to samples
- **Long sleeves** are required to the length of your wrist and meet the glove.
- **Lab coats** must be full length and fully buttoned down the front.
- **Sturdy closed toed shoes** are required to cover your feet in case of spills or accidents

If you are exposed to a hazardous substance or samples, take the following actions:

.

For first-aid instructions, here are some general instructions. You should check with your supervisor for specific instructions at your institution prior to an accident.

- **Eyes:** Flush with water for 15 minutes.
- **Ingestion:** Follow labels and MSDS instructions MSDS is an abbreviation for Materials Safety Data Sheet and is available from the manufacturer for every chemical produced.
- **Skin Contact:** If limited to a small area of the body such as the hands, remove any contaminated gloves or clothing and wash with copious amounts of water. If there is greater exposure, stand under emergency shower and remove contaminated clothing immediately.
- **Inhalation:** Get to fresh air and get prompt medical attention.

Module III: Preventing Exposure to Blood Borne Pathogens:

This module will include the following:

- Universal precautions
- Work practices, including the use of protective clothing that eliminates or minimizes exposure to staff and subjects
- Housekeeping procedures to ensure cleanliness and possible spread of infection
- Hepatitis B vaccinations for employees at risk
- Exposure evaluation and follow-up for exposure incidents
- Hazardous material container warnings such as biohazard labels
- Confidential, accurate employee medical records

Your chance of being directly exposed to bloodborne pathogens on the job is small. But keeping exposure minimal can only succeed if staff members use the tools to protect themselves on the job.

- **Universal Precautions** are your best protection against any risk to exposure. This means all staff must treat all blood, urine, and other potentially infectious body fluids as if they are infected.

  All specimens should be regarded as potentially hazardous.

  DO:

  - Wash hands and exposed skin with soap and water immediately after exposure to infectious materials or after taking off gloves or other personal protective equipment.
  - Use antiseptic or cleansers or towelettes only if washing facilities aren't available.
  - Minimize splashing, spraying, or spattering of blood or other potentially infectious materials.
  - Place contaminated sharps in assigned labeled, puncture-resistant, leak-proof containers.

  DON'T:

  - Don't shear or break contaminated needles or other sharps, and don't bend, recap, or remove unless specifically instructed.
  - Don't keep food, drink, medication or makeup in work areas with exposure potential.
  - Don't eat, drink, smoke apply cosmetics or lip balm, or handle contact lenses in work areas with exposure potential.
  - Don't pipette or suction anything by mouth.

- **Protective Clothing:**

  BEFORE you put on protective clothing, make sure it's in good condition. Don't wear anything that's damaged or does not fit properly.

  AFTER tasks in the area are completed, remove all protective clothing before leaving that area. Remove protective clothing in such a manner as to minimize exposure and avoid contamination. Place protective clothing in a specially assigned area or container for decontamination, washing, storage or disposal.

- **Housekeeping:**

  Written procedures and a cleaning schedule help keep the workplace free of infection.

- **Cover** equipment and surfaces with plastic wrap, aluminum foil, or impervious absorbent paper. Remove and replace covering that is, or may be, contaminated.

Module IV: Proper Labeling

This module will include the following:

- Correct identification and labeling of containers with biohazardous labels
- Instructions in case of exposure

Proper labeling of containers for regulated waste must be labeled with fluorescent orange or orange-red biohazard warning labels.

Examples in the clinical area or lab are: refrigerators and freezers containing blood and other potentially infectious materials and other containers used to store, transport or ship blood and other potentially infectious materials

Biohazard labels **ARE** required for the following:

- waste containers used for disposal of contaminated needles
- refrigerator or freezer holding blood or other potentially infectious material
- individual specimen containers for storage or shipment zip-lok biohazard bags

Biohazard labels **ARE NOT** required for the following:

- when red bags or red containers are used
- on individual containers or blood of other potentially infectious materials that are placed in a labeled container during storage, transport, shipment or disposal

The risk of exposure is very small and most encounters with an HIV or HBV carrier pose no risk. AIDS and Hepatitis B can be transmitted through:

- Sexual contact
- Shared needles
- Needlestick injuries from infected needles or sharps
- Direct contact between broken or chaffed skin and infected body fluids.
- Hepatitis B can also be transmitted through dried blood and contaminated surfaces.

Neither AIDS (HIV) nor Hepatitis B are transmitted by:

- Coughing or sneezing
- Touching an infected person
- By using the same equipment, materials, toilets, showers, or water fountains.

Be safe!!! Your employer must make available, free of charge or at a reasonable time and place, the hepatitis B vaccine and vaccination series to all employees at risk. Any booster doses recommended by the US Public Health Service also must be provided. You are not required to participate in a prescreening program to receive the vaccine series. Also, the vaccine can be available at a later time if initially declined. If you choose to not receive the vaccine, your facility will ask you to complete and sign a form stating your refusal. This is required by law.

If you are directly exposed, REPORT IT IMMEDIATELY!!!

An exposure incident is specific to eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties. A common example of exposure would be a puncture from a used needle.

If exposed, you should contact your supervisor immediately. This allows for timely medical evaluation and follow up as well as for timely testing of the source. Your facility will provide immediate, confidential assistance and medical evaluation, including a blood test. All information will be treated with the strictest of confidence.

2.0 Sample Collection Instructions:

Personnel involved in sample collection should be highly experienced with vacutainer and butterfly blood collections, and be prepared to handle common problems, such as difficult blood collection and situations such as fainting. The phlebotomist should also be familiar with precautions to avoid exposing themselves to blood and be trained in the following:

- Ideally staff will have cardiopulmonary resuscitation (CPR) certification.
- It is suggested that they read "Collection and Handling of Laboratory Specimens: A Practical Guide"[1] or a similar phlebotomy manual.
- Personnel should wear clean white lab coats (with no blood stains) and

[1] Slockbower, J.M., and Blumenfeld, T.A., (Eds.). Collection and Handling of Laboratory Specimens: A Practical Guide. Philadelphia: J.B. Lippincott Company, 1983.

maintain a neat appearance. Lab coats will be full length, with long sleeves. Lab coats will be buttoned closed down the full length of the coat.

- Personnel will wear protective eyewear. Safety glasses are required when performing phlebotomy, processing specimens and preparing samples for storage and/or shipment.
- Staff should wear nametags and introduce themselves (if necessary) before a blood draw.
- Long hair and bangs should be pulled back.
- Phlebotomists and assistants should not chew gum or have any food in their mouths during blood draws. Food and drink must never be brought into areas used for blood drawing or processing.
- Staff will attempt no more than three venipunctures on the same subject. After three failed attempts, another person will be asked to try.

Module I: Sample Collection Facilities

This module will include the following:

- Room requirements for sample collection
- Supplies for sample collection

The area in which phlebotomy will occur should be clean and tidy with no evidence of previous blood draws such as used needles, blood stains, etc. A phlebotomy chair should be available for 15-20 minute periods to allow subjects to be seated for 10 minutes prior to a blood draw. If not available within the room, there should be quick access to a bed or examining table and ammonia capsules in case a subject feels faint. Also, there should be easy access to emergency equipment in case of cardiac arrest. Ideally, only the participant and phlebotomist (and assistant when needed) are in the room during the procedure.

The room should be set up in advance with basic supplies for blood collection:

- Vacutainer holders/hub
- Vacutainer needles
- Disposable graduated transfer pipettes
- alcohol wipes or swabs
- 2x2 sterile gauze pads
- band aids
- adhesive tape
- urine collection cups
- disposable latex gloves
- ammonia inhalants
- paper cups
- emesis basin

- tourniquets
- biohazard labels
- biohazard needle disposal boxes
- biohazard bags
- Tube racks or supports
- Waterproof marking pen
- Refrigerator
- Centrifuge
- -70^{o}C Freezer (or lower temperature Freezer than -70^{o}C)

Module II: Sample Collection and Processing

This module will include the following:

- Completion of clinical logs
- Completion of laboratory requisitions
- Demonstration of One-Touch Sure Step Flexx procedure
- Proper labeling of vacutainers and transport tubes
- Venipuncture Instructions
- Posture during blood collection
- Difficult Venipunture Techniques
- Vacutainers for Sample Collection and Processing Instructions

Sample Collection Logs and Laboratory Requisition Forms

Clinic personnel should carefully review the description of collection requirements to ensure that specimens are collected in the proper order and use the proper technique. Each clinic should set up a blood collection and blood processing notebook or a laboratory logbook in advance. It should be located in the blood collection/processing area. This should be a hardbound notebook from which pages cannot be easily removed. Pages should have columns headed for date, visit number, participant name and ID, barcode labels, redraw labels and room to write "comments" about any problems with blood draws or processing, including hemolysis of samples, etc.

In addition to the logs for the clinical area, it will be necessary to complete a laboratory requisition form for each subject (see example of this PARTICIPANT SAMPLE FORM in Appendix C below). The completed requisition form should include the following:

- Exam ID
- Date of Collection
- Under left column marked “write the number of samples sent” record the actual number of samples sent.

After proper completion of requisition form, affix barcode label to both copies of the form and one label in the laboratory log book.

Redraw

If sample collection is a redraw, indicate "yes" on new requisition form and take the following steps:

- Affix original barcode label to both copies of the requisition form
- Also affix redraw barcode label to both copies of the requisition form
- Place redraw label by the appropriate participant ID in laboratory log book

One-Touch Sure Step Flexx Procedure

1) One-Touch Sure Step Flexx glucose reading from a drop of blood obtained by finger stick. Using the blood from the venipuncture procedure below will not provide comparable results since there is a difference between capillary blood (fingerstick) and venous blood values.

2) See One-Touch Sure Step Flexx procedure for calibrating the glucometer and steps to follow in obtaining a glucose reading. (Consult with the operations manual, which can be obtained from Lifescan, Inc. 1-800-227-8862) A video and training will be provided at the initial training session. Thereafter, training will be provided on-site. See Appendix A of this volume (p. IV-A-1 below) for additional instructions.

Labeling Collection Tubes and Samples:

Prior to venipuncture, a label showing the date and time of collection and participant ID number should be written by the phlebotomist.

Pre-numbered and bar-coded labels will be provided to the study sites. Take care to select the correct number depending on whether the samples are being collected from the participant as a QA sample or for a Courtesy visit.

To properly label vacutainers and shipping vials, the white section of the label must be applied (first) to the tube laterally with the clear end wrapped over the white section of the label after the label is wrapped around the tube.

Module III: Venipuncture Procedure

This module will include the following:

- Correct Venipuncture procedures

Posture During Blood Draws:

A participant should be seated during blood draws. However, if the participant is clearly uncomfortable with the blood drawing situation, because of a previous fainting episode or a fear of fainting, have the participant lie down provided the

blood draw can proceed within 10 minutes. This is to ensure that blood is collected before body fluid shifts occur, which could alter plasma concentrations of outcome variables. Therefore, it is desirable that less than **10 minutes** elapse between the participant's lying down and completion of the blood draw.

Difficult Venipunctures:

There will be several common situations in which vascular access may be difficult. These will include but are not limited to the following:

- Palpated vein feels small or rolls.
- Excess subcutaneous tissue and fat lies over veins.
- Participant complains of being stuck more than once on a previous visit (no single staff person will attempt more than three venipunctures on a single participant at a single clinic visit) or has had a bad experience elsewhere.
- Participant has been stuck once already and none of the usual veins are palpable.

All reasonable efforts should be made to collect a blood sample, including use of a 23 gauge needle if that is the only means available to obtain a sample, e.g., in the case of a child or elderly person. If the participant experiences any of the above problems, and is agreeable to a repeat attempt, you may try the following procedure:

- Check back of hand and forearm for venipuncture sites with larger veins.
- Attempt one or more vein dilation methods:

1. Hot pack venipuncture site with a warm, wet towel or apply heating pad for 3-5 minutes.
2. Have participant hold hand in warm water for 3-5 minutes.
3. Have participant dangle arm at side with tourniquet in place for one minute.
4. Use blood pressure cuff as a tourniquet by pumping pressure to 60-80 mm Hg.
5. Be sure room is not too cool.

1) Position the participant in comfortable chair in an environment free from distraction.

2) Query the participant about their fasting state. Example: "When was the last time you ate or drank anything except water?" The participant should be fasting for about 12 hours. Record the time since the last food or beverage was consumed. If subject is not fasting, record time and note in comment section what foods or beverages were consumed that morning. Be sure to include any

additives like cream, sugar, or artificial sweeteners if a beverage was consumed. Regardless of fasting state, proceed with drawing procedure.

3) Inform the participant about the procedure. Explain the procedure to the participant, e.g., "I will be drawing a blood sample from your arm today. You will probably feel a small prick when I insert the needle."

4) Assemble all materials; have extra tubes within reach.

5) Blood samples will be collected from Strong Heart Study participants using conventional vascular access with a multi-draw Vacutainer (butterfly) needle and collection of the blood sample into Vacutainer tubes.

6) The antecubital site of the left arm will be used as the first choice for venipuncture. The median cubital vein is the one most frequently used. If the venipuncture of this vein is unsuccessful, the cephalic and basilic may be the next appropriate choice, followed by veins on the back of the hand. For known mastectomy participants, avoid use of an arm where there was axillary lymph node dissection.

7) Be sure all necessary supplies and equipment are available and set up in advance. Note visit type and type of Vacutainer tubes required. Label tubes with participant ID# and date and time of collection. Complete all lab forms before specimen collection. Ensure that all necessary equipment is functioning properly.

8) Be sure a full length lab coat is worn and buttoned. Wash hands and put on protective gloves.

9) Fit luer adapter needle at end of collection set into Vacutainer sleeve and place the first collection tube into sleeve/hub.

10) Position participant's arm on the drawing table. Extend the arm toward you, palm up.

If no radial pulse can be felt, the tourniquet is too tight. *Tourniquet must not be in place more than two minutes.*

11) Apply tourniquet 3 inches above a venipuncture site. If it is necessary to apply a tourniquet for preliminary vein selection, release it for two minutes and reapply immediately before entering the vein.

12) Pull skin taut 2 inches below site to keep vein from rolling.

13) Palpate vein. (A vein feels like an elastic tube and returns when pressure is applied). If the presence of a vein is questionable, remove or loosen the

tourniquet. If the structure remains, it probably was not a vein; if it disappears assume it was a vein. Another technique to assist in locating a vein is to moisten the skin with alcohol as it will decrease the friction and may aid in the palpation of a vein. If no vein is felt, try other arm or another site (See section on "Difficult Venipunctures").

14) Cleanse skin over vein thoroughly using a circular motion from center to periphery. Wipe alcohol with new 2x2 gauze to dry the area.

DO NOT TOUCH SKIN AFTER CLEANSING.

15) With the bevel of the needle in upright position, enter vein. Hold needle in the same direction as vein and at a 15-degree angle to vein. Insert the multidraw needle bevel up, parallel to vein. Use a straight smooth movement through the skin; do not poke around. The needle is sterile; do not touch it while performing venipuncture. If vein rolls, withdraw needle slightly without coming completely out of the arm and try a second attempt. If the vein collapses, remove the needle and tourniquet. Apply slight pressure to the puncture site. Try another site and/or call another staff person to assist. After a new location has been determined, usually the other arm, begin the procedure again. Reapply the tourniquet, possibly have participant open and close the fist, swab areas with alcohol and dry, then reinsert the tube. If there is still no blood, stop the procedure and use techniques in section on "Difficult Venipunctures."

16) If the phlebotomy is successful, draw required blood tubes. After blood begins to flow, secure butterfly with a piece of tape and loosen the tourniquet. Place tubes in conditions as specified in the instructions.

If blood does not begin to flow, try the following:

a) Move the needle slightly in or out.
b) Rotate needle slightly or lift needle to move bevel away from the wall of the vein.
c) Try another tube.
d) Loosen tourniquet; blood flow may be impeded if tourniquet is too tight.
e) Be sure to watch for signs of hematoma or swelling from the vein. If there is any indication of hematoma or swelling, immediately remove tourniquet and needle. Place 2x2 gauze over the site, and apply pressure and/or ice pack on site for 5 minutes. If the first attempt to obtain blood is unsuccessful (with the subject's permission) try again on the opposite arm. **The same technician should not attempt a venipuncture more than three times.**

17) When first tube is filled, remove tube and replace with the next tube. Invert all filled tubes **except SST tubes** 8-10 times and place on ice. **DO NOT** place SST tube on ice.

18) Proceed with collection of tubes in this order. Label all tubes:

Fasting:
1. (3) Red top (SST) tubes
2. (1) or (2) Light Blue top (Citrate) tubes
3. (1) Gray top (Sodium fluoride) tubes
4. (4) Lavender top (EDTA) tubes

19) After drawing the last tube, remove the tourniquet. Use clean gauze to apply slight pressure to arm and withdraw needle, then immediately apply pressure to site. Apply gentle pressure to the site.

20) Request participant apply pressure at site for 3-5 minutes while leaving the arm straight at the elbow. This is more important than elevating the arm or bending the elbow, which some participants might do automatically.

21) Confirm that bleeding has stopped, and apply a pressure bandage at venipuncture site. If bleeding has not stopped, elevate arm and continue to apply pressure until it stops.

22) Check preprinted labels and tubes, making sure the ID# and tube designation are correct.

23) Dispose of entire needle set-up into a proper biohazard disposal container. *Never try to re-cap a needle since this puts you at risk for a needle puncture.*

24) Check site. If blood oozes from the site, have the participant apply pressure to the site 1-2 minutes longer or as long as is necessary, elevating arm above head. Apply Band-Aid.

25) Give the participant labeled urine specimen cup and instruct him to void into the container. Inform him/ her where to leave the container.

26) Remove gloves, wash hands, and proceed to next participant.

Realize that the participant might be disoriented, embarrassed, or irritable and may need additional attention. Recognize also that this incident will have an impact on future blood drawing, and possible adherence through the study, and must be handled with reassurance. Make a note in the participant's file so that clinic staff will be aware of the situation in the future.

Note: If sample is not collected, try to reschedule the visit especially if the technician and participant agree that this is an unusual situation and that is not likely to occur again. If participant does not wish to reschedule, indicate in the comment section on the visit form that the samples were not collected.

Finish venipuncture following procedures outlined above, if possible. If multiple attempts at venipuncture are unsuccessful, do not reschedule the participant unless both the technician and the participant agree that this is an unusual situation and that there is a high probability of obtaining a sample on the first try at another visit.

If Fainting Episodes Are Experienced:

If participant shows signs of becoming faint (loss of color in the face, unusual sweating on the forehead) or reports feeling dizzy:

- Finish drawing blood if possible but do not proceed if participant is clearly in trouble.
- Remain calm and call for help.
- Have participant lay head on table or move participant into a fully reclined position, if possible.
- Have participant prop feet up on pillow or cushion and elevate participant's legs above her head.
- Continue talking to participant to assess level of consciousness.
- Prevent injuries from possible fall or seizure.
- Have participant lie down for 5-10 minutes after removing the needle; apply pressure on vein.
- Apply cool compress to forehead.
- Use ammonia capsule if needed.
- Keep participant in a reclined position until the subject feels better.
- Taking blood pressure readings to assess recovery may be worthwhile.
- Offer participant water, juice and food after they have recovered.

Urine Sample Collection:

1 Containers for routine collection should be clean and hold about 50 ml in volume and

must have a tight-fitting lid.

2 The participant's privacy should be assured and a clean bathroom available.

3 Instruct the participant to perform the following steps:

- Remove cap from the labeled container before beginning urination
- Void directly into toilet and after stream is steady, pause.
- Begin stream again and fill approximately half of the cup.
- Finish urinating, firmly place cap on container and return sample to the study person.

Flow charts summarizing processing procedures are in Appendix B-1A through B-1C of the SHS Phase V Manual, Volume4.

General Sample Collection:

Table I: General Instructions for Sample Processing of Blood & Urine Samples

Collection Tube	Test
3 10ml SST Chem Profile, Lipids, Insulin, CRP, FFA Serum Storage	1. Let stand at room temperature for 20 minutes so blood can clot. If samples cannot be processed within the hour, refrigerate sample or place on ice. 2. Centrifuge at 3000 rpm (1000xG) for 10 minutes. 3. Place approximately 1 ml of serum sample in each of the appropriate 2ml-cryovials and label.
1 4.5ml Lt blue or **2** 2.7ml Lt blue Fibrinogen Na Citrate Plasma Storage	*1. This vacutainer must be allowed to fill completely with blood at the time of collection.* 2. After collection gently invert 8-10 times. Place on ice or refrigerate immediately. 3. Centrifuge at 3000 rpm (1000xG) for 10 minutes at 4°C. 4. Place approximately 1 ml of plasma sample in each of the appropriate 2ml-cryovials and label.
1 4ml Gray Fasting Glucose NaFl Plasma Storage	1. After collection gently invert 8-10 times. Place on ice or refrigerate immediately. 2. Centrifuge at 3000 rpm (1000xG) for 10 minutes at 4°C. 3. Place approximately 1 ml of plasma sample in each of the appropriate 2ml-cryovials and label.
3 10 ml Purple HemoglobinA1c DNA Isolation Leptin EDTA Plasma Storage **1** purple for CBC at local lab	1. After collection, gently invert 8-10 times, place on ice or refrigerate immediately. 2. Tube #1: Prior to centrifuging, mix well and pipette approximately 1 ml of whole blood and place in each appropriate 2-ml cryovial and label. Re-cap tube #1. 3. All three tubes: Centrifuge at 3000 rpm (1000xG) for 10 minutes at 4°C. First, place approximately 1 ml of plasma sample in each of the appropriate 2-ml cryovials and label. Then, remove the buffy coat using the *Purple top tube buffy coat isolation protocol* as follows: **Buffy Coat:** 1. After plasma has been removed, there should be about 1/8th inch of plasma remaining on top of the buffy coat. 2. With either a glass or plastic pipette, place the tip of the pipette at the bottom of the small plasma layer just *slightly above* the buffy coat. Also, rest the pipette against the glass inside edge of the vacutainer tube. 3. Slowly draw up the buffy coat by moving the pipette in a circular motion around the inside of the vacutainer. 4. Remove all of the buffy coat from one tube and place in a 2.0 ml cryovial (orange cap). 5. Cap cryovial firmly, apply label. 6. With each tube repeat steps 1-4 using a different pipette for each tube. Use a new clean pipet for each tube. Do not mix the buffy coats between cryovials, ie only one buffy coat from one tube per cryovial.
1 cup Random Urine Creatinine & Albumin Urine Storage	1. Do not centrifuge. 2. After collection, place on ice or refrigerate immediately. 3. Place 1 ml of urine sample in each of the appropriate 2-ml cryovials and label.

Table II: Participant Collection Instructions

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Cryovial Type
3 10 ml SST (red/gray tiger top)	Chem Profile, Lipids, Insulin, CRP, FFA	Serum	Frozen	**4** 2 ml-red cap vial
	Storage	Serum	Frozen	**8** 2ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	**1** 2ml-blue cap vial
	Storage	Na Citrate Plasma	Frozen	**1** 2 ml-blue cap vial
1 4.0 ml Gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	**2** 2 ml-black cap vial
3 10 ml Purple	HemoglobinA1c	Whole Blood	Frozen	**3** 2 ml-neutral cap vial
	DNA Isolation	Buffy coat	Frozen	**3** 2 ml-orange cap vial
	Leptin	EDTA Plasma	Frozen	**2** 2 ml-purple cap vial
	EDTA Storage	EDTA Plasma	Frozen	**8** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	**2** 2 ml-yellow cap vial
	Storage	Urine	Frozen	**4** 2 ml-yellow cap vial

Table III: QA Collection Instructions:

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Cryovial Type
1 10 ml SST	Chem Profile, Lipids Insulin, CRP FFA	Serum	Frozen	**4** 2 ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7 ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	**2** 2 ml-blue vial
1 4 ml Gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	**2** 2 ml-black cap vial
1 10 ml Purple	HemoglobinA1c Leptin	Whole Blood EDTA Plasma	Frozen Frozen	**2** 2 ml-neutral cap vial **2** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	**2** 2 ml-yellow cap vial

Table IV: Courtesy Collection Instructions

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Cryovial Type
3 10 ml SST	Chem Profile, Lipids, Insulin, CRP, FFA	Serum	Frozen	**4** 2 ml-red cap vial
	Storage	Serum	Frozen	**8** 2 ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	**1** 2 ml-blue cap vial
	Storage	Na Citrate Plasma	Frozen	**1** 2 ml-blue cap vial
1 4 ml Gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	**2** 2 ml-black cap vial
3 10 ml Purple	HemoglobinA1c	Whole Blood	Frozen	**3** 2 ml-neutral cap vial
	DNA Isolation	Buffy Coat	Frozen	**3** 2 ml-orange cap vial
	Leptin	EDTA Plasma	Frozen	**2** 2 ml-purple cap vial
	EDTA Storage	EDTA Plasma	Frozen	**8** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	**2** 2 ml-yellow cap vial
	Storage	Urine	Frozen	**4** 2 ml-yellow cap vial

Module IV: Quality Assurance Sample Collection:

As part of the Quality Assurance process of this study, there is a need to assure that all the steps from the time that blood is collected to the time that results are reported are correct. To accomplish this, replication of unknown samples will be necessary by performing blind duplicate testing of samples. Blind duplicate samples, otherwise known as quality assurance (QA) samples, will be obtained from participants as follows:

1. Collect blind duplicate samples at a frequency of every 20th participant.

2. Collect blind duplicate samples only for the tests listed in Table III above.

3. In order to label the blind duplicate samples, the numbering system for these QA samples is similar to the Study ID and consists of 6 digits with the first digit corresponding to the center (1-SD, 2-OK, 3-AZ), the second digit will be a "3" to

indicate that the sample is a QA and the 4-digit participant ID number. The Coordinating Center should receive at monthly intervals the matching participant ID and corresponding QA for analysis. This list should not be made available to the Core Laboratory.

Processing and Shipping QA samples

These samples should be treated the same as the regular participant samples and be included in regular shipments with the participant and courtesy samples. DO NOT note the corresponding (regular) participant number anywhere on the form to go to the lab.

3.0 Sample Storage and Shipment

Module I: Equipment Maintenance

This module will include the following:

- Proper maintenance of equipment

The proper care of equipment promotes the life of any piece of equipment and will reduce the possibility of downtime while waiting for repair. Included in the proper maintenance of equipment is the requirement of taking temperatures of refrigerators and freezers.

- Refrigerators and Freezers

Storage requirements for samples include keeping samples at the proper temperature until samples are shipped. Never store samples in a self-defrost freezer. At each site, there should be a temperature log to record the temperatures of the room, all refrigerators and all freezers that hold samples. By recording and evaluating temperatures each day, you will see temperature fluctuation that is a signal that some part is not working properly and downtime is inevitable. It is also advisable to locate a maintenance/repair company that services your unit in the area before a problem is experienced. If temperatures begin to fluctuate, the repair service should be called in to evaluate the problem. It may be a simple repair like a door seal or it may require ordering a part. In any case, detecting the problem early will give you time to have the repair done while still maintaining samples at proper temperatures. In addition to recording temperatures, all refrigerators and freezers require routine maintenance. Follow manufacturer guidelines.

- Centrifuges

Like refrigerators and freezers, there are many makes and models of centrifuges. Follow manufacturer guidelines for the care of your centrifuge. In addition, locate a service company that can do maintenance and repairs. Find

this company before a problem occurs. In addition, once a month the inside bowl of the centrifuge should be cleaned with a disinfectant. Always wear gloves, safety glasses and a lab coat when performing this task.

Module II: Storage Requirements

This module will include the following:

- Proper storage
- Shipping instructions
- Proper packaging of samples
- Proper completion of FedEx airbill
- Notification of shipment to the lab

One important precaution which should always be kept in mind when handling samples is that all blood, **except for the SST tube,** should be cooled (either in the refrigerator or on ice) as soon as the samples are collected. They should be kept cold until processing is complete and samples are properly stored. After the SST tube is completely clotted (20-30 minutes) it should also be kept cool if it cannot be processed within the hour. Plasma should be separated from the cells within the hour. Plasma samples should not be allowed to freeze and thaw during any of the handling steps.

Module III: Shipping Instructions

Table V: Shipping Instructions for All Visit Types (Participant, QA & Courtesy)

PML = Penn Medical Laboratory
SFBR = Southwest Foundation for Biomedical Research

Collection Tube Type	Tests	Sample Type	Storage/Shipping Requirement	Lab to Ship to:	Cryovial Type
3 10 ml SST	Chem Profile, Lipids, Insulin, CRP, FFA	Serum	Frozen	PML	**4** 2 ml-red cap vial
	Storage	Serum	Frozen	PML	**8** 2 ml-red cap vial
1 4.5 ml Lt blue or **2** 2.7 ml Lt blue	Fibrinogen	Na Citrate Plasma	Frozen	PML	**1** 2 ml-blue cap vial
	Storage	Na Citrate Plasma	Frozen	PML	**1** 2 ml-blue cap vial
1 4 ml gray	0 hour (fasting) glucose	NaFl Plasma	Frozen	PML	**2** 2 ml-black cap vial
3 10 ml Purple	HemoglobinA1c	Whole Blood	Frozen	PML	**3** 2 ml-neutral cap vial
	DNA Isolation	Buffy Coat	Frozen	**SFBR**	**3** 2 ml-orange cap vial
	Leptin	EDTA Plasma	Frozen	PML	**2** 2 ml-purple cap vial
	EDTA Storage	EDTA Plasma	Frozen	PML	**8** 2 ml-purple cap vial
1 cup Random Urine	Albumin/Creatinine	Urine	Frozen	PML	**2** 2 ml-yellow cap vial
	Storage	Urine	Frozen	PML	**4** 2 ml-yellow cap vial

- **Supplies Required for Shipping**

- **Frozen Samples:**

  Shipping Log Form
  Polyfoam shipping containers with cardboard cartons
  FedEx Shipping Labels
  Biohazard bags
  Dry Ice
  Paper Towels for wrapping Storage Boxes
  Newspaper or Styrofoam chips - for filling empty container space to prevent rattling
  3/4" Scotch Brand Filament Tape

Note: 20 lbs of dry ice gives some insurance against thawing if the package is delayed a few hours.

- Preparation of Samples for Shipment to Penn Medical Lab:

  ◦ Study laboratory requisitions stapled to extra unused labels for each set of samples must accompany each shipment.

  ◦ Each is printed on two-part carbonless form.

  ◦ Keep the last copy for your records and send the original with the samples. When your shipment is received, lab technicians at each laboratory will perform an inventory to be certain that all samples in the box correspond to those indicated on the shipping log. If the lab finds any discrepancies, they will call you to ask for your assistance in identifying extra samples or find lost samples.

- Packing Shipping Containers

  ◦ All samples are to be packed according to DOT regulations and in compliance with shipper's requirements. This includes the following:

  ◦ Label the exterior of all shipping boxes according to the shipper's requirements. Boxes must have dry ice labels with the amount of dry ice marked on the label and orange-red labels with "Perishable" printed.

  ◦ Sort specimens to be sent to Penn Medical Lab or Southwest Foundation for Biomedical Research (See Table V above).

  ◦ Place approximately 20 pounds of dry ice at the bottom of the shipping box.

  ◦ Place packing material (i.e., chux, Styrofoam "peanuts" or newspaper) on top of dry ice.

- Place samples in biohazard bags with forms in pocket of bag on top of packing.
- Check all of the specimens in the box against the Shipping Log Form to be sure there are no transcription errors or missing specimens.
- Add more packing material if there is additional space so samples cannot bounce around the box while in shipment.
- Place "Class 9" (dry ice) labels on the outside of the cardboard shipping carton and record the amount enclosed.
- Place polyfoam lid on box.
- Close cardboard lids.
- With ¾" tape secure the cardboard lid closed.
- Prepare FedEx air bill.
- Samples will be shipped by priority air so that they arrive at the laboratory *WITHIN 24 HOURS*. ONLY SHIP SAMPLES MONDAY though WEDNESDAY.
- Retain a copy of the air bill as a receipt for tracking and auditing purposes.
- The day of shipment, fax (202-877-7342), call 202-877-5040 or email the laboratory to inform them that a package is being sent.
- Please give the following information:

    - Date samples will be shipped
    - The name of the person responsible for shipping the package and a phone number where the call can be returned if needed
    - Number of shipping boxes sent
    - FedEx tracking number

This information will allow the lab to track the package quickly if it does not arrive as planned.

- If you have any question regarding samples or shipment to Penn Medical Lab:

  Sophia Rushton-Reid: Phone: 202-877-8379
  Fax: 202-877-7342
  Email: Sophia rushton-reid@medstar.net

  Shipping/Receiving Dept: Phone: 202-877-5040 or 202-877-5055

  Technical Area: Phone: 202-877-5630

- If you have any question regarding samples or shipment to Southwest Foundation for Biomedical Research Lab:

  Shelly Cole : Phone: 210-258-9688
  Fax: 210-670-3334
  Email: scole@darwin.sfbr.org

- **Holiday Schedule:**

Penn Medical Laboratory is closed on the following holidays:

Holiday	2006	2007	2008	2009	2010
Labor Day	September 4, 2006	September 3, 2007	September 1, 2008	September 7, 2009	September 6, 2010
Thanksgiving	November 24, 2006	November 23, 2007	November 28, 2008	November 27, 2009	November 26, 2010
Christmas Day	December 25, 2006	December 25, 2007	December 25, 2008	December 25, 2009	December 25, 2010
New Years Day	January 1, 2006	January 1, 2007	January 1, 2008	January 1, 2009	January 1, 2010
ML King Day	January 16, 2006	January 15, 2007	January 21, 2008	January 19, 2009	January 18, 2010
President's Day	February 20, 2006	February 19, 2007	February 18, 2008	February 16, 2009	February 15, 2010
Memorial Day	May 29, 2006	May 28, 2007	May 27, 2008	May 26, 2009	May 31, 2010
Independence Day	July 4, 2006	July 4, 2007	July 4, 2008	July 4, 2009	July 4, 2010

SFBR Laboratories are closed on the following holidays:

Holiday	2006	2007	2008	2009	2010
Labor Day	September 4, 2006	September 3, 2007	September 1, 2008	September 7, 2009	September 6, 2010
Thanksgiving	November 24, 2006	November 23, 2007	November 28, 2008	November 27, 2009	November 26, 2010
Christmas Day	December 25, 2006	December 25, 2007	December 25, 2008	December 25, 2009	December 25, 2010
New Years Day	January 1, 2006	January 1, 2007	January 1, 2008	January 1, 2009	January 1, 2010
Fiesta Friday	April 28, 2006	April 27,2007	April 25,2008	April 24, 2009	April 23, 2010
Memorial Day	May 29, 2006	May 28, 2007	May 27, 2008	May 26, 2009	May 31, 2010
Independence Day	July 4, 2006	July 4, 2007	July 4, 2008	July 4, 2009	July 4, 2010

Slockbower, J.M., and Blumenfeld, T.A., (Eds.). Collection and Handling of Laboratory Specimens: A Practical Guide. Philadelphia: J.B. Lippincott Company, 1983.

APPENDIX A

THE STRONG HEART STUDY, PHASE V
CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

The following recommendations are made regarding maintenance and operation of the One-Touch Sure Step Flexx meter in order to ensure accurate readings of blood glucose.

There are 2 types of One Touch equipment (for Home use and for Hospital use). Hospital equipment requires daily QC checks, and this is also required by SHS. Please record the QC in your daily log. Be sure to use only Hospital products including the hospital test strips.

Excerpts taken from Sure Step Flexx meter operator's guide:

General Care

To keep the meter in good operating condition, you must keep it clean and handle it with care. Follow these simple rules:

- Keep the test strip holder and lens area clean.
- Keep the meter dry and avoid exposing it to extremes in temperature and humidity.
- Do not take apart the meter.
- If you drop the meter, inspect it for obvious damage.
- Perform a quality control test prior to
- Running a patient blood glucose test.

Cleaning

When to Clean the Meter

- If dirt, blood, or lint is present.
- When an error message appears and the troubleshooting solution indicates cleaning the meter.
- As defined by your institution's infection control policies.

Cleaning the Outside of the Meter

Clean the outside of the meter with a cloth dampened with a 10% bleach solution. Follow with a cloth moistened with water to remove residual bleach. Dry the meter thoroughly. Refer to "Cleaning Agents" on page 100 for other solutions that can be used to clean the outside of the meter.

▲ **CAUTION:** *Do not get water inside the meter. Never immerse the meter or hold it under running water because it will damage the meter.*

Cleaning the Test Strip Holder and Lens

To clean the test strip holder (cover and base), lens area, and contact points, use a 10% bleach solution followed by water. Dry thoroughly.

▲ **CAUTION:** *Do not use alcohol, glass cleaners, or any cleansers containing*

abrasives, phenol, or ammonia to clean the test strip holder or lens area because it will damage the meter parts.

1 **Press down on the left side of the test strip holder. This releases the holder, allowing you to slide it from the meter.**
2 **Wipe the test strip holder cover and base with a cotton swab or soft cloth dampened with a 10% bleach solution. Be sure to thoroughly wipe the gray area on the inside cover. Clean both sides of the base. Follow with a cotton swab dampened with water to remove residual bleach.**

▲ **CAUTION:** *Bleach residue left on the test strip holder may lead to an error message or an inaccurate, high result.*

3 **Dry the test strip holder with a soft cloth or lint-free tissue. Close the holder and set it aside.**
4 **Using a cotton swab or soft cloth dampened with a 10% bleach solution, wipe the lens area and contact points. Wipe this area even if it doesn't appear to be dirty. Use a cloth moistened with water to remove residual bleach.**

Be careful not to scratch the lens area or get water inside the meter, contact points, lens area

5 **Dry the lens area gently with a clean, soft, lint-free cloth or tissue. Remove any lint.**
6 **Slide the closed test strip holder into the meter. Push the holder until it clicks into place.**
7 **Turn on the meter. If an error appears, check to make sure you installed the test strip holder correctly.**
8 **If necessary, wipe the scanner lens with a soft cloth dampened with water.**
9 **Perform a quality control test to verify that the result is within the expected range.**

Changing the Batteries

The meter is powered by three size AA alkaline batteries. The **LOW BATTERY** message appears when the battery power is too low to perform a test. Change the batteries when the message appears. You may want to change the batteries if the battery bar on the status screen is low. Although the meter will continue to accurately perform glucose tests until the **LOW BATTERY** message appears, barcode scanning and data transfer may be affected before the message appears.

▲ **CAUTION:** *Do not use rechargeable batteries.*

■ **NOTE:** *Neither the* **LOW BATTERY** *message nor the removal of batteries affects the test results stored in meter memory.*

1 **Turn off the meter.**
2 **Turn the meter over. Press down on the battery door latch and lift open the door.**
3 **Remove the batteries from the battery compartment and dispose of them according to your institution's guidelines.**
4 **Insert three new size AA batteries, matching the positive + end of each battery with the + signs inside the battery compartment.**

■ **NOTE:** *The battery life depends on how quickly the meter is powered off after each test. Under optimal conditions—using the barcode scanner to enter information and turning off the meter immediately after test results are displayed and recorded—you can expect approximately 1000 tests.*

5 **Replace the battery compartment door.**

6 Turn on the meter to verify power.

Adjusting the Screen Contrast

You can increase or decrease the meter's LCD screen contrast.

1 Select Setup from the Main Menu.

2 Select LCD Contrast from the Setup Menu.

The options available at the Setup Menu are different for stand-alone meters and meters configured by a DataLink workstation.

3 Press the arrows to increase or decrease the LCD contrast.

A change occurs each time you press the arrow. The gauge within the bar gives you an approximate indication of the current setting.

4 When you are satisfied with the setting, press OK to save the setting and return to the Setup Menu, OR, press the back or menu key to ignore any changes and return to the Setup Menu.

Setting the Date and Time

You can set the date and time for meters operating in stand-alone mode.

1 Select Setup from the Main Menu.

2 Select Date/Time Entry from the Setup Menu.

The Date/Time Entry option is available for stand-alone meters only.

3 Enter the time using the 24-hour format (hours:minutes). Press OK to save the setting and advance to the date screen.

To exit the screen without changing the time, press back or menu key

4 Enter the date using the mm/dd/yy (month/day/year) format. Press Ok to save the setting and return to the Setup Menu.

To exit the screen without changing the date, press back or menu.

Performing a Patient Test

Setting Up the Meter

1 Press the power button to turn on the meter.

2 The status screen appears. Press Cont to continue.

3 Select Patient Test from the Main Menu.

4 Enter your operator ID and press OK.

If the meter is equipped with the optional barcode scanner, you may scan the barcode on your ID badge.

5 Enter the patient's ID and press OK.

If the meter is equipped with the optional barcode scanner, you may scan the patient's barcode.

■ **NOTE:** *Carefully enter the ID. An accurate patient ID is imperative for transferring the correct results to the medical record.*

❑ Operator ID required for all tests

❑ Maintain ID for ___ min. after power off

If your ID appears at the operator ID screen, press OK to confirm it is correct. If the ID is not correct or does not appear, enter your ID.

❑ Patient ID required

6 Select the test strip lot number (and code) from the list displayed.

The last test strip lot number selected appears at the top of the list. Use the arrow(s) to scroll through the list, if necessary. If the meter is equipped with the optional barcode scanner, you may scan the barcode on the test strip bottle label.

▲ **CAUTION:** *To obtain accurate results, you must enter the correct test strip lot number (and code) for each new test.*

The Patient Test screen appears with messages prompting you to apply blood to the strip and insert the strip.

❑ New reagent entry at workstation only

The meter may be set to allow you to enter new reagent information. If the test strip lot number does not appear in the list, press the **Entr Lot#** button and enter the test strip lot number, control code, and control ranges.

Applying Blood Sample to the Test Strip

The puncture site must be cleaned and thoroughly dried before obtaining the sample. Thus, the participant will be asked to wash his/her hands with soap and water and dry them. Then the staff will apply alcohol to the puncture site and wait for the alcohol to dry. A drop of capillary blood will be obtained by puncturing the finger using a lancing device. Follow your institution's policy and procedure guidelines for blood collection.

7 Apply the blood to the center of the pink test square as follows:

Finger Stick

Carefully touch the center of the pink test square to the drop of blood on the patient's finger. The test area will quickly absorb the blood.

8 Check the white pad on the front of the test strip and the confirmation dot on the back of the test strip.

• If the white pad becomes completely saturated, you have applied too much blood for an accurate result. Repeat the application with a new test strip.

• The confirmation dot should be completely blue. If white patches or streaks are visible, you have not applied enough blood for an accurate result. Repeat the application with a new test strip.

▲ **CAUTION:** *Do not apply additional blood to the test strip or you may get an inaccurate result.*

If white patches or streaks continue to appear after you have repeated the test and used a larger volume of blood, call the LifeScan Healthcare Professional Line at 1 800 524-7226.

Inserting the Test Strip

9 Firmly insert the test strip all the way into the test strip holder until it stops (the confirmation dot should be facing down).

▲ **CAUTION:** *If you fail to completely insert the test strip, the test may start; however, you may receive an inaccurate, low result.*

▲ **CAUTION:** *You have up to **2 minutes** to insert the test strip after the blood is applied. If you insert the test strip after 2 minutes, you may get an inaccurate result or an error message. Discard the test strip and repeat the test with a new test strip.*

Patient Results

The patient test result appears in approximately 30 seconds.

◆ **IMPORTANT:** *Do not remove the test strip until the countdown is complete.*

If an error message appears, refer to Chapter 7, Troubleshooting, for information.

A glucose range may be defined by your system administrator. Results that fall above or below the limits of this range appear as follows:

- **CRITICAL HIGH** indicates a result above the range.
- **CRITICAL LOW** indicates a result below the range.
- **HIGH** indicates a result greater than 500 mg/dL.

◆ **IMPORTANT:** *When the result is greater than 500 mg/dL and proper procedures are followed, the meter will display HIGH in virtually all cases. Additionally, the confirmation dot will be darker than the 350-mg/dL sample color dot on the test strip bottle Color Chart. This indicates hyperglycemia. Follow your institution's policies for treatment.*

10 Remove the test strip and dispose of it according to your institution's policies and procedures.

11 You may press Entr Note and choose 1 to 3 comments that correspond to the patient's current situation. Press OK, Or, press menu and continue testing.

■ **NOTE:** *Results tagged with the comment "Procedure Err" are not included in any patient reports.*

If you have problems using the meter to test patient samples, or if the meter malfunctions, call the LifeScan Healthcare Professional Line at 1 800 524-7226.

❑ Require message entry for patient tests outside the critical limits. You may be required to select a comment when a patient test result falls outside the limits of the range.

Record the glucose reading (from the Sure Step Flexx screen) on form S7, Sample Collection Checklist, item #1 (Fasting One-Touch Sure Step Flexx glucose result.)

Complete the rest of the sample collection checklist (form S7)

SHS PHASE V FAMILY STUDY

Safety and Protection Precautions Checklist

Technician Code # / Initials:		
Observer Code # / Initials:		
Date Observed:		
	Yes	**No**
Avoids direct contact with blood, sera, plasma or urine.		
Wears protective clothing, gloves, goggles or safety glasses when handling specimens or performing phlebotomy.		
Wears long-sleeved full-length lab coat buttoned down front or apron over scrubs.		
Wears close-toed shoes.		
Immunized against Hepatitis B.		
Disposes of tubes, containers and other material exposed to blood in appropriately labeled waste receptacles for biohazardous material.		
Places contaminated sharps in labeled, puncture-resistant, leak-proof containers.		
Processes blood where first aid instructions can be followed (i.e., wash off skin contact, eye wash, needle-stick instructions).		
Follows universal precautions and treats every specimen as potentially hazardous.		
Removes protective clothing before leaving processing area.		
Uses biohazard labels on refrigerator or freezer holding blood and on specimen containers for storage (including zip-lok bags).		
Comments:		

SHS PHASE V FAMILY STUDY

Checklist for Sample Collection

Technician Code # / Initials:		
Observer Code # / Initials:		
Date Observed:		
	Yes	**No**
Room set-up with basic supplies for blood collection.		
Follows safety/universal precautions as outlined in checklist.		
Labels collection tubes with ID number and date of draw.		
Introduces self and wears nametag.		
Positions participant in comfortable chair in quiet environment.		
Explains blood drawing procedures and purpose.		
Conducts glucometer procedure as required.		
Completes forms related to blood collection accurately. Assesses fasting state of participant.		
Applies tourniquet. Palpates vein. Cleanses skin over vein using circular motion from center to periphery. Wipes with dry gauze following cleansing. Does not touch skin after cleansing.		
Conducts venipuncture using vascular access with a multi-draw vacutainer (butterfly) needle into vacutainer tubes.		
Draws tubes in order recommended by SHS Core Lab.		
Loosens tourniquet after blood flow starts.		
Does not attempt a venipuncture more than three (3) times.		
Inverts all tubes (except SST) 8-10 times and places on ice. SST tube is to remain upright at room temperature for 20 min.		
After the last tube is drawn, removes tourniquet and uses clean gauze to apply slight pressure to vein (has arm extended) and after 3-5 minutes, applies a pressure bandage.		
Disposes of entire needle set-up into biohazard container. Does not attempt to recap a needle.		
Obtains a urine sample from participant in a pre-labeled container and places it on ice immediately. Records time of voiding.		
Thanks participant and instructs them on next activity.		
Removes gloves, washes hands, proceeds to next participant.		
Comments:		

STRONG HEART STUDY

PHASE V

FAMILY STUDY

Quality Control - Equipment

SHS Phase V Family Study

ARIZONA FIELD CENTER

DAKOTA FIELD CENTER

OKLAHOMA FIELD CENTER

EQUIPMENT – QUALITY ASSURANCE CHECKLIST

Device	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ECG												
IMPEDANCE												
BLOOD SUGAR METER												
SPHYGMO-MANOMETER												
MEASURING TAPES												
SCALE												

IMPEDANCE

SHS Phase V Family Study

IMPEDANCE QUALITY CONTROL

DATE	OHMS	DATE	OHMS	DATE	OHMS	DATE	OHMS

SURE STEP FLEXX GLUCOMETER

SHS Phase V Family Study

QUALITY CONTROL LOG

Glucose Controls will remain stable until manufacturer's date or "opened" expiration date, whichever comes first.

Low Level Control Solution Lot# _____ Date Opened _____ Opened Exp. _____ Manufacturer's Exp. _____
Normal Level Control Solution Lot# _____ Date Opened _____ Opened Exp. _____ Manufacturer's Exp. _____
High Level Control Solution Lot# _____ Date Opened _____ Opened Exp. _____ Manufacturer's Exp. _____

			Test Strip			**Low Level Control**				**Normal Level Control**				**High Level Control**				
Date	Time	Init.	Lot #	Code #	Exp.	Accep Range	Actual Value	Mean -/+ Mean	W/in Range Y/N	Accep Range	Actual Value	Mean -/+ Mean	W/in Range Y/N	Accep Range	Actual Value	Mean -/+ Mean	W/in Range Y/N	Corrective Action if Applicable

SPHYGMOMANOMETER

SHS Phase V Family Study

MAINTENANCE PROCEDURES FOR STANDARD SPHYGMOMANOMETERS

The following checks should be conducted at least every month, and a log kept of the dates and the people carrying out the troubleshooting.

1. With the instrument placed flat on the table, and the inflation system disconnected, the level of mercury should read zero in the standard instrument. The top of the meniscus is on the zero line when the eyes are level with this line and the mercury is correctly adjusted. If the reading is either above or below the zero mark, the system should be returned to the manufacturer or replaced.

2. The inflation system should then be reconnected, and the cuff rolled around a bottle and secured. The valve should be closed on the Air Flo system, and the instrument inflated until the mercury rises to 240 mmHg. The Air Flo valve should then be slowly opened and the mercury allowed to fall to 200 mmHg. The valve should then be closed, at which time the mercury column should remain stable. If the column continues to fall, there is an air leak, and the following steps should be taken:
   a) The system should be re-inflated until the column rises to 200 mmHg.
   b) The tubing should be pinched at various locations to localize the area of the leak.
   c) Appropriate replacement of the tubing, cuff, or valve should be performed.

3. With the instrument inflated above full calibration, the screw cap should be examined for mercury leaks. If this happens, the screw cap should be tightened. If the leak persists or the mercury is seen at the bottom of the tube, the system should be returned to the manufacturer or replaced.

4. With time, the mercury will become dirty and an oxide layer will be deposited on the inside of the glass tube. Check with the manufacturer to determine where the system should be sent for maintenance.

5. Since mercury is a toxic substance, all maintenance procedures must be performed carefully and with attention to safety. Mercury should not be allowed to get in contact with rings and other jewelry. All clinics should have a mercury spill kit available, and staff should be trained in how to use the kit.

SHS Phase V Family Study

Quality Control

SPHYGMOMANOMETERS

MONTH	DATE	INIT.	MERCURY LEVEL IS AT ZERO WITH NO PRESSURE	CHECK FOR AIR LEAKS WITH MERCURY AT 200 mmHg	CHECK CAP FOR TIGHTNESS	CHECK TUBE FOR OXIDE DUST	COMMENT ON ANY PROBLEMS FOUND AND CORRECTIVE ACTION TAKEN.
JAN							
FEB							
MAR							
APR							
MAY							
JUN							
JUL							
AUG							
SEP							
OCT							
NOV							
DEC							

SCALE/TAPE

SHS Phase V Family Study

Quality Control

SCALE & MEASUREMENT TAPES

MONTH	DATE	INIT.	PORTABLE SCALE	CALIBRATED WEIGHTS	MEASURING TAPE, to 30 cm METAL TAPE
JAN					
FEB					
MAR					
APR					
MAY					
JUN					
JUL					
AUG					
SEP					
OCT					
NOV					
DEC					