Third National Health and Nutrition Examination Survey
(NHANES III), 1988-94

NHANES III ELECTROCARDIOGRAPHY DATA FILE DOCUMENTATION

Series 11, No. 2A

April 1998

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Introduction

The National Center for Health Statistics (NCHS) of the Centers for Disease
Control and Prevention (CDC) collects, analyzes, and disseminates data on the
health status of U.S. residents. The results of surveys, analyses, and studies
are made known through a number of data release mechanisms including
publications, mainframe computer data files, CD-ROMs (Search and Retrieval
Software, Statistical Export and Tabulation System (SETS)), and the Internet.

The National Health and Nutrition Examination Survey (NHANES) is a periodic
survey conducted by NCHS. The third National Health and Nutrition Examination
Survey (NHANES III), conducted from 1988 through 1994, was the seventh in a
series of these surveys based on a complex, multi-stage sample plan. It was
designed to provide national estimates of the health and nutritional status of
the United States' civilian, noninstitutionalized population aged two months
and older.

The following table summarizes the NHANES III data which are currently available on CD-ROM, including this release.

Table 1. Available NHANES III CD-ROMs

CD-ROM Name	Release Date	Size in Megabytes	Data Files / Description
NHANES III, 1988-94, Series 11, No. 2A, ASCII Version (this release)	April 1998	407	Dietary recall (replacement), electrocardiography, laboratory (additional analytes), and vitamins/medicines data files and documentation
NHANES III, 1988-94, Series 11, No. 1, Revised SETS Version 1.22a	October 1997	285	Adult and youth household questionnaire, examination, and laboratory data files and documentation, plan and operation, analytic and reporting guidelines, weighting and estimation methodology, field operations, non-response bias
NHANES III, 1988-94, Series 11, No. 1A, ASCII Version	July 1997	454	Adult and youth household questionnaire, dietary recall, examination, and laboratory data files and documentation
NHANES III, 1988-94, Series 11, No. 1, SETS Version 1.22a *	July 1997	285	Adult and youth household questionnaire, examination, and laboratory data files and documentation
NHANES III Reference Manuals and Reports October 1996	October 1996	152	Plan and operation, analytic and reporting guidelines, weighting and estimation methodology, field operations, non-response bias

*   Do not use this CD-ROM It had technical problems and has been
     superseded by the revised SETS version 1.22a, Series 11, No. 1,
     released in October 1997.

This release, Series 11, No. 2A, contains previously unreleased data and corrections. Corrections were made to the vitamin/minerals portion of the adult and youth questionnaire data files as well as the dietary recall portion of the examination data file. For the laboratory component, some previously release variables have been augmented with NHANES III Phase 2 data. In addition several new laboratory variables have been added.

The following table shows which public use files contain information from the interview and examination components.

Table 2. Location of the interview and examination components in the
NHANES III public use data files

Data File

Topic	HA	HY	EXAM	LAB	DIET	VMS	ECG
Sample weights	X	X	X	X	.	.	X
Age/race/sex	X	X	X	X	.	.	X
Ethnic background	X	X	.	.	.	.	.
Household composition	X	X	.	.	.	.	.
Individual characteristics	X	X	.	.	.	.	.
Health insurance	X	X	.	.	.	.	.
Family background	X	X	.	.	.	.	.
Occupation of family head	X	X	.	.	.	.	.
Housing characteristics	X	X	.	.	.	.	.
Family characteristics	X	X	.	.	.	.	.
Orientation	X	X	.	.	.	.	.
Health services	X	X	.	.	.	.	.
Selected health conditions	X	X	X	.	.	.	.
Diabetes questions	X	.	.	.	.	.	.
High blood pressure and cholesterol questions	X	.	.	.	.	.	.
Cardiovascular disease questions	X	.	.	.	.	.	.
Musculoskeletal conditions	X	.	.	.	.	.	.
Physical functioning questions	X	.	.	.	.	.	.
Gallbladder disease questions	X	.	.	.	.	.	.

Table 2. (continued) Location of the interview and examination components in the NHANES III public use data files

Data File

Topic	HA	HY	EXAM	LAB	DIET	VMS	ECG
Kidney conditions	X	.	.	.	.	.	.
Respiratory and allergy questions	X	X	.	.	.	.	.
Diet questions	X	.	.	.	.	.	.
Food frequency	X	.	X	.	.	.	.
Vision questions	X	X	.	.	.	.	.
Hearing questions	X	X	.	.	.	.	.
Dental care and status	X	X	.	.	.	.	.
Tobacco	X	.	X	.	.	.	.
Occupation	X	.	.	.	.	.	.
Language usage	X	X	.	.	.	.	.
Exercise	X	.	.	.	.	.	.
Social support/residence	X	.	.	.	.	.	.
Vitamin/mineral/medicine usage	X	X	X	.	.	.	.
Blood pressure measurement	X	.	X	.	.	.	.
Birth	.	X	X	.	.	.	.
Infant feeding practices/diet	.	X	.	.	.	.	.
Motor and social development	.	X	.	.	.	.	.
Functional impairment	X	X	.	.	.	.	.
School attendance	.	X	.	.	.	.	.
Cognitive function	.	X	X	.	.	.	.

Table 2. (continued) Location of the interview and examination components in the NHANES III public use data files

Data File

Topic	HA	HY	EXAM	LAB	DIET	VMS	ECG
Alcohol and drug use	.	.	X	.	.	.	.
Reproductive health	.	.	X	.	.	.	.
Diagnostic interview schedule	.	.	X	.	.	.	.
Activity	.	.	X	.	.	.	.
Physician's examination	.	.	X	.	.	.	.
Height and weight	.	.	X	.	.	.	.
Body measurements	.	.	X	.	.	.	.
Dental examination	.	.	X	.	.	.	.
Allergy skin test	.	.	X	.	.	.	.
Audiometry	.	.	X	.	.	.	.
Tympanometry	.	.	X	.	.	.	.
WISC and WRAT	.	.	X	.	.	.	.
Spirometry	.	.	X	.	.	.	.
Bone densitometry	.	.	X	.	.	.	.
Gallbladder ultrasonography	.	.	X	.	.	.	.
Central nervous system function evaluation	.	.	X	.	.	.	.
Fundus photography	.	.	X	.	.	.	.
Physical function evaluation	.	.	X	.	.	.	.
Fasting questions	.	.	.	X	.	.	.

Table 2. (continued) Location of the interview and examination components in
the NHANES III public use data files

                                              Data File

Topic	HA	HY	EXAM	LAB	DIET	VMS	ECG
Laboratory tests on blood and urine	.	.	.	X	.	.	.
Total nutrient intakes	.	.	X	.	.	.	.
Individual foods	.	.	.	.	X	.	.
Combination foods	.	.	.	.	X	.	.
Ingredients	.	.	.	.	X	.	.
Prescription Medicines	X	X	.	.	.	X	.
Vitamins and Minerals	X	X	.	.	.	X	.
Electrocardiography	.	.	.	.	.	.	X

Data File Definitions

HA   - Household Adult Data File
HY   - Household Youth Data File
EXAM - Examination Data File
LAB - Laboratory Data File and Second Laboratory Data File
DIET - Dietary Recall Data Files
VMS - Vitamin Mineral Supplement Data File
ECG - Electrocardiography Data File

This document includes the documentation for the NHANES III Electrocardiography
Data File and also contains a general overview of the survey and the use of the
data files. The general overview includes five sections. The first section,
entitled "Guidelines for Data Users," contains important information about the
use of the data files. The second section, "Survey Description," is a brief
overview of the survey plan and operation. The third section, "Sample Design
and Analysis Guidelines," describes some technical aspects of the sampling plan
and discusses some analytic issues particularly related to the use of data from
complex sample surveys. The "Data Preparation and Processing Procedures"
section describes the editing conventions and the codes used to represent the
data. The last and fifth section, "General References," includes a reference
list for the survey overview sections of the document.

Public Use Data Files for the third National Health and Nutrition
Examination Survey will also be available from the National Technical
Information Service (NTIS). A list of NCHS public use data tapes available
for purchase from NTIS may be obtained from the Data Dissemination Branch at
NCHS. Information regarding a bibliography (on disk) of journal articles
citing data from all the NHANES and the availability of NHANES III data in
CD-ROM/SETS software format can be obtained from the Data Dissemination
Branch at:

Data Dissemination Branch
National Center for Health Statistics
Room 1018
6525 Belcrest Road
Hyattsville, Maryland 20782

Phone: (301)436-8500

URL:http://www.cdc.gov/nchswww

NTIS can be contacted at:

NTIS - Computer Products Office
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4807

Copies of all NHANES III questionnaires and data collection forms are
included in the Plan and Operation of the Third National Health and
Nutrition Examination Survey, 1988-94 (NCHS, 1994; U.S. DHHS, 1996). This
publication, along with detailed information on NHANES procedures,
interviewing, data collection, quality control techniques, survey design,
nonresponse, and sample weighting can be found on the NHANES III Reference
Manuals and Reports CD-ROM (U.S. DHHS, 1996). Information on how to order
this CD-ROM is also available from the Data Dissemination Branch at NCHS at
the address and telephone number given above.

GUIDELINES FOR DATA USERS

Please refer to the following important information before analyzing data.

NHANES III Background Documents

o   The Plan and Operation of the Third National Health and Nutrition
     Examination Survey, 1988-94, (NCHS, 1994; U.S. DHHS, 1996) provides an
     overview of the survey and includes copies of the survey forms.

o   The sample design, nonresponse, and analytic guidelines documents on
     the NHANES III Reference Manuals and Reports CD-ROM (U.S. DHHS, 1996)
     discuss the reasons that sample weights and the complex survey design
     should be taken into account when conducting any analysis.

o   Instruction manuals, laboratory procedures, and other NHANES III
     reference manuals on the NHANES III Reference Manuals and Reports
     CD-ROM(U.S. DHHS, 1996) are also available for further information on
     the details of the survey.

Analytic Data Set Preparation

o   Most NHANES III survey design and demographic variables are found only
     on the Adult and Youth Household Data Files available on the first
     release. In preparing a data set for analysis, other data files must
     be merged with either or both of these files to obtain many important
     analytic variables.

o   All of the NHANES III public use data files are linked with the common
     survey participant identification number (SEQN). Merging information
     from multiple NHANES III data files using this variable ensures that
     the appropriate information for each survey participant is linked
     correctly.

o   NHANES III public use data files do not have the same number of
     records on each file. The Household Questionnaire Files (divided into
     two files, Adult and Youth) contain more records than the Examination
     Data File because not everyone who was interviewed completed the
     examination. The Laboratory Data File contains data only for persons
     aged one year and older. The Individual Foods Data File based on the
     dietary recall has multiple records for each person rather than the one
     record per sample person contained in the other data files.

o   For each data file, SAS program code with standard variable names and
     labels is provided as separate text files on the CD-ROM that contains
     the data files. This SAS program code can be used to create a SAS
     data set from the data file.

o   Modifications were made to items in the questionnaires, laboratory,
     and examination components over the course of the survey; as a result,
     data may not be available for certain variables for the full six years.
     In addition, variables may differ by phase since some changes were
     implemented between phases. Users are encouraged to read the Notes

sections of this document carefully for information about changes.

o   Extremely high and low values have been verified whenever possible,
      and numerous consistency checks have been performed. Nonetheless, users
      should examine the range and frequency of values before analyzing
      data.

o   Some data were not ready for release at the time of this publication
      due to continued processing of the data or analysis of laboratory
      specimens. A listing of those data are available in the general
      information section of each data file.

o   Confidential and administrative data are not being released to the
      public. Additionally, some variables have been recoded to help
      protect the confidentiality of the survey participants. For example,
      all age-related variables were recoded to 90+ years for persons who were
      90 years of age and older.

o   Some variable names may differ from those used in the Phase 1 NHANES
      III Provisional Data Release and some variables included in the Phase 1
      provisional release may not appear on these files.

o   Although the data files have been edited carefully, errors may be
      detected. Please notify NCHS staff (301-436-8500) of any errors in
      the data file or the documentation.

Analytic Considerations

o   NHANES III (1988-94) was designed so that the survey's first three
      years, 1988-91, its last three years, 1991-94, and the entire six
      years were national probability samples. Analysts are encouraged to use
      all six years of survey results.

o   Sample weights are available for analyzing NHANES III data. One of
      the following three sample weights will be appropriate for nearly all
      analyses: interviewed sample final weight (WTPFQX6), examined sample
      final weight (WTPFEX6), and mobile examination center (MEC)- and
      home-examined sample final weight (WTPFHX6). Choosing which of these
      sample weights to use in any analysis depends on the variables being
      used. A good rule of thumb is to use "the least common denominator"
      approach. In this approach, the user checks the variables of
      interest. The variable that was collected on the smallest number of
      persons is the "least common denominator," and the sample weight that
      applies to that variable is the appropriate one to use for that
      analysis. For more detailed information, see the Analytic and Reporting
      Guidelines for NHANES III (U.S. DHHS, 1996).

Referencing or Citing NHANES III Data

o   In publications, please acknowledge NCHS as the original data source.
      For instance, the reference for the NHANES III Laboratory Data File
      On this CD-ROM is:

      U.S. Department of Health and Human Services (DHHS). National Center

for Health Statistics. Third National Health and Nutrition
Examination Survey, 1988-1994, NHANES III Second Laboratory Data File
(CD-ROM, Series 11, No. 2A). Hyattsville, MD.: Centers for Disease
Control and Prevention, 1998.

o   Please place the acronym "NHANES III" in the titles or abstracts of
     journal articles and other publications in order to facilitate the
     retrieval of such materials in bibliographic searches.

The third National Health and Nutrition Examination Survey (NHANES III) was the seventh in a series of large health examination surveys conducted in the United States beginning in 1960. Three of these surveys, the National Health Examination Surveys (NHES), were conducted in the 1960's (NCHS, 1965; NCHS, 1967; NCHS, 1969). In 1970, an expanded nutrition component was added to provide data with which to assess nutritional status and dietary practices, and the name was changed to the National Health and Nutrition Examination Survey (Miller, 1973; Engel, 1978; McDowell, 1981). A special survey of Hispanic populations in the United States was conducted during 1982-1984 (NCHS, 1985).

The general structure of the NHANES III sample design was similar to that of the previous NHANES. All of the surveys used complex, multi-stage, stratified, clustered samples of civilian, noninstitutionalized populations. NHANES III was the first NHANES without an upper age limit; in fact, the age range for the survey was two months and older. A home examination option was employed for the first time in order to obtain examination data for very young children and for elderly persons who were unable to visit the mobile examination center (MEC). The home examination included only a subset of the components used in the full MEC examination since it would have been difficult to collect some types of data in a home setting. A detailed description of design specifications and copies of the data collection forms can be found in the Plan and Operation of the Third National Health and Nutrition Examination Survey, 1988-1994 (NCHS, 1994; U.S. DHHS, 1996).

NHANES III was conducted from October 1988 through October 1994 in two phases, each of which comprised a national probability sample. The first phase was conducted from October 18, 1988, through October 24, 1991, at 44 locations. The second phase was conducted from September 20, 1991, through October 15, 1994, at 45 different locations. In NHANES III, 39,695 persons were selected over the six years; of those, 33,994 (86%) were interviewed in their homes. All interviewed persons were invited to the MEC for a medical examination. Seventy-eight percent (30,818) of the selected persons were examined in the MEC, and an additional 493 persons were given a special, limited examination in their homes.

Data collection began with a household interview. Several questionnaires were administered in the household: Household Screener Questionnaire, Family Questionnaire, Household Adult Questionnaire, and Household Youth Questionnaire.

At the MEC, an examination was performed, and five automated questionnaires or interviews were administered: MEC Adult Questionnaire, MEC Youth Questionnaire, MEC Proxy Questionnaire, 24-Hour Dietary Recall, and Dietary Food Frequency (ages 12-16 years). The health examination component included a variety of tests and procedures. The examinee's age at the time of the interview and other factors determined which procedures were administered. Blood and urine specimens were obtained, and a number of tests and measurements were performed including body measurements, spirometry, fundus photography, x-rays, electrocardiography, allergy and glucose tolerance tests, and ultrasonography. Measurements were taken of bone density, hearing, and physical, cognitive, and central nervous system functions. A physician performed a limited standardized medical examination

and a dentist performed a standardized dental examination. While some of the blood and urine analyses were performed in the MEC laboratory, most analyses were conducted elsewhere by contract laboratories.

A home examination was conducted for those sample persons aged 2-11 months and aged 20 years or older who were unable to visit the mobile examination center. The home examination consisted of an abbreviated version of the tests and interviews performed in the MEC. Depending on age of the sample person, the components included body measurements, blood pressure, spirometry, venipuncture, physical function evaluation, and a questionnaire to inquire about infant feeding, selected health conditions, cognitive function, tobacco use, and reproductive history.

SAMPLE DESIGN AND ANALYSIS GUIDELINES

Sample Design

The general structure of the NHANES III sample design is the same as that
of the previous NHANES. Each of these surveys used a stratified, multi-stage
probability design. The major design parameters of the two previous NHANES
and the special Hispanic HANES, as well as NHANES III, have been previously
summarized (Miller, 1973; McDowell, 1981; NCHS, 1985; NCHS, 1994). The
NHANES III sample was designed to be self-weighting within a primary
sampling unit (PSU) for subdomains (age, sex, and race-ethnic groups). While
the sample was fairly close to self-weighting nationally for each of these
subdomain groups, it was not representative of the total population, which
includes institutionalized, non-civilian persons that were outside the
scope of the survey.

The NHANES III sample represented the total civilian, noninstitutionalized
population, two months of age or over, in the 50 states and the District of
Columbia of the United States. The first stage of the design consisted of
selecting a sample of 81 PSU's that were mostly individual counties. In a
few cases, adjacent counties were combined to keep PSU's above a minimum
population size. The PSU's were stratified and selected with probability
proportional to size (PPS). Thirteen large counties (strata) were chosen
with certainty (probability of one). For operational reasons, these 13
certainty PSU's were divided into 21 survey locations. After the 13
certainty strata were designated, the remaining PSU's in the United States
were grouped into 34 strata, and two PSU's were selected per stratum (68
survey locations). The selection was done with PPS and without
replacement. The NHANES III sample therefore consists of 81 PSU's or 89
locations.

The 89 locations were randomly divided into two groups, one for each phase.
The first group consisted of 44 and the other of 45 locations. One set
of PSU's was allocated to the first three-year survey period (1988-91) and
the other set to the second three-year period (1991-94). Therefore,
unbiased estimates (from the point of view of sample selection) of health and
nutrition characteristics can be independently produced for both Phase 1
and Phase 2 as well as for both phases combined.

For most of the sample, the second stage of the design consisted of area
segments composed of city or suburban blocks, combinations of blocks, or
other area segments in places where block statistics were not produced in
the 1980 Census. In the first phase of NHANES III, the area segments were
used only for a sample of persons who lived in housing units built before
1980. For units built in 1980 and later, the second stage consisted of sets
of addresses selected from building permits issued in 1980 or later. These
are referred to as "new construction segments." In the second phase, 1990
Census data and maps were used to define the area segments. Because the
second phase followed within a few years of the 1990 Census, new construction
did not account for a significant part of the sample, and the entire sample
came from the area segments.

The third stage of sample selection consisted of households and certain types of group quarters, such as dormitories. All households and eligible group quarters in the sample segments were listed, and a subsample was designated for screening to identify potential sample persons. The subsampling rates enabled production of a national, approximately equal-probability sample of households in most of the United States with higher rates for the geographic strata with high Mexican-American populations. Within each geographic stratum, there was a nearly equal-probability sample of households across all 89 stands.

Persons within the sample of households or group quarters were the fourth stage of sample selection. All eligible members within a household were listed, and a subsample of individuals was selected based on sex, age, and race or ethnicity. The definitions of the sex, age, race or ethnic classes, subsampling rates, and designation of potential sample persons within screened households were developed to provide approximately self-weighting samples for each subdomain within geographic strata and at the same time to maximize the average number of sample persons per sample household. Previous NHANES indicated that this increased the overall participation rate. Although the exact sample sizes were not known until data collection was completed, estimates were made. Below is a summary of the sample sizes for the full six-year NHANES III at each stage of selection:

Number of PSU's	81
Number of stands (survey locations)	89
Number of segments	2,144
Number of households screened	93,653
Number of households with sample persons	19,528
Number of designated sample persons	39,695
Number of interviewed sample persons	33,994
Number of MEC-examined sample persons	30,818
Number of home-examined sample persons	493

More detailed information on the sample design and weighting and estimation procedures for NHANES III can be found in the Plan and Operation of the Third National Health and Nutrition Examination Survey, 1988-94 (NCHS, 1994; U.S. DHHS, 1996) and in the Analytic and Reporting Guidelines: Third National Health and Nutrition Examination Survey (NHANES III), 1988-94 (U.S. DHHS, 1996).

Analysis Guidelines

Because of the complex survey design used in NHANES III, traditional methods of statistical analysis based on the assumption of a simple random sample are not applicable. Detailed descriptions of this issue and possible analytic methods for analyzing NHANES data have been described earlier (NCHS, 1985; Yetley, 1987; Landis, 1982; Delgado, 1990). Recent analytic and reporting guidelines that should be used for most NHANES III analyses and publications are contained in Analytic and Reporting Guidelines (U.S. DHHS, 1996). These recommendations differ slightly from those used by analysts for previous NHANES surveys. These suggested guidelines provide a framework to users for producing estimates that conform to the analytic design of the survey. All users are strongly urged to review these analytic and reporting guidelines before beginning any analyses of NHANES III data.

It is important to remember that this set of statistical guidelines is not absolute. When conducting analyses, the analyst needs to use his/her subject matter knowledge (including methodological issues) as well as information about the survey design. The more one deviates from the original analytic categories defined in the sample design, the more important it is to evaluate the results carefully and to interpret the findings cautiously.

In NHANES III, 89 survey locations were randomly divided into two sets or phases, the first consisting of 44 and the other of 45 locations. One set of PSU's was allocated to the first three-year survey period (1988-91) and the other set to the second three-year period (1991-94). Therefore, unbiased national estimates of health and nutrition characteristics can be independently produced for each phase as well as for both phases combined. Computation of national estimates from both phases combined (i.e., total NHANES III) is the preferred option; individual phase estimates may be highly variable. In addition, individual phase estimates are not statistically independent. It is also difficult to evaluate whether differences in individual phase estimates are real or due to methodological differences. That is, differences may be due to changes in sampling methods or data collection methodology over time. At this time, there is no valid statistical test for examining differences between Phase 1 and Phase 2. Therefore, although point estimates can be produced separately for each phase, no test is available to test whether those estimates are significantly different from each other.

NHANES III is based on a complex, multi-stage probability sample design. Several aspects of the NHANES design must be taken into account in data analysis, including the sample weights and the complex survey design. Appropriate sample weights are needed to estimate prevalence, means, medians, and other statistics. Sample weights are used to produce correct population estimates because each sample person does not have the same probability of selection. The sample weights incorporate the differential probabilities of selection and include adjustments for noncoverage and nonresponse. A detailed discussion of nonresponse adjustments and issues related to survey coverage have been published (U.S. DHHS, 1996). With the large oversampling of young children, older persons, black persons, and Mexican-Americans in NHANES III, it is essential that the sample weights be used in all analyses. Otherwise, a misinterpretation of results is highly likely. Other aspects of the design that must be taken into account in data analyses are the strata and PSU pairings from the sample design. These pairings should be used to estimate variances and test for statistical significance. For weighted analyses, analysts can use special computer software packages that use an appropriate method for estimating variances for complex samples such as SUDAAN (Shah, 1995) and WesVarPC (Westat, 1996).

Although initial exploratory analyses may be performed on unweighted data using standard statistical packages and assuming simple random sampling, final analyses should be done on weighted data using appropriate sample weights. A summary of the weighting methodology and the type of sample weights developed for NHANES III is included in Weighting and Estimation Methodology (U.S. DHHS, 1996).

The purpose of weighting the sample data is to permit analysts to produce estimates of statistics that would have been obtained if the entire sampling frame (the United States) had been surveyed. Sample weights can be considered as measures of the number of persons the particular sample

observation represents. Weighting takes into account several features of the survey: the specific probabilities of selection for the individual domains that were oversampled as well as nonresponse and differences between the sample and the total U.S. population. Differences between the sample and the population may arise due to sampling variability, differential undercoverage in the survey among demographic groups, and possibly other types of response errors, such as differential response rates or misclassification errors. Sample weighting in NHANES III was used to:

1.   Compensate for differential probabilities of selection among subgroups
     (i.e., age-sex-race-ethnicity subdomains where persons living in
     different geographic strata were sampled at different rates);
2.   Reduce biases arising from the fact that nonrespondents may be
     different from those who participate;
3.   Bring sample data up to the dimensions of the target population
     totals;
4.   Compensate, to the extent possible, for inadequacies in the sampling
     frame (resulting from omissions of some housing units in the listing
     of area segments, omissions of persons with no fixed address, etc.); and
5.   To reduce variances in the estimation procedure by using auxiliary
     information that is known with a high degree of accuracy.

In NHANES III, the sample weighting was carried out in three stages. The first stage involved the computation of weights to compensate for unequal probabilities of selection (objective 1, above). The second stage adjusted for nonresponse (objective 2). The third stage used poststratification of the sample weights to Census Bureau estimates of the U.S. population to accomplish the third, fourth, and fifth objectives simultaneously. In NHANES III, several types of sample weights (see the sample weights table that follows) were computed for the interviewed and examined sample and are included in the NHANES III data file. Also, sample weights were computed separately for Phase 1 (1988-91), Phase 2 (1991-94), and total NHANES III (1988-94) to facilitate analysis of items collected only in Phase 1, only in Phase 2, and over six years of the survey. Three sets of pseudo strata and PSU pairings are provided to use with SUDAAN in variance estimation. Since NHANES III is based on a complex, multi-stage sample design, appropriate sample weights should be used in analyses to produce national estimates of prevalence and associated variances while accounting for unequal probability of selection of sample persons. For example, the final interview weight, WTPFQX6, should be used for analysis of the items or questions from the family or household questionnaires, and the final MEC examination weight, WTPFEX6, should be used for analysis of the questionnaires and measurements administered in the MEC. Furthermore, for a combined analysis of measurements from the MEC examinations and associated medical history questions from the household interview, the final MEC examination weight, WTPFEX6, should be used. We recommend using SUDAAN (Shah, 1995) to estimate statistics of interest and the associated variance. However, one can also use other published methods for variance estimation. Application of SUDAAN and alternative methods, such as the average design effect approach, balance repeated replication (BRR) methods, or jackknife methods for variance estimation, are discussed in Weighting and Estimation Methodology (U.S. DHHS, 1996).

Appropriate Uses of the NHANES III Sample Weights

Final interview weight, WTPFQX6

    Use only in conjunction with the sample interviewed at home and
    with items collected during the household interview.

Final examination (MEC only) weight, WTPFEX6

    Use only in conjunction with the MEC-examined sample and with
    interview and examination items collected at the MEC.

Final MEC+home examination weight, WTPFHX6

    Use only in conjunction with the MEC+home-examined sample and
    with items collected at both the MEC and home.

Final allergy weight, WTPFALG6

    Use only in conjunction with the allergy subsample and with items
    collected as part of the allergy component of the exam.

Final CNS weight, WTPFCNS6

    Use only in conjunction with the CNS subsample and with items
    collected as part of the CNS component of the exam.

Final morning examination (MEC only) subsample weight, WTPFSD6

    Use only in conjunction with the MEC-examined persons assigned to
    the morning subsample and only with items collected in the MEC
    exam.

Final afternoon/evening examination (MEC only) subsample weight, WTPFMD6

    Use only in conjunction with the MEC-examined persons assigned to
    the afternoon/evening subsample and only with items collected in
    the MEC exam.

Final morning examination (MEC+home) subsample weight, WTPFHSD6

    Use only in conjunction with the MEC- and home-examined persons
    assigned to the morning subsample and with items collected during
    the MEC and home examinations.

Final afternoon/evening examination (MEC+home) weight, WTPFHMD6

Use only in conjunction with the MEC- and home-examined persons
assigned to the afternoon/evening subsample and with items
collected during the MEC and home examinations.

DATA PREPARATION AND PROCESSING PROCEDURES

Automated data collection procedures for the survey were introduced in NHANES III. In the mobile examination centers, data for the interview and examination components were recorded directly onto a computerized data collection form. With the exception of a few independently automated systems, the system was centrally integrated. This operation allowed for ongoing monitoring of much of the data. Before the introduction of the computer-assisted personal interview (CAPI), the household questionnaire data were reviewed manually by field editors and interviewers. CAPI (1992-1994 only) questionnaires featured built-in edits to prevent entering inconsistencies and out-of-range responses. The multi-level data collection and quality control systems are discussed in detail in the Plan and Operation of the Third National Health and Nutrition Examination Survey, 1988-1994 (NCHS, 1994; U.S. DHHS, 1996). All interview, laboratory, and examination data were sent to NCHS for final processing.

Guidelines were developed that provided standards for naming variables, filling missing values and coding conventional responses, handling missing records, and standardizing two-part quantity/unit questionnaire variables. NCHS staff, assisted by contract staff, developed data editing specifications that checked data sets for valid codes, ranges, and skip pattern consistencies and examined the consistency of values between interrelated variables. Comments, collected in both interviews and examination components, were reviewed and recoded when possible. Responses to "Other" and "Specify" were recoded either to existing code categories or to new categories. The documentation for each data set includes notes for those variables that have been recoded and standardized and for those variables that differ significantly from what appears in the original data collection instrument. While the data have undergone many quality control and editing procedures, there still may be values that appear extreme or illogical. Values that varied considerably from what was expected were examined by analysts who checked for comments or other responses that might help to clarify unusual values. Generally, values were retained unless they could not possibly be true, in which case they were changed to "Blank but applicable." Therefore, the user must review each data set for extreme or inconsistent values and determine the status of each value for analysis.

Several editing conventions were used in the creation of final analytic data sets:

1. Standardized variables were created to replace all two-part quantity/unit questions using standard conversion factors. Standardized variables have the same name as the variable of the two-part question with an "S" suffix. For instance, MAPF18S (Months received WIC benefits) in the MEC Adult Questionnaire was created from the two-part response option to question F18, "How long did you receive benefits from the WIC program?," using the conversion factor 12 months per year.

2. Recoded variables were created by combining responses from two or more like variables, or by collapsing responses to create a summary variable for the purpose of confidentiality. Recoded variables have the original variable name with an R suffix. For example, place of birth

variable (HFA6X) in the Family Questionnaire was collapsed to a three level response category (U.S., Mexico, Other) and renamed HFA6XR. Generally, only the recoded variable has been included in the data file.

3. Fill values, a series of one or more digits, were used to represent certain specific conditions or responses. Below is a list of the fill values that were employed. Some of the fill values pertain only to questionnaire data, although 8-fill and blank-fill values are found in all data sets. Other fill values, not included in this list, are used to represent component-specific conditions.

    6-fills = Varies/varied. (Questionnaires only)

    7-fills = Fewer than the smallest number that could be reported within the question structure (e.g., fewer than one cigarette per day). (Questionnaires only)

    8-fills = Blank but applicable/cannot be determined. This means that a respondent was eligible to receive the question, test, or component but did not because of refusal, lack of time, lack of staff, loss of data, broken vial, language barrier, unreliability, or other similar reasons.

    9-fills = Don't know. This fill was used only when a respondent did not know the response to a question and said, "I don't know." (Questionnaires only)

    Blank fills = Inapplicable. If a respondent was not eligible for a questionnaire, test, or component because of age, gender, or specific reason, the variable was blank-filled. In the questionnaire, if a respondent was not asked a question because of a skip-pattern, variables corresponding to the question were blank-filled. For examination or laboratory components, if a person was excluded by a defined protocol (e.g., screening exclusion questions) and these criteria are included in the data set, then the corresponding variables were blank-filled for that person. For home examinees, variables for examination components and blood tests not performed as part of the home examination protocol were blank-filled.

4. For variables describing discrete data, codes of zero (0) were used to mean "none," "never," or the equivalent. Value labels for which "0" is used include: "has not had," "never regularly," "still taking," or "never stopped using." Unless otherwise labeled, for variables containing continuous data, "zero" means "zero.

5. Where there are logical skip patterns in the flow of the questionnaire or examination component, the skip was indicated by placing the variable label of the skip destination in parentheses as part of the value label of the response generating the skip. For example, in the Physical Function Evaluation, the variable PFPWC (in wheelchair) has a value label, "2 No (PFPSCOOT)" that means that the next item for persons not in a wheelchair would be represented by the variable, PFPSCOOT.

Variable Nomenclature

A unique name was assigned to every NHANES III variable using a standard
convention. By following this naming convention, the origin of each
variable is clear, and there is no chance of overlaying similar variables
across multiple components. Variables range in length from three to eight
characters. The first two variable characters represent the topic (e.g.,
analyte, questionnaire instrument, examination component) and are listed
below alphabetically by topic. For questionnaires administered in the
household, the remainder of the variable name following the first two
characters indicates the question section and number. For example, data
for the response to the Household Adult Questionnaire question B1 are
contained in the variable HAB1. For most laboratory and examination
variables, as well as some other variables, a "P" in the third position
refers to "primary" and the remainder of the variable name is a brief
description of the item. For instance, in the Laboratory Data File,
information on the length of time the person fasted before the first blood
draw is contained in the variable PHPFAST. The variable PHPFAST was derived
as follows: characters 1-2 (PH) refer to "phlebotomy," character 3 (P)
refers to "primary," characters 4-8 (FAST) refer to an abbreviation for
"fasting."

CODE   TOPIC

AT   Alanine aminotransferase (from biochemistry profile)
AM   Albumin (from biochemistry profile)
AP   Alkaline phosphatase (from biochemistry profile)
AL   Allergy skin test
AC   Alpha carotene
AN   Anisocytosis
TM   Antimicrosomal antibodies
TA   Antithyroglobulin antibodies
AA   Apolipoprotein (AI)
AB   Apolipoprotein (B)
AS   Aspartate aminotransferase (from biochemistry profile)
LA   Atypical lymphocyte
AU   Audiometry
BA   Band
BO   Basophil
BS   Basophilic stippling
BC   Beta carotene
BX   Beta cryptoxanthin
BL   Blast
BU   Blood urea nitrogen (BUN) (from biochemistry profile)
BM   Body measurements
BD   Bone densitometry
C1   C-peptide (first venipuncture)
C2   C-peptide (second venipuncture)
CR   C-reactive protein
UD   Cadmium
CN   Central nervous system function evaluation
CL   Chloride (from biochemistry profile)
CO   Cotinine
CE   Creatinine (serum)(from biochemistry profile)
UR   Creatinine (urine)

```
CODE          TOPIC


DM            Demographic
DE            Dental examination
MQ            Diagnostic interview schedule
DR            Dietary recall (total nutrient intakes)
EO            Eosinophil
EP            Erythrocyte protoporphyrin
FR            Ferritin
FB            Fibrinogen
RB            Folate (RBC)
FO            Folate (serum)
FH            Follicle stimulating hormone (FSH)
FP            Fundus photography
GG            Gamma glutamyl transferase (GGT) (from biochemistry profile)
GU            Gallbladder ultrasonography
GB            Globulin (from biochemistry profile)
G1            Glucose (first venipuncture)
G2            Glucose (second venipuncture)
SG            Glucose (from biochemistry profile)
GH            Glycated hemoglobin
GR            Granulocyte
C3            HCO3 (Bicarbonate)(from biochemistry profile)
HD            HDL cholesterol
HP            Helicobacter pylori antibody
HT            Hematocrit
HG            Hemoglobin
AH            Hepatitis A antibody (HAV)
HB            Hepatitis B core antibody (anti-HBc)
SS            Hepatitis B surface antibody (anti-HBs)
SA            Hepatitis B surface antigen (HBsAg)
HC            Hepatitis C antibody (HCV)
DH            Hepatitis D antibody (HDV)
H1            Herpes 1 antibody
H2            Herpes 2 antibody
HX            Home examination (general)
HO            Homocysteine
HF            Household family questionnaire
HA            Household adult questionnaire
HQ            Household questionnaire variables (composite)
HS            Household screener questionnaire
HY            Household youth questionnaire
HZ            Hypochromia
I1            Insulin (first venipuncture)
I2            Insulin (second venipuncture)
UI            Iodine (urine)
FE            Iron
SF            Iron (from biochemistry profile)
LD            Lactate dehydrogenase (from biochemistry profile)
L1            Latex antibody
LC            LDL cholesterol (calculated)
PB            Lead
LP            Lipoprotein (a)
LH            Luteinizing hormone
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CODE          TOPIC


LU            Lutein/zeaxanthin
LY            Lycopene
LM            Lymphocyte
MR            Macrocyte
MC            Mean cell hemoglobin (MCH)
MH            Mean cell hemoglobin concentration (MCHC)
MV            Mean cell volume (MCV)
PV            Mean platelet volume
MA            MEC adult questionnaire
MX            MEC examination (general)
FF            Dietary food frequency (ages 12-16 years)
MP            MEC proxy questionnaire
MY            MEC youth questionnaire
ME            Metamyelocyte
MI            Microcyte
MO            Monocyte
MN            Mononuclear cell
ML            Myelocyte
IC            Normalized calcium (derived from ionized calcium)
OS            Osmolality (from biochemistry profile)
PH            Phlebotomy data collected in MEC (e.g., questions)
PS            Phosphorus (from biochemistry profile)
PF            Physical function evaluation
PE            Physician's examination
PL            Platelet
DW            Platelet distribution width
PK            Poikilocytosis
PO            Polychromatophilia
SK            Potassium (from biochemistry profile)
PR            Promyelocyte
RC            Red blood cell count (RBC)
RW            Red cell distribution width (RDW)
RE            Retinyl esters
RF            Rheumatoid factor antibody
RU            Rubella antibody
WT            Sample weights
SE            Selenium
SI            Sickle cell
NA            Sodium (from biochemistry profile)
SH            Spherocyte
SP            Spirometry
SD            Survey design
TT            Target cell
TE            Tetanus
TH            Thyroid Stimulating Hormone (TSH)
T4            Thyroxine
TB            Total bilirubin (from biochemistry profile)
CA            Total calcium
SC            Total calcium (from biochemistry profile)
TC            Total cholesterol
CH            Total cholesterol (from biochemistry profile)
TI            Total iron binding capacity (TIBC)
TP            Total protein (from biochemistry profile)
TX            Toxic granulation
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CODE           TOPIC

TO             Toxoplasmosis antibody
PX             Transferrin saturation
TG             Triglycerides
TR             Triglycerides (from biochemistry profile)
TY             Tympanometry
UA             Uric acid (from biochemistry profile)
UB             Urinary albumin
VU             Vacuolated cells
VR             Varicella antibody
VA             Vitamin A
VB             Vitamin B12
VC             Vitamin C
VD             Vitamin D
VE             Vitamin E
WC             White blood cell count (WBC)
WW             WISC/WRAT cognitive test
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ELECTROCARDIOGRAM EXAMINATION NATIONAL HEALTH AND NUTRITION
EXAMINATION SURVEYS (NHANES) I, II, & III

These data files are dedicated to the memory of Daniel D. Savage, M.D., Ph.D.

Daniel D. Savage (1944-1990) was born in Memphis, Tennessee. He attended the
University of Wisconsin in Madison, and between 1965 and 1972 he received four
degrees from that institution, including a Bachelor of Science degree in
Chemistry, a Master of Science degree in Physiology, a Ph.D. in Physiology and
an M.D. degree. During a life that was too short, Dr. Savage made major
contributions to the field of cardiovascular medicine as an epidemiologist,
researcher, and author. Perhaps his most important scientific contributions
were the establishment and conduct of the Minority Framingham Study, and the
establishment of left ventricular hypertrophy as an independent risk factor for
sudden cardiac death. Dr. Savage has been described by his colleagues as a man
of ideas, an innovator, scholar, and scientist who fervently served his
community. His challenge to students was to "set your standards high,
sacrifice to achieve your goals, and don't stop until you've done your best."

The data presented in this file consist of information about standard
12-lead resting electrocardiogram(ECG) recorded on men and women in the
mobile examination center (MEC)during NHANES III. NHANES is a series of
cross-sectional, national noninstitutionalized representative surveys conducted
by the National Center for Health Statistics of the Centers for Disease
Control and Prevention. Table 1 represents the following information: years
the surveys were conducted; the eligibility age of the examinee receiving the
exam; and equipment used.

Table 1. General information

Survey   Survey years   Age   Equipment used

  I   1971-1975   25-74   Beckman Digicorder*
  II   1976-1981   25-74   Marquette**
  III   1988-1994   40 and over Marquette** MAC 12
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*Beckman Instruments, Inc. Fullerton California
**Marquette Medical Systems, Inc. Milwaukee, Wisconsin,

NHANES I ECG data quality and data processing procedures were substantially
different from those used for NHANES II and NHANES III. NHANES I ECGs,
recorded with Beckman Digicorders, were available as single channel data, 2.5
seconds per lead and sampled at 500 samples per second. In 1970-1975 when the
survey was conducted, ECG acquisition technology was still in an early phase of
development, and ECG data quality was in general poor. This made automated ECG
processing difficult. The initial attempts to process NHANES I ECGs with an
automated ECG program (ECAN-E, U.S. Public Health Service) from these single
channel data did not produce stable ECG wave measurements, and a semiautomated
procedure was later developed in an attempt to remedy the problem. This
process involved the display of each ECG lead on a large screen of a Tektronix
terminal, and an operator used cursors to identify the onsets and offsets of P,
QRS and T waves of the complex selected for analysis. These ECG segments were
then processed by the Dalhousie Novacode ECG program (Rautaharju et al, 1990).

The single channel ECG data of relatively poor quality imposes certain
limitations on the validity of NHANES I ECG reports, particularly concerning
ECG codes which rely on P wave detection and measurements. Arrhythmias were
not coded. However, ECGs with no P waves identified by the program were
checked visually for the presence of a trial fibrillation.

The QRS amplitude measurements in NHANES I were obtained with a reasonable
degree of confidence although at times the gain control and calibration could
not be ascertained with adequate reliability. ST-T measurements were more
difficult because of drift problems, and although the program had algorithms
with higher order terms for non-linear drift correction, these were difficult
to apply because of the short record length (2.5 records).

NHANES II 12-lead ECG data were recorded in 4 lead groups sequenced 3 leads at
a time for 5 seconds (I, II, III, aVR, aVL, aVF, V1, V2, V3 and V4, V5, V6),
and NHANES III ECGs with 8 independent components of the 12 standard leads
simultaneously. For both surveys, the ECG data were sampled at 250 samples per
second per channel. The availability of multiple simultaneous ECG leads for
analysis greatly improved the precision and accuracy of ECG amplitude and
interval measurements compared to the single channel procedure applied on
NHANES I ECG data.

The key features of the Novacode ECG program are described elsewhere
(Rautaharju et al, 1990). The program was designed to handle both the resting
and exercise ECGs and it relies on the use of selective averaging to derive a
representative P-QRS-T complex for analysis of wave durations and amplitudes.

The data are presented as three separate files, one for each survey. However,
we named all the variables the same. The variable ECPSNUM is the variable
showing the survey number. Eight fill values "Blank but applicable," were used

to represent certain conditions or responses in which a respondent was eligible to receive the ECG but did not because of refusal, lack of time, lack of staff, loss of data, language barrier, unreliability, or the computer program not able to code the data.

Because we administered this test in the examination center, MEC examination weights (WTPFEX) must be used for data analysis. Besides the MEC weights, each file contains the following additional variables: respondent identification number (SEQN); race-ethnicity (DMARETHN); sex (HSSEX); age at interview (HSAGEIR); pseudo-PSU (SDPPSU); and pseudo-stratum (SDPSTRA). Tables 2a, 2b, and 3 presents additional information available froma NHANES I and II. These data sets are available on tape and can be obtained from the National Technical Information Service (NTIS), Computer Products Office, 5285 Port Royal Road, Springfield, Virginia 22161 (703) 487-4807.

Table 2a. NHANES I PUBLIC USE DATA SETS

TAPE NAME/NUMBER	ORDER NUMBER
Anthropometry, goniometry, skeletal age, bone density, and cortical thickness, ages 1-74 years (4111)	PB-295908
Arthritis, ages 25-74 years (4121)	PB-296018
Audiometric test (air, bone, speech reception), ages 25-74 years (4241)	PB-297337
Biochemistry, serology, hematology, peripheral blood slide, and urinary findings, ages 25-74 years (4800)	PB-297344
Dental, ages 1-74 years (4235)	PB-296023
Dermatology, ages 1-74 years (4151)	PB80-130255
Dietary frequency and adequacy, ages 1-74 years (4701)	PB-295906
General well-being and the CES-D depression scale developed by the National Institute of Mental Health, ages 25-74 years (4171)	PB-296020

Table 2b. NHANES I PUBLIC USE DATA SETS

TAPE NAME/NUMBER	ORDER NUMBER
Health care needs, general medical history, sample person supplement, and respiratory and cardiovascular supplements, ages 25-74 years (4091)	PB-296029
Medical examination, ages 1-74 years (4233)	PB-296035
Medical history questionnaire, ages 12-74 years (4081)	PB-296073
Model gram and nutrient composition (4702-4703)	PB-296027
Near and distant vision, ages 25-74 years (4163)	PB-295910
Ophthalmology, ages 1-74 years (4161)	PB-296033
Pulmonary diffusion, TB, chest x ray planimetry, heart size, and lung and heart pathology, ages 25-74 years (4251)	PB87-126009
Spirometry-best trials only, ages 25-74 years (4250)	PB80-145931
24-hour recall consumption intake, ages 1-74 years (4704)	PB-297339

Table 3. NHANES II PUBLIC USE DATA SETS

TAPE NAME/NUMBER	ORDER NUMBER
Anthropometric data, ages 6 months 74 years (5301)	PB82-191917
Behavior questionnaire, ages 25-74 years (5317)	PB90-501578
Chest x ray examination ages 25-74 years (5252)	PB89-136667
Health History supplement, ages 12-74 years (5305)	PB83-256537
Hematology and biochemistry, ages 6 months-74 years (5411) Version 2	PB90-500943
Medical History, ages 12 -74 years (5020)	PB83-154815
Model gram and nutrient composition (5702-5703)	PB82-142613
Physician's examination, ages 6 months-74 years (5302)	PB86-242930
Total nutrient intake, food frequency, and other related dietary data, ages 6 months-74 years (5701)	PB82-168261
Allergy Skin Testing, Ages 6-74, (5309)	PB86-121613
24-hour recall specific food item, ages 6 months-74 years (5704)	PB82-142639

Two aspects of NHANES surveys should be taken into account when conducting any analyses: the sample weights and the complex survey design. Therefore it is very important that the analyst refers to Landis et al. (1982) and NHANES III Analytic and Reporting Guidelines (U.S. DHHS, 1996b) before attempting to analyze the data.

A detailed description of the ECG procedure can be found in the plan and operation of the respective survey, NHANES I (U.S. DHEW, 1973), NHANES II (U.S. DHHS, 1980), and NHANES III (U.S. DHHS, 1996).

A bibliography of NHANES journal articles citing data from 1980 through 1996 and additional NHANES data can be obtained from the Data Dissemination Branch, NCHS at:

Data Dissemination Branch
National Center for Health Statistics
Room 1018
6525 Belcrest Road
Hyattsville, Maryland 20782

Phone: (301)436-8500

URL:http://www.cdc.gov/nchswww

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                NHANES III Electrocardiography Data File Index

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                                           Variable
Description                                Name       Positions
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DEMOGRAPHIC DATA

Sample person identification number ........  SEQN             1-5
NHANES III Survey (1988-94) ................  ECPSNUM            6
Sex ........................................  HSSEX              7
Race .......................................  DMARACER           8
Age at interview (Screener) in years .......  HSAGEIR         9-10
Pseudo-PSU .................................  SDPPSU            11
Pseudo-stratum .............................  SDPSTRA        12-13
MEC-examined sample final weight ...........  WTPFEX         14-22


INTRODUCTORY INFORMATION

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Chest half-depth (mm) ......................  ECPDEPTH       33-35
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Minor ECG abnormalities ....................  ECPG2             37
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Possible MI ................................  ECPG4             39
Probable left ventricular hypertrophy ......  ECPG5             40
Possible LVH by MC .........................  ECPG6             41


MINNESOTA CODES

MC 1 Leadgroup L(I, aVL, V6) ...............  ECPL1          42-43
MC 1 Leadgroup F(II, III, aVF) .............  ECPF1          44-45
MC 1 Leadgroup V(V1-V5) ....................  ECPV1          46-47
MC 4 Leadgroup L ...........................  ECPL4          48-49
MC 4 Leadgroup F ...........................  ECPF4          50-51
MC 4 Leadgroup V ...........................  ECPV4          52-53
MC 5 Leadgroup L ...........................  ECPL5             54
MC 5 Leadgroup F ...........................  ECPF5             55
MC 5 Leadgroup V ...........................  ECPV5             56
MC 9.2 Leadgroup L .........................  ECPL9             57
MC 9.2 Leadgroup F .........................  ECPF9             58
MC 9.2 Leadgroup V .........................  ECPV9             59
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              NHANES III Electrocardiography Data File Index

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                                               Variable
Description                                    Name          Positions
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    MC 2 (QRS axis code) ........................ ECPMC2         60-61
    MC 3 (High-amplitude R waves) ............... ECPMC3         62-63
    MC 6 (A-V conduction) ....................... ECPMC6         64-65
    MC 7 (Ventricular conduction) ............... ECPMC7            66
    MC 9.1 (Low-amplitude QRS) .................. ECPMC91           67
    MC 9.3 (High-amplitude P) ................... ECPMC93           68
    MC 9.4 (QRS transition zone) ................ ECPMC94           69
    MC 9.5 (High-amplitude T) ................... ECPMC95           70

    CARDIAC/INFARCTION INJURY SCORE

    Cardiac infarction score (12-lead by 10) .... ECPCIIS        71-73
    Probable infarction/injury .................. ECPCIIS2          74
    Possible infarction/injury .................. ECPCIIS3          75
    Consider infarction/injury .................. ECPCIIS4          76

    LEFT VENTRICULAR MASS

    ECG estimate of LV mass ..................... ECPLVM         77-79
    ECG estimate of LV mass index ............... ECPLVMI        80-82
    Probable LVH ................................ ECPLVM3           83

    HEART RATE, BASIC ECG INTERVALS, AND MEAN AXIS DATA

    Heart rate (beats per minute) ............... ECPRATE        84-86
    PR interval (msec) .......................... ECPPR          87-89
    QRS interval (msec) ......................... ECPQRS         90-92
    QT interval (msec) .......................... ECPQT          93-95
    P axis, frontal plane (degrees) ............. ECPAXIS1       96-99
    QRS axis, frontal plane (degrees) ........... ECPAXIS2      100-103
    T axis, frontal plane (degrees) ............. ECPAXIS3      104-107
    Rhythm code ................................. ECPBEAT          108

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                    NHANES III Electrocardiography Data File Index

          ----------------------------------------------------------------------
                                                    Variable
          Description                               Name         Positions
          ----------------------------------------------------------------------

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          P amplitude, negative phase, lead V1(uV) ....  ECPP4         118-121
          Q or QS amplitude, lead I (uV) ..............  ECPQA1        122-125
          Q or QS amplitude, lead II (uV) .............  ECPQA2        126-129
          Q or QS amplitude, lead III (uV) ............  ECPQA3        130-133
          Q or QS amplitude, lead aVL (uV) ............  ECPQA4        134-137
          Q or QS amplitude, lead AVF (uV) ............  ECPQA5        138-141
          Q or QS amplitude, lead V1 (uV) .............  ECPQA6        142-145
          Q or QS amplitude, lead V2 (uV) .............  ECPQA7        146-149
          Q or QS amplitude, lead V3 (uV) .............  ECPQA8        150-153
          Q or QS amplitude, lead V4 (uV) .............  ECPQA9        154-157
          Q or QS amplitude, lead V5 (uV) .............  ECPQA10       158-161
          Q or QS amplitude, lead V6 (uV) .............  ECPQA11       162-165
          Q or QS duration, lead I (msec) .............  ECPQD1        166-168
          Q or QS duration, lead II (msec) ............  ECPQD2        169-171
          Q or QS duration, lead III (msec) ...........  ECPQD3        172-174
          Q or QS duration, lead aVL (msec) ...........  ECPQD4        175-177
          Q or QS duration, lead aVF (msec) ...........  ECPQD5        178-180
          Q or QS duration, lead V1 (msec) ............  ECPQD6        181-183
          Q or QS duration, lead V2 (msec) ............  ECPQD7        184-186
          Q or QS duration, lead V3 (msec) ............  ECPQD8        187-189
          Q or QS duration, lead V4 (msec) ............  ECPQD9        190-192
          Q or QS duration, lead V5 (msec) ............  ECPQD10       193-195
          Q or QS duration, lead V6 (msec) ............  ECPQD11       196-198
          R amplitude, lead I (uV) ....................  ECPRA1        199-202
          R amplitude, lead II (uV) ...................  ECPRA2        203-206
          R amplitude, lead III (uV) ..................  ECPRA3        207-210
          R amplitude, lead aVR (uV) ..................  ECPRA4        211-214
          R amplitude, lead aVL (uV) ..................  ECPRA5        215-218
          R amplitude, lead aVF (uV) ..................  ECPRA6        219-222
          R amplitude, lead V1 (uV) ...................  ECPRA7        223-226
          R amplitude, lead V2 (uV) ...................  ECPRA8        227-230
          R amplitude, lead V3 (uV) ...................  ECPRA9        231-234
          R amplitude, lead V4 (uV) ...................  ECPRA10       235-238
          R amplitude, lead V5 (uV) ...................  ECPRA11       239-242
          R amplitude, lead V6 (uV) ...................  ECPRA12       243-246
          R duration, lead I (msec) ...................  ECPRD1        247-249
          R duration, lead II (msec) ..................  ECPRD2        250-252
          R duration, lead III (msec) .................  ECPRD3        253-255
```

```
                    NHANES III Electrocardiography Data File Index

    -----------------------------------------------------------------------
                                              Variable
    Description                               Name         Positions
    -----------------------------------------------------------------------

    R duration, lead aVR (msec) .................  ECPRD4       256-258
    R duration, lead aVL (msec) .................  ECPRD5       259-261
    R duration, lead aVF (msec) .................  ECPRD6       262-264
    R duration, lead V1 (msec) ..................  ECPRD7       265-267
    R duration, lead V2 (msec) ..................  ECPRD8       268-270
    R duration, lead V3 (msec) ..................  ECPRD9       271-273
    R duration, lead V4 (msec) ..................  ECPRD10      274-276
    R duration, lead V5 (msec) ..................  ECPRD11      277-279
    R duration, lead V6 (msec) ..................  ECPRD12      280-282
    S amplitude, lead I (uV) ....................  ECPSA1       283-286
    S amplitude, lead II (uV) ...................  ECPSA2       287-290
    S amplitude, lead III (uV) ..................  ECPSA3       291-294
    S amplitude, lead aVR (uV) ..................  ECPSA4       295-298
    S amplitude, lead aVL (uV) ..................  ECPSA5       299-302
    S amplitude, lead aVF (uV) ..................  ECPSA6       303-306
    S amplitude, lead V1 (uV) ...................  ECPSA7       307-310
    S amplitude, lead V2 (uV) ...................  ECPSA8       311-314
    S amplitude, lead V3 (uV) ...................  ECPSA9       315-318
    S amplitude, lead V4 (uV) ...................  ECPSA10      319-322
    S amplitude, lead V5 (uV) ...................  ECPSA11      323-326
    S amplitude, lead V6 (uV) ...................  ECPSA12      327-330
    S duration, lead I (msec) ...................  ECPSD1       331-333
    S duration, lead II (msec) ..................  ECPSD2       334-336
    S duration, lead III (msec) .................  ECPSD3       337-339
    S duration, lead aVR (msec) .................  ECPSD4       340-342
    S duration, lead aVL (msec) .................  ECPSD5       343-345
    S duration, lead aVF (msec) .................  ECPSD6       346-348
    S duration, lead V1 (msec) ..................  ECPSD7       349-351
    S duration, lead V2 (msec) ..................  ECPSD8       352-354
    S duration, lead V3 (msec) ..................  ECPSD9       355-357
    S duration, lead V4 (msec) ..................  ECPSD10      358-360
    S duration, lead V5 (msec) ..................  ECPSD11      361-363
    S duration, lead V6 (msec) ..................  ECPSD12      364-366
    R' amplitude, lead I (uV) ...................  ECPRPA1      367-370
    R' amplitude, lead II (uV) ..................  ECPRPA2      371-374
    R' amplitude, lead III (uV) .................  ECPRPA3      375-378
    R' amplitude, lead aVR (uV) .................  ECPRPA4      379-382
    R' amplitude, lead aVL (uV) .................  ECPRPA5      383-386
    R' amplitude, lead aVF (uV) .................  ECPRPA6      387-390
    R' amplitude, lead V1 (uV) ..................  ECPRPA7      391-394
```

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--------------------------------------------------------------------
                                          Variable
Description                               Name         Positions
--------------------------------------------------------------------

R' amplitude, lead V2 (uV) .................  ECPRPA8      395-398
R' amplitude, lead V3 (uV) .................  ECPRPA9      399-402
R' amplitude, lead V4 (uV) .................  ECPRPA10     403-406
R' amplitude, lead V5 (uV) .................  ECPRPA11     407-410
R' amplitude, lead V6 (uV) .................  ECPRPA12     411-414
J amplitude, lead I (uV) ...................  ECPJ1        415-418
J amplitude, lead II (uV) ..................  ECPJ2        419-422
J amplitude, lead III (uV) .................  ECPJ3        423-426
J amplitude, lead aVR (uV) .................  ECPJ4        427-430
J amplitude, lead aVL (uV) .................  ECPJ5        431-434
J amplitude, lead aVF (uV) .................  ECPJ6        435-438
J amplitude, lead V1 (uV) ..................  ECPJ7        439-442
J amplitude, lead V2 (uV) ..................  ECPJ8        443-446
J amplitude, lead V3 (uV) ..................  ECPJ9        447-450
J amplitude, lead V4 (uV) ..................  ECPJ10       451-454
J amplitude, lead V5 (uV) ..................  ECPJ11       455-458
J amplitude, lead V6 (uV) ..................  ECPJ12       459-462
Negative T amplitude, lead I (uV) ..........  ECPNTA1      463-467
Negative T amplitude, lead II (uV) .........  ECPNTA2      468-471
Negative T amplitude, lead III (uV) ........  ECPNTA3      472-475
Negative T amplitude, lead aVR (uV) ........  ECPNTA4      476-479
Negative T amplitude, lead aVL (uV) ........  ECPNTA5      480-483
Negative T amplitude, lead aVF (uV) ........  ECPNTA6      484-487
Negative T amplitude, lead V1 (uV) .........  ECPNTA7      488-491
Negative T amplitude, lead V2 (uV) .........  ECPNTA8      492-496
Negative T amplitude, lead V3 (uV) .........  ECPNTA9      497-501
Negative T amplitude, lead V4 (uV) .........  ECPNTA10     502-506
Negative T amplitude, lead V5 (uV) .........  ECPNTA11     507-511
Negative T amplitude, lead V6 (uV) .........  ECPNTA12     512-516
Positive T amplitude, lead I (uV) ..........  ECPPTA1      517-520
Positive T amplitude, lead II (uV) .........  ECPPTA2      521-524
Positive T amplitude, lead III (uV) ........  ECPPTA3      525-528
Positive T amplitude, lead aVR (uV) ........  ECPPTA4      529-532
Positive T amplitude, lead aVL (uV) ........  ECPPTA5      533-536
Positive T amplitude, lead aVF (uV) ........  ECPPTA6      537-540
Positive T amplitude, lead V1 (uV) .........  ECPPTA7      541-544
Positive T amplitude, lead V2 (uV) .........  ECPPTA8      545-548
Positive T amplitude, lead V3 (uV) .........  ECPPTA9      549-552
Positive T amplitude, lead V4 (uV) .........  ECPPTA10     553-556
Positive T amplitude, lead V5 (uV) .........  ECPPTA11     557-560
```

```
              NHANES III Electrocardiography Data File Index

---------------------------------------------------------------------------
                                              Variable
Description                                   Name         Positions
---------------------------------------------------------------------------

Positive T amplitude, lead V6 (uV) .........  ECPPTA12       561-564



               NHANES III Electrocardiography Data File

---------------------------------------------------------------------------
FILENAME=NH3ECG                  VERSION 1.0                     N=8,561
---------------------------------------------------------------------------
                           DEMOGRAPHIC DATA
---------------------------------------------------------------------------
Positions            Item description
SAS name    Counts     and code                                  Notes
---------------------------------------------------------------------------


     1-5                Sample person identification number
  SEQN        8561    00009-53616


      6                NHANES III Survey (1988-94)
  ECPSNUM     8561    3     NHANES III


      7                Sex
  HSSEX       4155    1     Male
              4406    2     Female


      8                Race
  DMARACER    6286    1     White
              2041    2     Black
               234    3     Other


     9-10               Age at interview (Screener) in years
  HSAGEIR     8494    40-89
                67    90    90+


     11                Pseudo-PSU
  SDPPSU      8561    1-2


    12-13               Pseudo-stratum
  SDPSTRA     8561    01-49


    14-22               MEC-examined sample final weight
  WTPFEX      8561    000227.87-129993.17
```

NHANES III Electrocardiography Data File

```
------------------------------------------------------------------------
                      INTRODUCTORY INFORMATION
------------------------------------------------------------------------
Positions          Item description
SAS name    Counts    and code                                   Notes
------------------------------------------------------------------------


   23-27             Technician number
 ECPTECH1    8560    01001-09018
                1    88888 Blank but applicable


   28-29             Number of leads
 ECPLEADS       2    06
               12    07
                3    09
               45    10
               19    11
             8426    12
               54    88     Blank but applicable


   30-32             Chest half-width (mm)
 ECPWIDTH    8528    100-275
               33    888    Blank but applicable


   33-35             Chest half-depth (mm)
 ECPDEPTH    8541    050-250
               20    888    Blank but applicable


      36             Major ECG abnormalities              See note
 ECPG1       6991    0      Absent
             1550    1      Present
               20    8      Blank but applicable


      37             Minor ECG abnormalities              See note
 ECPG2       6671    0      Absent
             1870    1      Present
               20    8      Blank but applicable


      38             Probable myocardial infarction (MI)  See note
 ECPG3       8511    0      Absent
               30    1      Present
               20    8      Blank but applicable
```

NHANES III Electrocardiography Data File

```
------------------------------------------------------------------------
                        INTRODUCTORY INFORMATION
------------------------------------------------------------------------
Positions            Item description
SAS name    Counts      and code                                  Notes
------------------------------------------------------------------------

        39              Possible MI                           See note
  ECPG4     8277   0    Absent
             264   1    Present
              20   8    Blank but applicable


        40              Probable left ventricular hypertrophy  See note
  ECPG5                 (LVH) by Minnesota Code (MC)
            8370   0    Absent
             171   1    Present
              20   8    Blank but applicable


        41              Possible LVH by MC                    See note
  ECPG6     7861   0    Absent
             680   1    Present
              20   8    Blank but applicable
```

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------------------------------------------------------------------------
                          MINNESOTA CODES
------------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                                    Notes
------------------------------------------------------------------------

   42-43              MC 1 Leadgroup L(I, aVL, V6)
  ECPL1     8399   00    1.0.0
               6   11    1.1.1
               2   12    1.1.2
               2   13    1.1.3
              10   21    1.2.1
               1   22    1.2.2
              53   31    1.3.1
               9   33    1.3.3
              79   88    Blank but applicable

   44-45              MC 1 Leadgroup F(II, III, aVF)
  ECPF1     8094   00    1.0.0
              16   11    1.1.1
               1   12    1.1.2
              12   14    1.1.4
               1   15    1.1.5
              27   21    1.2.1
               1   22    1.2.2
              20   23    1.2.3
              43   24    1.2.4
               1   25    1.2.5
             103   26    1.2.6
              39   31    1.3.1
              53   34    1.3.4
               3   35    1.3.5
              81   36    1.3.6
              66   88    Blank but applicable
```

NHANES III Electrocardiography Data File

```
-----------------------------------------------------------------------
                            MINNESOTA CODES
-----------------------------------------------------------------------
Positions           Item description
SAS name    Counts    and code                              Notes
-----------------------------------------------------------------------

   46-47              MC 1 Leadgroup V(V1-V5)
 ECPV1      8208   00    1.0.0
              18   11    1.1.1
              10   12    1.1.2
              37   16    1.1.6
               7   17    1.1.7
               7   21    1.2.1
               4   22    1.2.2
              23   27    1.2.7
              39   28    1.2.8
               9   31    1.3.1
              89   32    1.3.2
             110   88    Blank but applicable

   48-49              MC 4 Leadgroup L
 ECPL4      8145   00    4.0.0
              22   12    4.1.2
             166   20    4.2.0
             141   30    4.3.0
               9   40    4.4.0
              78   88    Blank but applicable

   50-51              MC 4 Leadgroup F
 ECPF4      8375   00    4.0.0
               5   12    4.1.2
              65   20    4.2.0
              42   30    4.3.0
               7   40    4.4.0
              67   88    Blank but applicable
```

MINNESOTA CODES

Positions		Item description		
SAS name	Counts	and code		Notes

52-53		MC 4 Leadgroup V		
ECPV4	8181	00	4.0.0	
	2	11	4.1.1	
	35	12	4.1.2	
	145	20	4.2.0	
	75	30	4.3.0	
	13	40	4.4.0	
	110	88	Blank but applicable	
54		MC 5 Leadgroup L		
ECPL5	7244	0	5.0	
	2	1	5.1	
	309	2	5.2	
	653	3	5.3	
	280	4	5.4	
	73	8	Blank but applicable	
55		MC 5 Leadgroup F		
ECPF5	8125	0	5.0	
	108	2	5.2	
	184	3	5.3	
	77	4	5.4	
	67	8	Blank but applicable	
56		MC 5 Leadgroup V		
ECPV5	7441	0	5.0	
	18	1	5.1	
	416	2	5.2	
	267	3	5.3	
	315	4	5.4	
	104	8	Blank but applicable	

NHANES III Electrocardiography Data File

```
------------------------------------------------------------------------
                           MINNESOTA CODES
------------------------------------------------------------------------
Positions          Item description
SAS name   Counts     and code                              Notes
------------------------------------------------------------------------

        57             MC 9.2 Leadgroup L
   ECPL9      8475  0     9.2.0
                 7  2     9.2.2
                79  8     Blank but applicable


        58             MC 9.2 Leadgroup F
   ECPF9      8484  0     9.2.0
                10  2     9.2.2
                67  8     Blank but applicable


        59             MC 9.2 Leadgroup V
   ECPV9      8331  0     9.2.0
               119  2     9.2.2
               111  8     Blank but applicable


     60-61             MC 2 (QRS axis code)                 See note
   ECPMC2     6417  00    2.0.0
              1201  11    2.1.1
               456  12    2.1.2
               283  21    2.2.1
                86  22    2.2.2
                49  30    2.3.0
                69  88    Blank but applicable


     62-63             MC 3 (High-amplitude R waves)
   ECPMC3     7575  00    3.0.0
               195  12    3.1.2
                34  13    3.1.3
               260  14    3.1.4
                11  20    3.2.0
                92  31    3.3.1
               270  32    3.3.2
               124  88    Blank but applicable
```

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-----------------------------------------------------------------------
                            MINNESOTA CODES
-----------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                                 Notes
-----------------------------------------------------------------------

    64-65                MC 6 (A-V conduction)
  ECPMC6      7917  00    6.0
               313  30    6.3
               204  50    6.5
                15  80    6.8
               112  88    Blank but applicable


      66                 MC 7 (Ventricular conduction)
  ECPMC7      7209  0     7.0
                55  1     7.1
               256  2     7.2
               124  3     7.3
               280  4     7.4
               178  5     7.5
               347  6     7.6
               112  8     Blank but applicable


      67                 MC 9.1 (Low-amplitude QRS)
  ECPMC91     8310  0     9.1.0
               124  1     9.1.1
               127  8     Blank but applicable


      68                 MC 9.3 (High-amplitude P)
  ECPMC93     8438  0     9.3.0
                18  3     9.3.3
               105  8     Blank but applicable


      69                 MC 9.4 (QRS transition zone)
  ECPMC94     2827  0     9.4.0
              5074  1     9.4.1
               630  2     9.4.2
                30  8     Blank but applicable
```

```
------------------------------------------------------------------------
                           MINNESOTA CODES
------------------------------------------------------------------------
Positions              Item description
SAS name     Counts       and code                                 Notes
------------------------------------------------------------------------


      70                 MC 9.5 (High-amplitude T)
  ECPMC95      8371   0     9.5.0
                56   5     9.5.5
               134   8     Blank but applicable
```

NHANES III Electrocardiography Data File

```
------------------------------------------------------------------------
                   CARDIAC/INFARCTION INJURY SCORE
------------------------------------------------------------------------
Positions          Item description
SAS name   Counts     and code                                    Notes
------------------------------------------------------------------------


   71-73              Cardiac infarction/injury score for    See note
  ECPCIIS             12-lead ECG multiplied by 10
             8422     000-489
              139     888   Blank but applicable


     74               Probable infarction/injury             See note
  ECPCIIS2   7664     0     Absent
              760     1     Present
              137     8     Blank but applicable


     75               Possible infarction/injury             See note
  ECPCIIS3   7749     0     Absent
              675     1     Present
              137     8     Blank but applicable


     76               Consider infarction/injury             See note
  ECPCIIS4   7387     0     Absent
             1037     1     Present
              137     8     Blank but applicable
```

```
                  NHANES III Electrocardiography Data File

    ------------------------------------------------------------------------
                          LEFT VENTRICULAR MASS
    ------------------------------------------------------------------------
    Positions           Item description
    SAS name    Counts     and code                                  Notes
    ------------------------------------------------------------------------

       77-79               ECG estimate of LV mass                 See note
      ECPLVM     8440    070-326
                  121    888   Blank but applicable

       80-82               ECG estimate of LV mass index           See note
      ECPLVMI    8451    040-276
                  110    888   Blank but applicable

          83               Probable LVH                            See note
      ECPLVM3    7448    0     Absent
                 1003    1     Present
                  110    8     Blank but applicable
```

NHANES III Electrocardiography Data File

```
------------------------------------------------------------------------
          HEART RATE, BASIC ECG INTERVALS, AND MEAN AXIS DATA
------------------------------------------------------------------------
Positions            Item description
SAS name    Counts      and code                               Notes
------------------------------------------------------------------------


    84-86             Heart rate (beats per minute)
  ECPRATE    8517   035-156
              44    888   Blank but applicable


    87-89             PR interval (msec)
  ECPPR      8444   021-421
             117    888   Blank but applicable


    90-92             QRS interval (msec)
  ECPQRS     8531   061-209
              30    888   Blank but applicable


    93-95             QT interval (msec)
  ECPQT      8381   191-540
             180    888   Blank but applicable


    96-99             P axis, frontal plane (degrees)
  ECPAXIS1   8504   -155-0176
              57    8888  Blank but applicable


   100-103            QRS axis, frontal plane (degrees)
  ECPAXIS2   8504   -178-0177
              57    8888  Blank but applicable


   104-107            T axis, frontal plane (degrees)
  ECPAXIS3   8503   -180-0178
              58    8888  Blank but applicable
```

NHANES III Electrocardiography Data File

```
------------------------------------------------------------------------
         HEART RATE, BASIC ECG INTERVALS, AND MEAN AXIS DATA
------------------------------------------------------------------------
Positions              Item description
SAS name    Counts       and code                               Notes
------------------------------------------------------------------------


        108          Rhythm code                            See note
  ECPBEAT   8263    1   Sinus rhythm
               2    2   Atrial fibrillation/flutter
              20    3   Pacemaker
             149    4   Ventricular ectopic complexes
               6    5   Wandering atrial pacemaker
               1    6   Supraventricular tachycardia
             110    7   Supraventricular ectopic complexes
              10    9   Other rhythm abnormality
```

NHANES III Electrocardiography Data File

```
----------------------------------------------------------------------
                        ECG WAVE MEASUREMENTS
----------------------------------------------------------------------
Positions            Item description
SAS name    Counts       and code                              Notes
----------------------------------------------------------------------

   109-111              P amplitude, positive phase,
  ECPP1                 lead II (microvolt (uV))
              8499   000-491
                62   888   Blank but applicable

   112-114              P duration, lead II (msec)
  ECPP2       8499   000-207
                62   888   Blank but applicable

   115-117              P amplitude, positive phase,
  ECPP3                 lead V1 (uV)
              8487   000-311
                74   888   Blank but applicable

   118-121              P amplitude, negative phase,
  ECPP4                 lead V1 (uV)
              8487   -316-0000
                74   8888  Blank but applicable

   122-125              Q or QS amplitude, lead I (uV)
  ECPQA1      8516   0000-0504
                45   8888  Blank but applicable

   126-129              Q or QS amplitude, lead II (uV)
  ECPQA2      8499   0000-1899
                62   8888  Blank but applicable

   130-133              Q or QS amplitude, lead III (uV)
  ECPQA3      8500   0000-2174
                61   8888  Blank but applicable

   134-137              Q or QS amplitude, lead aVL (uV)
  ECPQA4      8501   0000-0632
                60   8888  Blank but applicable
```

```
-----------------------------------------------------------------------
                    ECG WAVE MEASUREMENTS
-----------------------------------------------------------------------
Positions          Item description
SAS name    Counts     and code                                   Notes
-----------------------------------------------------------------------

  138-141              Q or QS amplitude, lead AVF (uV)
 ECPQA5       8502  0000-2026
               59  8888  Blank but applicable

  142-145              Q or QS amplitude, lead V1 (uV)
 ECPQA6       8487  0000-2857
               74  8888  Blank but applicable

  146-149              Q or QS amplitude, lead V2 (uV)
 ECPQA7       8487  0000-3179
               74  8888  Blank but applicable

  150-153              Q or QS amplitude, lead V3 (uV)
 ECPQA8       8467  0000-2921
               94  8888  Blank but applicable

  154-157              Q or QS amplitude, lead V4 (uV)
 ECPQA9       8497  0000-2108
               64  8888  Blank but applicable

  158-161              Q or QS amplitude, lead V5 (uV)
 ECPQA10      8497  0000-1264
               64  8888  Blank but applicable

  162-165              Q or QS amplitude, lead V6 (uV)
 ECPQA11      8498  0000-0632
               63  8888  Blank but applicable

  166-168              Q or QS duration, lead I (msec)
 ECPQD1       8516  000-056
               45  888   Blank but applicable

  169-171              Q or QS duration, lead II (msec)
 ECPQD2       8499  000-148
               62  888   Blank but applicable
```

```
-----------------------------------------------------------------------
                        ECG WAVE MEASUREMENTS
-----------------------------------------------------------------------
Positions          Item description
SAS name   Counts     and code                                   Notes
-----------------------------------------------------------------------

   172-174            Q or QS duration, lead III (msec)
  ECPQD3     8500   000-176
              61    888   Blank but applicable

   175-177            Q or QS duration, lead aVL (msec)
  ECPQD4     8501   000-200
              60    888   Blank but applicable

   178-180            Q or QS duration, lead aVF (msec)
  ECPQD5     8502   000-152
              59    888   Blank but applicable

   181-183            Q or QS duration, lead V1 (msec)
  ECPQD6     8487   000-148
              74    888   Blank but applicable

   184-186            Q or QS duration, lead V2 (msec)
  ECPQD7     8487   000-136
              74    888   Blank but applicable

   187-189            Q or QS duration, lead V3 (msec)
  ECPQD8     8467   000-128
              94    888   Blank but applicable

   190-192            Q or QS duration, lead V4 (msec)
  ECPQD9     8497   000-144
              64    888   Blank but applicable

   193-195            Q or QS duration, lead V5 (msec)
  ECPQD10    8497   000-120
              64    888   Blank but applicable

   196-198            Q or QS duration, lead V6 (msec)
  ECPQD11    8498   000-120
              63    888   Blank but applicable
```

NHANES III Electrocardiography Data File

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------------------------------------------------------------------------
                        ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                                    Notes
------------------------------------------------------------------------


   199-202             R amplitude, lead I (uV)
 ECPRA1      8516    0027-2913
               45    8888  Blank but applicable


   203-206             R amplitude, lead II (uV)
 ECPRA2      8499    0000-2476
               62    8888  Blank but applicable


   207-210             R amplitude, lead III (uV)
 ECPRA3      8500    0000-2005
               61    8888  Blank but applicable


   211-214             R amplitude, lead aVR (uV)
 ECPRA4      8503    0000-1063
               58    8888  Blank but applicable


   215-218             R amplitude, lead aVL (uV)
 ECPRA5      8501    0000-2458
               60    8888  Blank but applicable


   219-222             R amplitude, lead aVF (uV)
 ECPRA6      8502    0000-2165
               59    8888  Blank but applicable


   223-226             R amplitude, lead V1 (uV)
 ECPRA7      8487    0000-2101
               74    8888  Blank but applicable


   227-230             R amplitude, lead V2 (uV)
 ECPRA8      8487    0000-3671
               74    8888  Blank but applicable


   231-234             R amplitude, lead V3 (uV)
 ECPRA9      8467    0000-3937
               94    8888  Blank but applicable
```

```
------------------------------------------------------------------------
                         ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions          Item description
SAS name    Counts     and code                                    Notes
------------------------------------------------------------------------


   235-238             R amplitude, lead V4 (uV)
 ECPRA10     8497   0000-3999
              64    8888  Blank but applicable


   239-242             R amplitude, lead V5 (uV)
 ECPRA11     8497   0000-3947
              64    8888  Blank but applicable


   243-246             R amplitude, lead V6 (uV)
 ECPRA12     8498   0000-3817
              63    8888  Blank but applicable


   247-249             R duration, lead I (msec)
 ECPRD1      8516   008-188
              45    888   Blank but applicable


   250-252             R duration, lead II (msec)
 ECPRD2      8499   000-208
              62    888   Blank but applicable


   253-255             R duration, lead III (msec)
 ECPRD3      8500   000-204
              61    888   Blank but applicable


   256-258             R duration, lead aVR (msec)
 ECPRD4      8503   000-152
              58    888   Blank but applicable


   259-261             R duration, lead aVL (msec)
 ECPRD5      8501   000-188
              60    888   Blank but applicable


   262-264             R duration, lead aVF (msec)
 ECPRD6      8502   000-208
              59    888   Blank but applicable
```

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-----------------------------------------------------------------------
                        ECG WAVE MEASUREMENTS
-----------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                                    Notes
-----------------------------------------------------------------------

   265-267            R duration, lead V1 (msec)
 ECPRD7      8487     000-196
               74     888   Blank but applicable

   268-270            R duration, lead V2 (msec)
 ECPRD8      8487     000-200
               74     888   Blank but applicable

   271-273            R duration, lead V3 (msec)
 ECPRD9      8467     000-192
               94     888   Blank but applicable

   274-276            R duration, lead V4 (msec)
 ECPRD10     8497     000-180
               64     888   Blank but applicable

   277-279            R duration, lead V5 (msec)
 ECPRD11     8497     000-196
               64     888   Blank but applicable

   280-282            R duration, lead V6 (msec)
 ECPRD12     8498     000-200
               63     888   Blank but applicable

   283-286            S amplitude, lead I (uV)
 ECPSA1      8516     0000-1084
               45     8888  Blank but applicable

   287-290            S amplitude, lead II (uV)
 ECPSA2      8499     0000-1669
               62     8888  Blank but applicable

   291-294            S amplitude, lead III (uV)
 ECPSA3      8500     0000-2878
               61     8888  Blank but applicable
```

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-----------------------------------------------------------------------
                       ECG WAVE MEASUREMENTS
-----------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                                  Notes
-----------------------------------------------------------------------


   295-298              S amplitude, lead aVR (uV)
  ECPSA4      8503    0000-2037
              58      8888  Blank but applicable


   299-302              S amplitude, lead aVL (uV)
  ECPSA5      8501    0000-1195
              60      8888  Blank but applicable


   303-306              S amplitude, lead aVF (uV)
  ECPSA6      8502    0000-2118
              59      8888  Blank but applicable


   307-310              S amplitude, lead V1 (uV)
  ECPSA7      8487    0000-2969
              74      8888  Blank but applicable


   311-314              S amplitude, lead V2 (uV)
  ECPSA8      8487    0000-2984
              74      8888  Blank but applicable


   315-318              S amplitude, lead V3 (uV)
  ECPSA9      8467    0000-2993
              94      8888  Blank but applicable


   319-322              S amplitude, lead V4 (uV)
  ECPSA10     8497    0000-2783
              64      8888  Blank but applicable


   323-326              S amplitude, lead V5 (uV)
  ECPSA11     8497    0000-2228
              64      8888  Blank but applicable


   327-330              S amplitude, lead V6 (uV)
  ECPSA12     8498    0000-1481
              63      8888  Blank but applicable
```

NHANES III Electrocardiography Data File

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------------------------------------------------------------------------
                        ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                               Notes
------------------------------------------------------------------------


   331-333            S duration, lead I (msec)
 ECPSD1      8516   000-124
               45   888   Blank but applicable

   334-336            S duration, lead II (msec)
 ECPSD2      8499   000-160
               62   888   Blank but applicable

   337-339            S duration, lead III (msec)
 ECPSD3      8500   000-148
               61   888   Blank but applicable

   340-342            S duration, lead aVR (msec)
 ECPSD4      8503   000-128
               58   888   Blank but applicable

   343-345            S duration, lead aVL (msec)
 ECPSD5      8501   000-152
               60   888   Blank but applicable

   346-348            S duration, lead aVF (msec)
 ECPSD6      8502   000-164
               59   888   Blank but applicable

   349-351            S duration, lead V1 (msec)
 ECPSD7      8487   000-152
               74   888   Blank but applicable

   352-354            S duration, lead V2 (msec)
 ECPSD8      8487   000-140
               74   888   Blank but applicable

   355-357            S duration, lead V3 (msec)
 ECPSD9      8467   000-152
               94   888   Blank but applicable
```

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------------------------------------------------------------------------
                         ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions          Item description
SAS name    Counts      and code                                   Notes
------------------------------------------------------------------------


   358-360            S duration, lead V4 (msec)
  ECPSD10     8497   000-156
               64    888   Blank but applicable


   361-363            S duration, lead V5 (msec)
  ECPSD11     8497   000-156
               64    888   Blank but applicable


   364-366            S duration, lead V6 (msec)
  ECPSD12     8498   000-152
               63    888   Blank but applicable


   367-370            R' amplitude, lead I (uV)
  ECPRPA1     8516   0000-1527
               45    8888  Blank but applicable


   371-374            R' amplitude, lead II (uV)
  ECPRPA2     8499   0000-2145
               62    8888  Blank but applicable


   375-378            R' amplitude, lead III (uV)
  ECPRPA3     8500   0000-1394
               61    8888  Blank but applicable


   379-382            R' amplitude, lead aVR (uV)
  ECPRPA4     8503   0000-0480
               58    8888  Blank but applicable


   383-386            R' amplitude, lead aVL (uV)
  ECPRPA5     8501   0000-1169
               60    8888  Blank but applicable


   387-390            R' amplitude, lead aVF (uV)
  ECPRPA6     8502   0000-1762
               59    8888  Blank but applicable
```

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------------------------------------------------------------------------
                      ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                                   Notes
------------------------------------------------------------------------

   391-394             R' amplitude, lead V1 (uV)
 ECPRPA7     8487    0000-1817
               74    8888  Blank but applicable

   395-398             R' amplitude, lead V2 (uV)
 ECPRPA8     8487    0000-2891
               74    8888  Blank but applicable

   399-402             R' amplitude, lead V3 (uV)
 ECPRPA9     8467    0000-2059
               94    8888  Blank but applicable

   403-406             R' amplitude, lead V4 (uV)
 ECPRPA10    8497    0000-2095
               64    8888  Blank but applicable

   407-410             R' amplitude, lead V5 (uV)
 ECPRPA11    8497    0000-2321
               64    8888  Blank but applicable

   411-414             R' amplitude, lead V6 (uV)
 ECPRPA12    8498    0000-1662
               63    8888  Blank but applicable

   415-418             J amplitude, lead I (uV)
 ECPJ1       8516    -321-0197
               45    8888  Blank but applicable

   419-422             J amplitude, lead II (uV)
 ECPJ2       8499    -231-0300
               62    8888  Blank but applicable

   423-426             J amplitude, lead III (uV)
 ECPJ3       8500    -170-0306
               61    8888  Blank but applicable
```

NHANES III Electrocardiography Data File

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------------------------------------------------------------------------
                        ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions           Item description
SAS name    Counts      and code                                  Notes
------------------------------------------------------------------------

   427-430          J amplitude, lead aVR (uV)
  ECPJ4       8503   -202-0202
               58   8888  Blank but applicable

   431-434          J amplitude, lead aVL (uV)
  ECPJ5       8501   -294-0116
               60   8888  Blank but applicable

   435-438          J amplitude, lead aVF (uV)
  ECPJ6       8502   -197-0270
               59   8888  Blank but applicable

   439-442          J amplitude, lead V1 (uV)
  ECPJ7       8487   -142-0844
               74   8888  Blank but applicable

   443-446          J amplitude, lead V2 (uV)
  ECPJ8       8487   -211-0487
               74   8888  Blank but applicable

   447-450          J amplitude, lead V3 (uV)
  ECPJ9       8467   -243-0409
               94   8888  Blank but applicable

   451-454          J amplitude, lead V4 (uV)
  ECPJ10      8497   -358-0354
               64   8888  Blank but applicable

   455-458          J amplitude, lead V5 (uV)
  ECPJ11      8497   -336-0456
               64   8888  Blank but applicable

   459-462          J amplitude, lead V6 (uV)
  ECPJ12      8498   -322-0224
               63   8888  Blank but applicable
```

NHANES III Electrocardiography Data File

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------------------------------------------------------------------------
                        ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                                  Notes
------------------------------------------------------------------------

   463-467             Negative T amplitude, lead I (uV)
  ECPNTA1     8516     -0405-00000
               45      88888 Blank but applicable

   468-471             Negative T amplitude, lead II (uV)
  ECPNTA2     8499     -383-0000
               62      8888  Blank but applicable

   472-475             Negative T amplitude, lead III (uV)
  ECPNTA3     8500     -576-0000
               61      8888  Blank but applicable

   476-479             Negative T amplitude, lead aVR (uV)
  ECPNTA4     8503     -582-0000
               58      8888  Blank but applicable

   480-483             Negative T amplitude, lead aVL (uV)
  ECPNTA5     8501     -478-0000
               60      8888  Blank but applicable

   484-487             Negative T amplitude, lead aVF (uV)
  ECPNTA6     8502     -376-0000
               59      8888  Blank but applicable

   488-491             Negative T amplitude, lead V1 (uV)
  ECPNTA7     8487     -700-0000
               74      8888  Blank but applicable

   492-496             Negative T amplitude, lead V2 (uV)
  ECPNTA8     8487     -0847-00000
               74      88888 Blank but applicable

   497-501             Negative T amplitude, lead V3 (uV)
  ECPNTA9     8467     -1000-00000
               94      88888 Blank but applicable
```

NHANES III Electrocardiography Data File

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------------------------------------------------------------------------
                       ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions           Item description
SAS name    Counts     and code                               Notes
------------------------------------------------------------------------

   502-506              Negative T amplitude, lead V4 (uV)
 ECPNTA10     8497   -1025-00000
               64    88888 Blank but applicable


   507-511              Negative T amplitude, lead V5 (uV)
 ECPNTA11     8497   -0904-00000
               64    88888 Blank but applicable


   512-516              Negative T amplitude, lead V6 (uV)
 ECPNTA12     8498   -0700-00000
               63    88888 Blank but applicable


   517-520              Positive T amplitude, lead I (uV)
 ECPPTA1      8516   0000-0610
               45    8888  Blank but applicable


   521-524              Positive T amplitude, lead II (uV)
 ECPPTA2      8499   0000-0786
               62    8888  Blank but applicable


   525-528              Positive T amplitude, lead III (uV)
 ECPPTA3      8500   0000-0864
               61    8888  Blank but applicable


   529-532              Positive T amplitude, lead aVR (uV)
 ECPPTA4      8503   0000-0267
               58    8888  Blank but applicable


   533-536              Positive T amplitude, lead aVL (uV)
 ECPPTA5      8501   0000-0571
               60    8888  Blank but applicable


   537-540              Positive T amplitude, lead aVF (uV)
 ECPPTA6      8502   0000-0820
               59    8888  Blank but applicable
```

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------------------------------------------------------------------------
                    ECG WAVE MEASUREMENTS
------------------------------------------------------------------------
Positions          Item description
SAS name    Counts    and code                                    Notes
------------------------------------------------------------------------


   541-544            Positive T amplitude, lead V1 (uV)
  ECPPTA7     8487    0000-0968
               74     8888  Blank but applicable


   545-548            Positive T amplitude, lead V2 (uV)
  ECPPTA8     8487    0000-1792
               74     8888  Blank but applicable


   549-552            Positive T amplitude, lead V3 (uV)
  ECPPTA9     8467    0000-1607
               94     8888  Blank but applicable


   553-556            Positive T amplitude, lead V4 (uV)
  ECPPTA10    8497    0000-1784
               64     8888  Blank but applicable


   557-560            Positive T amplitude, lead V5 (uV)
  ECPPTA11    8497    0000-1328
               64     8888  Blank but applicable


   561-564            Positive T amplitude, lead V6 (uV)
  ECPPTA12    8498    0000-0911
               63     8888  Blank but applicable
```

Notes

ECPWIDTH: Chest half-width(mm)

Two anthropometric measurements related to the chest dimensions and chest
electrode locations were obtained in NHANES III using an electrode locator
(Heartsquare) used to position the V4 electrode at a 45 degree angle between
the midsternal line and the left midaxillary line (location of V6) (Rautaharju
et al, 1976). The half-width of the chest is the distance (cm) from the
midsternal line to the left lateral chest wall at the level of V6. The
half-depth of the chest is the distance from the frontal plane at lower sternum
to the frontal plane which transsects the thorax at the level of the
midaxillary levels. Both of these measurements were obtained to the nearest
0.5 cm and reported as three digit numbers without a decimal (mm) for
NHANES III only.

ECPDEPTH: Chest half-depth (mm)

See note for ECPWIDTH.

ECPG1: Major ECG abnormalities

        Minnesota Code Comments

Major Q, QS waves   1.1 or 1.2   Highest code in
                           except 1.2.8   any leadgroup
ST depression   4.1 or 4.2
Negative T waves   5.1 or 5.2
Complete AV block   6.1   Coded visually, not
                                              coded in NHANES I
WPW pattern   6.4
Artificial pacemaker   6.8   Coded visually, not
                                              coded in NHANES I
Ventricular conduction   7.1 or 7.2 or 7.4
defect
Atrial fibrillation   8.3   Coded visually
/flutter
ST elevation   9.2

ECPG2: Minor ECG abnormalities

        Minnesota Code Comments

Minor Q waves   1.2.8 or 1.3
High R waves   3.1 or 3.3   Any 3.1 or 3.3 code
Minor ST codes   4.3 or 4.4
Minor T wave codes   5.3 or 5.4
Prolonged PR interval   6.3
RR' in V1 or V2   7.3 or 7.5
Left anterior fascicular   7.7
block

ECPG3: Probable myocardial infarction by the Minnesota Code

Major Q/QS waves (Code 1.1.1 through 1.1.7), or Moderate Q/QS waves with ST
depression or T wave inversion (Code 1.2.1 through 1.2.7 and code 4.1, 4.2, 5.1
or 5.2)

ECPG4: Possible myocardial infarction by the Minnesota Code

Moderate Q/QS waves without ST depression or T wave inversion (Code 1.2.1
through 1.2.7 without Code 4.1, 4.2, 5.1 and 5.2),or minor Q/QS waves with ST
depression or T wave inversion (Code 1.2.8 or 1.3.1 through 1.3.6 and Code 4.1,
4.2, 5.1 or 5.2)

ECPG5: Probable LVH by the Minnesota Code

Code 3.1 with code 5.1 or 5.2 or 5.3

ECPG6: Possible LVH by the Minnesota Code

Code 3.1 without code 5.1 and 5.2 and 5.3, OR Any code 3.3

ECPMC2 MC 2 (QRS axis code)

The algorithm used for QRS axis determination provides a more accurate
estimation of the mean frontal plane axis than the approximation used in
Minnesota Code 2 according to the conventional visual measurement.

The algorithm used for the QRS axis determination is also used for P and T axis
calculation.

Values of QRS integrals (net QRS 'areas', A) determined from the six limb leads
are used for the mean frontal plane QRS axis calculation.

Three separate axis angle (ANG) values are calculated from three pairs of limb
leads. The lead vectors of these three pairs of leads are assumed to be
orthogonal according to the Einthoven's equilateral triangle approximation, and
the relative strength of the lead vectors of leads aVR, aVL and aVF are assumed
to be 3/2 times the lead vector strengths of leads I, II and III. Consequently,
the augmented unipolar limb leads are scaled by factor 1.16 in these pairwise
calculations of the three angles ANG(1), ANG(2) and ANG(3).

     ANG(1) = ARCTG (1.16 x A(aVF), A(I)),
     ANG(2) = ARCTG (A(II), 1.16 x A(aVF)),
     ANG(3) = ARCTG (1.16 x A(aVR), A(III)) + 120

In case the three values are reasonably consistent, the final mean frontal
plane axis is taken as the mean value of these three separate angle
determinations. Several inconsistency checks are performed, and if abnormally
large discrepancies are found, the angle is termed 'undetermined'.

QRS axis values are used to identify abnormal axis deviations, with the
following categories for the QRS axis code (code 2):

  2.0.0 from 0 to 90 degrees   Normal QRS axis
  2.1.1 from -29 to -1 degrees   Borderline left axis deviation
                 (LAD)
  2.1.2 from -89 to -30 degrees   LAD
  2.2.1 from 91 to 119 degrees   Borderline right axis deviation
                 (RAD)
  2.2.2 from 120 to 150 degrees   RAD
  3.3   from 149 to 90 degrees   Extreme axis deviation

ECPCIIS, ECPCIIS2, ECPCIIS3, ECPCIIS4: Cardiac Infarction/Injury Score for 12
lead ECG multiplied by 10

This ECG coding scheme was developed as a measure of the likelihood of
myocardial infarction on a continuous scale. The following thresholds for the
score define the likelihood of infarction in a decreasing order:

        Probable infarction CIIS >= 20
        Possible infarction 15 <= CIIS < 20
        Consider infarction 10 <= CIIS < 15

These thresholds correspond to the estimated specificity levels of 98%, 95% and
90% (Rautaharju et al., 1981.).

ECPCIIS2: Infarction/Injury probable

See note for ECPCIIS.

ECPCIIS3: Infarction/Injury possible

See note for ECPCIIS.

ECPCIIS4: Consider Infarction/Injury probable

See note for ECPCIIS.

ECPLVM, ECPLVMI, ECPLVM3: Estimate LV Mass and LV Mass Index

Coefficients for the regression equation used for ECG estimation of left
ventricular mass (LVM) and left ventricular mass index (LVMI) (Rautaharju
et al, 1990).

White and Black Men

Variables	LVM	LVMI
R amplitude in V5 (æV)	0.0217	0.0100
Q or S amplitude in V1 (æV)*	0.0338	0.0203
Q or S amplitude in III (æV)*	0.0600	0.0287
Negative T amplitude in V6 (æV)	0.3158	0.1819
Positive T amplitude in aVR (æV)	-0.2958	-0.1482
QRS duration (msec.)	1.8204	1.0485
Intercept	-58.5098	-36.4290

White Women

Variables	LVM	LVMI
R amplitude on aVL (æV)	0.0320	--
R amplitude in V5 (æV)	0.0233	0.0178
Q or S amplitude in V5 (æV)*	0.0693	0.0528
Q or S amplitude in I (æV)*	-0.1545	-0.1128
Positive T amplitude in V1 (æV)	0.1122	0.1075
Negative T amplitude in aVF (æV)	--	0.1701

```
    Positive T amplitude in V6 (æV)    -0.1236      -0.0939
    Intercept                         134.7722       88.4357


Black Women

    Variables                            LVM          LVMI

    R amplitude in aVL (æV)               --          0.0216
    R amplitude in I (æV)               0.0498          --
    (R amplitude in V6 +
    S amplitude in V2) (æV)             0.0235        0.0184
    R amplitude in V1                  -0.0507          --
    R amplitude in V2 (æV)                --         -0.0143
    Q or S amplitude in V6 (æV)*       -0.0980       -0.0693
    Negative T amplitude in aVL (æV)      --          0.199
    Negative T amplitude in I (æV)      0.5225          --
    QRS duration (msec.)                1.8478        0.7460
    Intercept                         -90.7136      -22.3064

    * whichever is larger
```

The following limits for LVMI are taken to indicate the presence of probable
left ventricular hypertrophy to correspond upper normal limits for
echocardiographic LVMI by the conventions of the American Society for
Echocardiography (Levy et al. 1987). These LVH criteria have been evaluated
recently in an independent study population (Rautaharju et al, 1996).

```
     Males> 150 g/m2
     Females> 120 g/m2
```

ECPLVMI: ECG estimate LV Mass Index

See note for ECPLVM.

ECPLVM3: Probable LVH

See note for ECPLVM.

ECPAXIS2: QRS axis, frontal plane (degrees)

See note for ECPMC2

ECPBEAT: Rhythm Code

Arrhythmias were not coded in NHANES I except that ECGs with no P waves
detected or with P wave detection uncertain were coded visually for the
presence of atrial fibrillation. Arrhythmic codes were determined visually
by a senior electrocardiographer (PMR) for NHANES II and III. Note that the
history of atrial fibrillation was an exclusion criterion for ECG recording in
NHANES III. Pacemaker enhancement circuits were not used in ECG recorders of
any of these surveys which makes coding uncertain.

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