

First National Health and Nutrition Examination Survey  
(NHANES I), 1971-75

NHANES I ELECTROCARDIOGRAPHY DATA FILE DOCUMENTATION

Series 11, No. 2A

April 1998

Table of Contents

NHANES I Electrocardiography Data

General Information . . . . .

Data File Index . . . . .

Data File Item Descriptions, Codes, Counts, and Notes . . . . .

References . . . . .

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 I. 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 ECG 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  |

\*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 list additional information available from NHANES I and II. These data sets are available on tape and can be ordered 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

| -----<br>TAPE NAME/NUMBER<br>-----  | -----<br>ORDER NUMBER<br>----- |
|---|--------------------------------|
| Anthropometry,<br>goniometry, skeletal<br>age, bone density,<br>and cortical<br>thickness, ages<br>1-74 years (4111)<br>----- | PB-295908                      |
| Arthritis, ages 25-<br>74 years (4121)<br>-----   | PB-296018                      |
| Audiometric test<br>(air, bone, speech<br>reception), ages 25-<br>74 years (4241)<br>-----                                    | PB-297337                      |
| Biochemistry,<br>serology,<br>hematology,<br>peripheral blood   | PB-297344                      |

|   |             |
|---|-------------|
| slide, and urinary findings, ages 25-74 years (4800)  |             |
| 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  | PB87-126009  |

|   |             |
|---|-------------|
| size, and lung and heart pathology, ages 25-74 years (4251) |             |
| 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  |

|   |                               |
|---|-------------------------------|
| -----<br>Allergy Skin<br>Testing, Ages 6-74,<br>(5309)<br>-----                             | -----<br>PB86-121613<br>----- |
| -----<br>24-hour recall<br>specific food item,<br>ages 6 months-74<br>years (5704)<br>----- | -----<br>PB82-142639<br>----- |

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>

NHANES I Electrocardiography Data File Index

| -----<br>Description<br>-----               | Variable<br>Name | Positions |
|---|------------------|-----------|
| DEMOGRAPHIC DATA                            |                  |           |
| Sample person identification number .....   | SEQN             | 1-5       |
| NHANES I Survey (1971-75) .....             | ECPSNUM          | 6         |
| Sex .....                                   | HSSEX            | 7         |
| Race .....                                  | DMARACER         | 8         |
| Age at interview ( Screener) in years ..... | HSAGEIR          | 9-10      |
| Pseudo-PSU .....                            | SDPPSU           | 11-13     |
| Pseudo-stratum .....                        | SDPSTRA          | 14-15     |
| Revised Pseudo-PSU .....                    | SDPPSUR          | 16        |
| MEC-examined sample final weight .....      | WTPFEX           | 17-22     |

INTRODUCTORY INFORMATION

|   |          |       |
|---|----------|-------|
| Technician number (not reported) .....      | ECPTECH1 | 23    |
| Number of leads .....                       | ECPLEADS | 24-25 |
| Chest half-width (mm) (not reported) .....  | ECPWIDTH | 26    |
| Chest half-depth (mm) (not reported) .....  | ECPDEPTH | 27    |
| Major ECG abnormalities .....               | ECPG1    | 28    |
| Minor ECG abnormalities .....               | ECPG2    | 29    |
| Probable myocardial infarction (MI) .....   | ECPG3    | 30    |
| Possible MI .....                           | ECPG4    | 31    |
| Probable left ventricular hypertrophy ..... | ECPG5    | 32    |
| Possible LVH by MC .....                    | ECPG6    | 33    |

MINNESOTA CODES

|                                      |       |       |
|--------------------------------------|-------|-------|
| MC 1 Leadgroup L(I, aVL, V6) .....   | ECPL1 | 34-35 |
| MC 1 Leadgroup F(II, III, aVF) ..... | ECPF1 | 36-37 |
| MC 1 Leadgroup V(V1-V5) .....        | ECPV1 | 38-39 |
| MC 4 Leadgroup L .....               | ECPL4 | 40-41 |
| MC 4 Leadgroup F .....               | ECPF4 | 42-43 |
| MC 4 Leadgroup V .....               | ECPV4 | 44-45 |
| MC 5 Leadgroup L .....               | ECPL5 | 46    |
| MC 5 Leadgroup F .....               | ECPF5 | 47    |
| MC 5 Leadgroup V .....               | ECPV5 | 48    |
| MC 9.2 Leadgroup L .....             | ECPL9 | 49    |
| MC 9.2 Leadgroup F .....             | ECPF9 | 50    |

NHANES I Electrocardiography Data File Index

| Description                         | Variable Name | Positions |
|-------------------------------------|---------------|-----------|
| MC 9.2 Leadgroup V .....            | ECPV9         | 51        |
| MC 2 (QRS axis code) .....          | ECPMC2        | 52-53     |
| MC 3 (High-amplitude R waves) ..... | ECPMC3        | 54-55     |
| MC 6 (A-V conduction) .....         | ECPMC6        | 56-57     |
| MC 7 (Ventricular conduction) ..... | ECPMC7        | 58        |
| MC 9.1 (Low-amplitude QRS) .....    | ECPMC91       | 59        |
| MC 9.3 (High-amplitude P) .....     | ECPMC93       | 60        |
| MC 9.4 (QRS transition zone) .....  | ECPMC94       | 61        |
| MC 9.5 (High-amplitude T) .....     | ECPMC95       | 62        |

CARDIAC/INFARCTION INJURY SCORE

|   |          |       |
|---|----------|-------|
| Cardiac infarction score (12-lead by 10) .... | ECPCIIS  | 63-65 |
| Probable infarction/injury .....              | ECPCIIS2 | 66    |
| Possible infarction/injury .....              | ECPCIIS3 | 67    |
| Consider infarction/injury .....              | ECPCIIS4 | 68    |

LEFT VENTRICULAR MASS

|                                     |         |       |
|-------------------------------------|---------|-------|
| ECG estimate of LV mass .....       | ECPLVM  | 69-71 |
| ECG estimate of LV mass index ..... | ECPLVMI | 72-74 |
| Probable LVH .....                  | ECPLVM3 | 75    |

HEART RATE, BASIC ECG INTERVALS, AND MEAN AXIS DATA

|                                     |         |       |
|-------------------------------------|---------|-------|
| Heart rate (beats per minute) ..... | ECPRATE | 76-78 |
| PR interval (msec) .....            | ECPPR   | 79-81 |

|   |          |         |
|---|----------|---------|
| QRS interval (msec) .....               | ECPQRS   | 82-84   |
| QT interval (msec) .....                | ECPQT    | 85-87   |
| P axis, frontal plane (degrees) .....   | ECPAXIS1 | 88-91   |
| QRS axis, frontal plane (degrees) ..... | ECPAXIS2 | 92-95   |
| T axis, frontal plane (degrees) .....   | ECPAXIS3 | 96-99   |
| Rhythm code .....                       | ECPBEAT  | 100-101 |

ECG WAVE MEASUREMENTS

|   |       |         |
|---|-------|---------|
| P amplitude, positive phase, lead II(uV) .... | ECPP1 | 102-104 |
|---|-------|---------|

NHANES I Electrocardiography Data File Index

| Description                                   | Variable Name | Positions |
|---|---------------|-----------|
| P duration, lead II (msec) .....              | ECPP2         | 105-107   |
| P amplitude, positive phase, lead V1(uV) .... | ECPP3         | 108-110   |
| P amplitude, negative phase, lead V1(uV) .... | ECPP4         | 111-114   |
| Q or QS amplitude, lead I (uV) .....          | ECPQA1        | 115-118   |
| Q or QS amplitude, lead II (uV) .....         | ECPQA2        | 119-122   |
| Q or QS amplitude, lead III (uV) .....        | ECPQA3        | 123-126   |
| Q or QS amplitude, lead aVL (uV) .....        | ECPQA4        | 127-130   |
| Q or QS amplitude, lead AVF (uV) .....        | ECPQA5        | 131-134   |
| Q or QS amplitude, lead V1 (uV) .....         | ECPQA6        | 135-138   |
| Q or QS amplitude, lead V2 (uV) .....         | ECPQA7        | 139-142   |
| Q or QS amplitude, lead V3 (uV) .....         | ECPQA8        | 143-146   |
| Q or QS amplitude, lead V4 (uV) .....         | ECPQA9        | 147-150   |
| Q or QS amplitude, lead V5 (uV) .....         | ECPQA10       | 151-154   |
| Q or QS amplitude, lead V6 (uV) .....         | ECPQA11       | 155-158   |
| Q or QS duration, lead I (msec) .....         | ECPQD1        | 159-161   |
| Q or QS duration, lead II (msec) .....        | ECPQD2        | 162-164   |
| Q or QS duration, lead III (msec) .....       | ECPQD3        | 165-167   |
| Q or QS duration, lead aVL (msec) .....       | ECPQD4        | 168-170   |
| Q or QS duration, lead aVF (msec) .....       | ECPQD5        | 171-173   |
| Q or QS duration, lead V1 (msec) .....        | ECPQD6        | 174-176   |
| Q or QS duration, lead V2 (msec) .....        | ECPQD7        | 177-179   |
| Q or QS duration, lead V3 (msec) .....        | ECPQD8        | 180-182   |
| Q or QS duration, lead V4 (msec) .....        | ECPQD9        | 183-185   |
| Q or QS duration, lead V5 (msec) .....        | ECPQD10       | 186-188   |
| Q or QS duration, lead V6 (msec) .....        | ECPQD11       | 189-191   |
| R amplitude, lead I (uV) .....                | ECPRA1        | 192-195   |
| R amplitude, lead II (uV) .....               | ECPRA2        | 196-199   |
| R amplitude, lead III (uV) .....              | ECPRA3        | 200-203   |
| R amplitude, lead aVR (uV) .....              | ECPRA4        | 204-207   |
| R amplitude, lead aVL (uV) .....              | ECPRA5        | 208-211   |
| R amplitude, lead aVF (uV) .....              | ECPRA6        | 212-215   |
| R amplitude, lead V1 (uV) .....               | ECPRA7        | 216-219   |
| R amplitude, lead V2 (uV) .....               | ECPRA8        | 220-223   |
| R amplitude, lead V3 (uV) .....               | ECPRA9        | 224-227   |
| R amplitude, lead V4 (uV) .....               | ECPRA10       | 228-231   |
| R amplitude, lead V5 (uV) .....               | ECPRA11       | 232-235   |
| R amplitude, lead V6 (uV) .....               | ECPRA12       | 236-239   |
| R duration, lead I (msec) .....               | ECPRD1        | 240-242   |
| R duration, lead II (msec) .....              | ECPRD2        | 243-245   |
| R duration, lead III (msec) .....             | ECPRD3        | 246-248   |



NHANES I Electrocardiography Data File Index

| Description                 | Variable Name | Positions |
|-----------------------------|---------------|-----------|
| R duration, lead aVR (msec) | ECPRD4        | 249-251   |
| R duration, lead aVL (msec) | ECPRD5        | 252-254   |
| R duration, lead aVF (msec) | ECPRD6        | 255-257   |
| R duration, lead V1 (msec)  | ECPRD7        | 258-260   |
| R duration, lead V2 (msec)  | ECPRD8        | 261-263   |
| R duration, lead V3 (msec)  | ECPRD9        | 264-266   |
| R duration, lead V4 (msec)  | ECPRD10       | 267-269   |
| R duration, lead V5 (msec)  | ECPRD11       | 270-272   |
| R duration, lead V6 (msec)  | ECPRD12       | 273-275   |
| S amplitude, lead I (uV)    | ECPSA1        | 276-279   |
| S amplitude, lead II (uV)   | ECPSA2        | 280-283   |
| S amplitude, lead III (uV)  | ECPSA3        | 284-287   |
| S amplitude, lead aVR (uV)  | ECPSA4        | 288-291   |
| S amplitude, lead aVL (uV)  | ECPSA5        | 292-295   |
| S amplitude, lead aVF (uV)  | ECPSA6        | 296-299   |
| S amplitude, lead V1 (uV)   | ECPSA7        | 300-303   |
| S amplitude, lead V2 (uV)   | ECPSA8        | 304-307   |
| S amplitude, lead V3 (uV)   | ECPSA9        | 308-311   |
| S amplitude, lead V4 (uV)   | ECPSA10       | 312-315   |
| S amplitude, lead V5 (uV)   | ECPSA11       | 316-319   |
| S amplitude, lead V6 (uV)   | ECPSA12       | 320-323   |
| S duration, lead I (msec)   | ECPSD1        | 324-326   |
| S duration, lead II (msec)  | ECPSD2        | 327-329   |
| S duration, lead III (msec) | ECPSD3        | 330-332   |
| S duration, lead aVR (msec) | ECPSD4        | 333-335   |
| S duration, lead aVL (msec) | ECPSD5        | 336-338   |
| S duration, lead aVF (msec) | ECPSD6        | 339-341   |
| S duration, lead V1 (msec)  | ECPSD7        | 342-344   |
| S duration, lead V2 (msec)  | ECPSD8        | 345-347   |
| S duration, lead V3 (msec)  | ECPSD9        | 348-350   |
| S duration, lead V4 (msec)  | ECPSD10       | 351-353   |
| S duration, lead V5 (msec)  | ECPSD11       | 354-356   |
| S duration, lead V6 (msec)  | ECPSD12       | 357-359   |
| R' amplitude, lead I (uV)   | ECPRPA1       | 360-363   |
| R' amplitude, lead II (uV)  | ECPRPA2       | 364-367   |
| R' amplitude, lead III (uV) | ECPRPA3       | 368-371   |
| R' amplitude, lead aVR (uV) | ECPRPA4       | 372-375   |
| R' amplitude, lead aVL (uV) | ECPRPA5       | 376-379   |
| R' amplitude, lead aVF (uV) | ECPRPA6       | 380-383   |
| R' amplitude, lead V1 (uV)  | ECPRPA7       | 384-387   |

NHANES I Electrocardiography Data File Index

| Description                | Variable Name | Positions |
|----------------------------|---------------|-----------|
| R' amplitude, lead V2 (uV) | ECPRPA8       | 388-391   |
| R' amplitude, lead V3 (uV) | ECPRPA9       | 392-395   |

|   |          |         |
|---|----------|---------|
| R' amplitude, lead V4 (uV) .....          | ECPRPA10 | 396-399 |
| R' amplitude, lead V5 (uV) .....          | ECPRPA11 | 400-403 |
| R' amplitude, lead V6 (uV) .....          | ECPRPA12 | 404-407 |
| J amplitude, lead I (uV) .....            | ECPJ1    | 408-411 |
| J amplitude, lead II (uV) .....           | ECPJ2    | 412-415 |
| J amplitude, lead III (uV) .....          | ECPJ3    | 416-419 |
| J amplitude, lead aVR (uV) .....          | ECPJ4    | 420-423 |
| J amplitude, lead aVL (uV) .....          | ECPJ5    | 424-427 |
| J amplitude, lead aVF (uV) .....          | ECPJ6    | 428-431 |
| J amplitude, lead V1 (uV) .....           | ECPJ7    | 432-435 |
| J amplitude, lead V2 (uV) .....           | ECPJ8    | 436-439 |
| J amplitude, lead V3 (uV) .....           | ECPJ9    | 440-443 |
| J amplitude, lead V4 (uV) .....           | ECPJ10   | 444-447 |
| J amplitude, lead V5 (uV) .....           | ECPJ11   | 448-451 |
| J amplitude, lead V6 (uV) .....           | ECPJ12   | 452-455 |
| Negative T amplitude, lead I (uV) .....   | ECPNTA1  | 456-460 |
| Negative T amplitude, lead II (uV) .....  | ECPNTA2  | 461-464 |
| Negative T amplitude, lead III (uV) ..... | ECPNTA3  | 465-468 |
| Negative T amplitude, lead aVR (uV) ..... | ECPNTA4  | 469-472 |
| Negative T amplitude, lead aVL (uV) ..... | ECPNTA5  | 473-476 |
| Negative T amplitude, lead aVF (uV) ..... | ECPNTA6  | 477-480 |
| Negative T amplitude, lead V1 (uV) .....  | ECPNTA7  | 481-484 |
| Negative T amplitude, lead V2 (uV) .....  | ECPNTA8  | 485-489 |
| Negative T amplitude, lead V3 (uV) .....  | ECPNTA9  | 490-494 |
| Negative T amplitude, lead V4 (uV) .....  | ECPNTA10 | 495-499 |
| Negative T amplitude, lead V5 (uV) .....  | ECPNTA11 | 500-504 |
| Negative T amplitude, lead V6 (uV) .....  | ECPNTA12 | 505-509 |
| Positive T amplitude, lead I (uV) .....   | ECPPTA1  | 510-513 |
| Positive T amplitude, lead II (uV) .....  | ECPPTA2  | 514-517 |
| Positive T amplitude, lead III (uV) ..... | ECPPTA3  | 518-521 |
| Positive T amplitude, lead aVR (uV) ..... | ECPPTA4  | 522-525 |
| Positive T amplitude, lead aVL (uV) ..... | ECPPTA5  | 526-529 |
| Positive T amplitude, lead aVF (uV) ..... | ECPPTA6  | 530-533 |
| Positive T amplitude, lead V1 (uV) .....  | ECPPTA7  | 534-537 |
| Positive T amplitude, lead V2 (uV) .....  | ECPPTA8  | 538-541 |
| Positive T amplitude, lead V3 (uV) .....  | ECPPTA9  | 542-545 |
| Positive T amplitude, lead V4 (uV) .....  | ECPPTA10 | 546-549 |
| Positive T amplitude, lead V5 (uV) .....  | ECPPTA11 | 550-553 |

NHANES I Electrocardiography Data File Index

| Description                              | Variable Name | Positions |
|--|---------------|-----------|
| Positive T amplitude, lead V6 (uV) ..... | ECPPTA12      | 554-557   |

NHANES I Electrocardiography Data File

FILENAME=NH1ECG                                      VERSION 1.0                                      N=6,316

DEMOGRAPHIC DATA

| Positions | Item description | Notes |
|-----------|------------------|-------|
| SAS name  | Counts and code  |       |

```

-----
      1-5      Sample person identification number
SEQN          6316      00228-25061

      6      NHANES I Survey (1971-75)
ECPSNUM      6316      1      NHANES I

      7      Sex
HSSEX        2870      1      Male
              3446      2      Female

      8      Race
DMARACER     5522      1      White
              725      2      Black
              69      3      Other

      9-10    Age at interview (Screeners) in years
HSAGEIR      6316      25-74

      11-13   Pseudo-PSU
SDPPSU       6316      001-235

      14-15   Pseudo-stratum
SDPSTRA      6316      01-35

      16      Revised Pseudo-PSU
SDPPSUR      6316      1-3

      17-22   MEC-examined sample final weight
WTPFEX       6316      001004-121040

```

NHANES I Electrocardiography Data File

-----  
INTRODUCTORY INFORMATION  
-----

| Positions<br>SAS name | Counts  | Item description<br>and code  | Notes                |
|-----------------------|---|---|----------------------|
| 23<br>ECPTECH1        | 6316  | Technician number<br>(not reported in NHANES I)<br>Blank              |                      |
| 24-25<br>ECPLEADS     | 1<br>3<br>6<br>15<br>32<br>114<br>1229<br>4911<br>5 | Number of leads<br>05<br>06<br>07<br>08<br>09<br>10<br>11<br>12<br>88 | Blank but applicable |
| 26<br>ECPWIDTH        |   | Chest half-width (mm)<br>(not reported in NHANES I)                   |                      |

|                |      |   |         |          |
|----------------|------|---|---------|----------|
|                | 6316 | Blank   |         |          |
| 27<br>ECPDEPTH |      | Chest half-depth (mm)<br>(not reported in NHANES I) |         |          |
|                | 6316 | Blank   |         |          |
| 28<br>ECPG1    |      | Major ECG abnormalities                             |         | See note |
|                | 5455 | 0   | Absent  |          |
|                | 861  | 1   | Present |          |
| 29<br>ECPG2    |      | Minor ECG abnormalities                             |         | See note |
|                | 5012 | 0   | Absent  |          |
|                | 1304 | 1   | Present |          |
| 30<br>ECPG3    |      | Probable myocardial infarction (MI)                 |         | See note |
|                | 6295 | 0   | Absent  |          |
|                | 21   | 1   | Present |          |

NHANES I Electrocardiography Data File

-----  
INTRODUCTORY INFORMATION  
-----

| Positions<br>SAS name | Counts | Item description<br>and code  |         | Notes    |
|-----------------------|--------|---|---------|----------|
| 31<br>ECPG4           |        | Possible MI   |         | See note |
|                       | 6160   | 0   | Absent  |          |
|                       | 156    | 1   | Present |          |
| 32<br>ECPG5           |        | Probable left ventricular hypertrophy<br>(LVH) by Minnesota Code (MC) |         | See note |
|                       | 6237   | 0   | Absent  |          |
|                       | 79     | 1   | Present |          |
| 33<br>ECPG6           |        | Possible LVH by MC  |         | See note |
|                       | 5788   | 0   | Absent  |          |
|                       | 528    | 1   | Present |          |

NHANES I Electrocardiography Data File

-----  
MINNESOTA CODES  
-----

| Positions<br>SAS name | Counts | Item description<br>and code |       | Notes |
|-----------------------|--------|------------------------------|-------|-------|
| 34-35<br>ECPL1        |        | MC 1 Leadgroup L(I, aVL, V6) |       |       |
|                       | 5593   | 00                           | 1.0.0 |       |
|                       | 5      | 11                           | 1.1.1 |       |
|                       | 1      | 12                           | 1.1.2 |       |
|                       | 3      | 13                           | 1.1.3 |       |
|                       | 7      | 21                           | 1.2.1 |       |

|     |    |                      |
|-----|----|----------------------|
| 2   | 22 | 1.2.2                |
| 20  | 31 | 1.3.1                |
| 10  | 33 | 1.3.3                |
| 675 | 88 | Blank but applicable |

|       |      |                                |
|-------|------|--------------------------------|
| 36-37 |      | MC 1 Leadgroup F(II, III, aVF) |
| ECPF1 | 5515 | 00 1.0.0                       |
|       | 2    | 11 1.1.1                       |
|       | 17   | 14 1.1.4                       |
|       | 15   | 21 1.2.1                       |
|       | 4    | 22 1.2.2                       |
|       | 6    | 23 1.2.3                       |
|       | 18   | 24 1.2.4                       |
|       | 1    | 25 1.2.5                       |
|       | 56   | 26 1.2.6                       |
|       | 13   | 31 1.3.1                       |
|       | 54   | 34 1.3.4                       |
|       | 3    | 35 1.3.5                       |
|       | 36   | 36 1.3.6                       |
|       | 576  | 88 Blank but applicable        |

NHANES I Electrocardiography Data File

-----  
MINNESOTA CODES  
-----

| Positions |        | Item description |       |
|-----------|--------|------------------|-------|
| SAS name  | Counts | and code         | Notes |

|       |      |                         |
|-------|------|-------------------------|
| 38-39 |      | MC 1 Leadgroup V(V1-V5) |
| ECPV1 | 5894 | 00 1.0.0                |
|       | 12   | 11 1.1.1                |
|       | 17   | 12 1.1.2                |
|       | 19   | 16 1.1.6                |
|       | 10   | 17 1.1.7                |
|       | 3    | 21 1.2.1                |
|       | 20   | 27 1.2.7                |
|       | 33   | 28 1.2.8                |
|       | 5    | 31 1.3.1                |
|       | 44   | 32 1.3.2                |
|       | 259  | 88 Blank but applicable |

|       |      |                         |
|-------|------|-------------------------|
| 40-41 |      | MC 4 Leadgroup L        |
| ECPL4 | 5464 | 00 4.0.0                |
|       | 2    | 11 4.1.1                |
|       | 28   | 12 4.1.2                |
|       | 104  | 20 4.2.0                |
|       | 31   | 30 4.3.0                |
|       | 28   | 40 4.4.0                |
|       | 659  | 88 Blank but applicable |

|       |      |                  |
|-------|------|------------------|
| 42-43 |      | MC 4 Leadgroup F |
| ECPF4 | 5671 | 00 4.0.0         |
|       | 6    | 12 4.1.2         |
|       | 49   | 20 4.2.0         |
|       | 10   | 30 4.3.0         |
|       | 5    | 40 4.4.0         |

## NHANES I Electrocardiography Data File

-----  
MINNESOTA CODES  
-----

| Positions<br>SAS name | Counts | Item description<br>and code | Notes |
|-----------------------|--------|------------------------------|-------|
| 44-45<br>ECPV4        | 5877   | MC 4 Leadgroup V<br>00 4.0.0 |       |
|                       | 5      | 11 4.1.1                     |       |
|                       | 23     | 12 4.1.2                     |       |
|                       | 76     | 20 4.2.0                     |       |
|                       | 37     | 30 4.3.0                     |       |
|                       | 50     | 40 4.4.0                     |       |
|                       | 248    | 88 Blank but applicable      |       |
| 46<br>ECPL5           | 5216   | MC 5 Leadgroup L<br>0 5.0    |       |
|                       | 5      | 1 5.1                        |       |
|                       | 133    | 2 5.2                        |       |
|                       | 243    | 3 5.3                        |       |
|                       | 82     | 4 5.4                        |       |
|                       | 637    | 8 Blank but applicable       |       |
| 47<br>ECPF5           | 5587   | MC 5 Leadgroup F<br>0 5.0    |       |
|                       | 52     | 2 5.2                        |       |
|                       | 94     | 3 5.3                        |       |
|                       | 21     | 4 5.4                        |       |
|                       | 562    | 8 Blank but applicable       |       |
| 48<br>ECPV5           | 5713   | MC 5 Leadgroup V<br>0 5.0    |       |
|                       | 12     | 1 5.1                        |       |
|                       | 177    | 2 5.2                        |       |
|                       | 112    | 3 5.3                        |       |
|                       | 67     | 4 5.4                        |       |
|                       | 235    | 8 Blank but applicable       |       |

## NHANES I Electrocardiography Data File

-----  
MINNESOTA CODES  
-----

| Positions<br>SAS name | Counts | Item description<br>and code  | Notes |
|-----------------------|--------|-------------------------------|-------|
| 49<br>ECPL9           | 5607   | MC 9.2 Leadgroup L<br>0 9.2.0 |       |
|                       | 36     | 2 9.2.2                       |       |

|        |      |    |                               |          |
|--------|------|----|-------------------------------|----------|
|        | 673  | 8  | Blank but applicable          |          |
| 50     |      |    | MC 9.2 Leadgroup F            |          |
| ECPF9  | 5722 | 0  | 9.2.0                         |          |
|        | 9    | 2  | 9.2.2                         |          |
|        | 585  | 8  | Blank but applicable          |          |
| 51     |      |    | MC 9.2 Leadgroup V            |          |
| ECPV9  | 5907 | 0  | 9.2.0                         |          |
|        | 147  | 2  | 9.2.2                         |          |
|        | 262  | 8  | Blank but applicable          |          |
| 52-53  |      |    | MC 2 (QRS axis code)          | See note |
| ECPMC2 | 4033 | 00 | 2.0.0                         |          |
|        | 473  | 11 | 2.1.1                         |          |
|        | 182  | 12 | 2.1.2                         |          |
|        | 424  | 21 | 2.2.1                         |          |
|        | 33   | 22 | 2.2.2                         |          |
|        | 14   | 30 | 2.3.0                         |          |
|        | 5    | 40 | 2.4.0                         |          |
|        | 1152 | 88 | Blank but applicable          |          |
| 54-55  |      |    | MC 3 (High-amplitude R waves) |          |
| ECPMC3 | 4413 | 00 | 3.0.0                         |          |
|        | 244  | 12 | 3.1.2                         |          |
|        | 38   | 13 | 3.1.3                         |          |
|        | 112  | 14 | 3.1.4                         |          |
|        | 6    | 20 | 3.2.0                         |          |
|        | 40   | 31 | 3.3.1                         |          |
|        | 173  | 32 | 3.3.2                         |          |
|        | 1290 | 88 | Blank but applicable          |          |

NHANES I Electrocardiography Data File

-----  
MINNESOTA CODES  
-----

| Positions |        |    | Item description              |       |
|-----------|--------|----|-------------------------------|-------|
| SAS name  | Counts |    | and code                      | Notes |
| -----     |        |    |                               |       |
| 56-57     |        |    | MC 6 (A-V conduction)         |       |
| ECPMC6    | 4905   | 00 | 6.0                           |       |
|           | 88     | 30 | 6.3                           |       |
|           | 9      | 40 | 6.4                           |       |
|           | 49     | 50 | 6.5                           |       |
|           | 1265   | 88 | Blank but applicable          |       |
| 58        |        |    | MC 7 (Ventricular conduction) |       |
| ECPMC7    | 4803   | 0  | 7.0                           |       |
|           | 19     | 1  | 7.1                           |       |
|           | 88     | 2  | 7.2                           |       |
|           | 217    | 3  | 7.3                           |       |
|           | 123    | 4  | 7.4                           |       |
|           | 298    | 5  | 7.5                           |       |
|           | 17     | 6  | 7.6                           |       |
|           | 751    | 8  | Blank but applicable          |       |

|         |      |                              |
|---------|------|------------------------------|
| 59      |      | MC 9.1 (Low-amplitude QRS)   |
| ECPMC91 | 5823 | 0 9.1.0                      |
|         | 56   | 1 9.1.1                      |
|         | 437  | 8 Blank but applicable       |
| 60      |      | MC 9.3 (High-amplitude P)    |
| ECPMC93 | 6070 | 0 9.3.0                      |
|         | 27   | 3 9.3.3                      |
|         | 219  | 8 Blank but applicable       |
| 61      |      | MC 9.4 (QRS transition zone) |
| ECPMC94 | 2184 | 0 9.4.0                      |
|         | 2860 | 1 9.4.1                      |
|         | 1272 | 2 9.4.2                      |

NHANES I Electrocardiography Data File

-----  
MINNESOTA CODES  
-----

| Positions |        | Item description |       |
|-----------|--------|------------------|-------|
| SAS name  | Counts | and code         | Notes |

|         |      |                           |
|---------|------|---------------------------|
| 62      |      | MC 9.5 (High-amplitude T) |
| ECPMC95 | 4822 | 0 9.5.0                   |
|         | 122  | 5 9.5.5                   |
|         | 1372 | 8 Blank but applicable    |

NHANES I Electrocardiography Data File

-----  
CARDIAC/INFARCTION INJURY SCORE  
-----

| Positions |        | Item description |       |
|-----------|--------|------------------|-------|
| SAS name  | Counts | and code         | Notes |

|         |      |                                     |          |
|---------|------|-------------------------------------|----------|
| 63-65   |      | Cardiac infarction/injury score for | See note |
| ECPCIIS |      | 12-lead ECG multiplied by 10        |          |
|         | 4911 | 000-462                             |          |
|         | 1405 | 888 Blank but applicable            |          |

|          |      |                            |          |
|----------|------|----------------------------|----------|
| 66       |      | Probable infarction/injury | See note |
| ECPCIIS2 | 4789 | 0 Absent                   |          |
|          | 183  | 1 Present                  |          |
|          | 1344 | 8 Blank but applicable     |          |

|          |      |                            |          |
|----------|------|----------------------------|----------|
| 67       |      | Possible infarction/injury | See note |
| ECPCIIS3 | 4791 | 0 Absent                   |          |
|          | 181  | 1 Present                  |          |
|          | 1344 | 8 Blank but applicable     |          |

|          |      |                            |          |
|----------|------|----------------------------|----------|
| 68       |      | Consider infarction/injury | See note |
| ECPCIIS4 | 4660 | 0 Absent                   |          |



|      |   |                      |
|------|---|----------------------|
| 312  | 1 | Present              |
| 1344 | 8 | Blank but applicable |

NHANES I Electrocardiography Data File

-----  
LEFT VENTRICULAR MASS  
-----

| Positions<br>SAS name | Counts | Item description<br>and code             | Notes    |
|-----------------------|--------|--|----------|
| 69-71<br>ECPLVM       | 5739   | ECG estimate of LV mass<br>062-358       | See note |
|                       | 577    | 888 Blank but applicable                 |          |
| 72-74<br>ECPLVMI      | 5806   | ECG estimate of LV mass index<br>041-295 | See note |
|                       | 510    | 888 Blank but applicable                 |          |
| 75<br>ECPLVM3         | 5309   | Probable LVH<br>0 Absent                 | See note |
|                       | 497    | 1 Present                                |          |
|                       | 510    | 8 Blank but applicable                   |          |

NHANES I Electrocardiography Data File

-----  
HEART RATE, BASIC ECG INTERVALS, AND MEAN AXIS DATA  
-----

| Positions<br>SAS name | Counts | Item description<br>and code                 | Notes |
|-----------------------|--------|--|-------|
| 76-78<br>ECPRATE      | 6312   | Heart rate (beats per minute)<br>040-136     |       |
|                       | 4      | 888 Blank but applicable                     |       |
| 79-81<br>ECPPR        | 6311   | PR interval (msec)<br>003-389                |       |
|                       | 5      | 888 Blank but applicable                     |       |
| 82-84<br>ECPQRS       | 6312   | QRS interval (msec)<br>071-203               |       |
|                       | 4      | 888 Blank but applicable                     |       |
| 85-87<br>ECPQT        | 6132   | QT interval (msec)<br>309-527                |       |
|                       | 184    | 888 Blank but applicable                     |       |
| 88-91<br>ECPAXIS1     | 6261   | P axis, frontal plane (degrees)<br>-117-0159 |       |
|                       | 55     | 8888 Blank but applicable                    |       |
| 92-95                 |        | QRS axis, frontal plane (degrees)            |       |

|          |      |                                 |                             |
|----------|------|---------------------------------|-----------------------------|
| ECPAXIS2 | 6280 | -179-0177                       |                             |
|          | 36   | 8888                            | Blank but applicable        |
| 96-99    |      | T axis, frontal plane (degrees) |                             |
| ECPAXIS3 | 6272 | -179-0178                       |                             |
|          | 44   | 8888                            | Blank but applicable        |
| 100-101  |      | Rhythm code                     | See note                    |
| ECPBEAT  | 6210 | 01                              | Sinus rhythm                |
|          | 28   | 02                              | Atrial fibrillation/flutter |
|          | 78   | 88                              | Blank but applicable        |

NHANES I Electrocardiography Data File

-----  
ECG WAVE MEASUREMENTS  
-----

| Positions |        | Item description                 |                      |
|-----------|--------|----------------------------------|----------------------|
| SAS name  | Counts | and code                         | Notes                |
| -----     |        |                                  |                      |
| 102-104   |        | P amplitude, positive phase,     |                      |
| ECPPI     | 6249   | lead II (microvolt (uV))         |                      |
|           | 67     | 000-394                          |                      |
|           |        | 888                              | Blank but applicable |
| 105-107   |        | P duration, lead II (msec)       |                      |
| ECPPI2    | 6249   | 000-169                          |                      |
|           | 67     | 888                              | Blank but applicable |
| 108-110   |        | P amplitude, positive phase,     |                      |
| ECPPI3    | 6243   | lead VI (uV)                     |                      |
|           | 73     | 000-406                          |                      |
|           |        | 888                              | Blank but applicable |
| 111-114   |        | P amplitude, negative phase,     |                      |
| ECPPI4    | 6243   | lead VI (uV)                     |                      |
|           | 73     | -498-0000                        |                      |
|           |        | 8888                             | Blank but applicable |
| 115-118   |        | Q or QS amplitude, lead I (uV)   |                      |
| ECPQA1    | 6236   | 0000-1285                        |                      |
|           | 80     | 8888                             | Blank but applicable |
| 119-122   |        | Q or QS amplitude, lead II (uV)  |                      |
| ECPQA2    | 6249   | 0000-1921                        |                      |
|           | 67     | 8888                             | Blank but applicable |
| 123-126   |        | Q or QS amplitude, lead III (uV) |                      |
| ECPQA3    | 5991   | 0000-2262                        |                      |
|           | 325    | 8888                             | Blank but applicable |
| 127-130   |        | Q or QS amplitude, lead aVL (uV) |                      |
| ECPQA4    | 5773   | 0000-1077                        |                      |
|           | 543    | 8888                             | Blank but applicable |

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions<br>SAS name | Counts      | Item description<br>and code   | Notes |
|-----------------------|-------------|--|-------|
| 131-134<br>ECPQA5     | 6077<br>239 | Q or QS amplitude, lead AVF (uV)<br>0000-1740<br>8888 Blank but applicable |       |
| 135-138<br>ECPQA6     | 6243<br>73  | Q or QS amplitude, lead V1 (uV)<br>0000-2957<br>8888 Blank but applicable  |       |
| 139-142<br>ECPQA7     | 6244<br>72  | Q or QS amplitude, lead V2 (uV)<br>0000-3403<br>8888 Blank but applicable  |       |
| 143-146<br>ECPQA8     | 6246<br>70  | Q or QS amplitude, lead V3 (uV)<br>0000-3726<br>8888 Blank but applicable  |       |
| 147-150<br>ECPQA9     | 6268<br>48  | Q or QS amplitude, lead V4 (uV)<br>0000-2065<br>8888 Blank but applicable  |       |
| 151-154<br>ECPQA10    | 6255<br>61  | Q or QS amplitude, lead V5 (uV)<br>0000-1518<br>8888 Blank but applicable  |       |
| 155-158<br>ECPQA11    | 6216<br>100 | Q or QS amplitude, lead V6 (uV)<br>0000-2000<br>8888 Blank but applicable  |       |
| 159-161<br>ECPQD1     | 6236<br>80  | Q or QS duration, lead I (msec)<br>000-128<br>888 Blank but applicable     |       |
| 162-164<br>ECPQD2     | 6249<br>67  | Q or QS duration, lead II (msec)<br>000-118<br>888 Blank but applicable    |       |

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions<br>SAS name | Counts      | Item description<br>and code   | Notes |
|-----------------------|-------------|--|-------|
| 165-167<br>ECPQD3     | 5991<br>325 | Q or QS duration, lead III (msec)<br>000-126<br>888 Blank but applicable |       |

|         |      |                                   |
|---------|------|-----------------------------------|
| 168-170 |      | Q or QS duration, lead aVL (msec) |
| ECPQD4  | 5773 | 000-134                           |
|         | 543  | 888 Blank but applicable          |
| 171-173 |      | Q or QS duration, lead aVF (msec) |
| ECPQD5  | 6077 | 000-124                           |
|         | 239  | 888 Blank but applicable          |
| 174-176 |      | Q or QS duration, lead V1 (msec)  |
| ECPQD6  | 6243 | 000-152                           |
|         | 73   | 888 Blank but applicable          |
| 177-179 |      | Q or QS duration, lead V2 (msec)  |
| ECPQD7  | 6244 | 000-148                           |
|         | 72   | 888 Blank but applicable          |
| 180-182 |      | Q or QS duration, lead V3 (msec)  |
| ECPQD8  | 6246 | 000-102                           |
|         | 70   | 888 Blank but applicable          |
| 183-185 |      | Q or QS duration, lead V4 (msec)  |
| ECPQD9  | 6268 | 000-106                           |
|         | 48   | 888 Blank but applicable          |
| 186-188 |      | Q or QS duration, lead V5 (msec)  |
| ECPQD10 | 6255 | 000-098                           |
|         | 61   | 888 Blank but applicable          |
| 189-191 |      | Q or QS duration, lead V6 (msec)  |
| ECPQD11 | 6216 | 000-064                           |
|         | 100  | 888 Blank but applicable          |

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions |        | Item description           |       |
|-----------|--------|----------------------------|-------|
| SAS name  | Counts | and code                   | Notes |
| -----     |        |                            |       |
| 192-195   |        | R amplitude, lead I (uV)   |       |
| ECPRA1    | 6236   | 0000-2850                  |       |
|           | 80     | 8888 Blank but applicable  |       |
| 196-199   |        | R amplitude, lead II (uV)  |       |
| ECPRA2    | 6249   | 0000-2773                  |       |
|           | 67     | 8888 Blank but applicable  |       |
| 200-203   |        | R amplitude, lead III (uV) |       |
| ECPRA3    | 5991   | 0000-2835                  |       |
|           | 325    | 8888 Blank but applicable  |       |
| 204-207   |        | R amplitude, lead aVR (uV) |       |
| ECPRA4    | 6270   | 0000-1410                  |       |
|           | 46     | 8888 Blank but applicable  |       |

|         |      |                            |
|---------|------|----------------------------|
| 208-211 |      | R amplitude, lead aVL (uV) |
| ECPRA5  | 5773 | 0000-2624                  |
|         | 543  | 8888 Blank but applicable  |
| 212-215 |      | R amplitude, lead aVF (uV) |
| ECPRA6  | 6077 | 0000-2784                  |
|         | 239  | 8888 Blank but applicable  |
| 216-219 |      | R amplitude, lead V1 (uV)  |
| ECPRA7  | 6243 | 0000-1396                  |
|         | 73   | 8888 Blank but applicable  |
| 220-223 |      | R amplitude, lead V2 (uV)  |
| ECPRA8  | 6244 | 0000-3631                  |
|         | 72   | 8888 Blank but applicable  |
| 224-227 |      | R amplitude, lead V3 (uV)  |
| ECPRA9  | 6246 | 0000-3909                  |
|         | 70   | 8888 Blank but applicable  |

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions |        | Item description            |       |
|-----------|--------|-----------------------------|-------|
| SAS name  | Counts | and code                    | Notes |
| -----     |        |                             |       |
| 228-231   |        | R amplitude, lead V4 (uV)   |       |
| ECPRA10   | 6268   | 0000-3977                   |       |
|           | 48     | 8888 Blank but applicable   |       |
| 232-235   |        | R amplitude, lead V5 (uV)   |       |
| ECPRA11   | 6255   | 0000-3934                   |       |
|           | 61     | 8888 Blank but applicable   |       |
| 236-239   |        | R amplitude, lead V6 (uV)   |       |
| ECPRA12   | 6216   | 0000-3985                   |       |
|           | 100    | 8888 Blank but applicable   |       |
| 240-242   |        | R duration, lead I (msec)   |       |
| ECPRD1    | 6236   | 000-180                     |       |
|           | 80     | 888 Blank but applicable    |       |
| 243-245   |        | R duration, lead II (msec)  |       |
| ECPRD2    | 6249   | 000-148                     |       |
|           | 67     | 888 Blank but applicable    |       |
| 246-248   |        | R duration, lead III (msec) |       |
| ECPRD3    | 5991   | 000-128                     |       |
|           | 325    | 888 Blank but applicable    |       |
| 249-251   |        | R duration, lead aVR (msec) |       |
| ECPRD4    | 6270   | 000-130                     |       |
|           | 46     | 888 Blank but applicable    |       |
| 252-254   |        | R duration, lead aVL (msec) |       |

|         |      |                             |
|---------|------|-----------------------------|
| ECPRD5  | 5773 | 000-166                     |
|         | 543  | 888 Blank but applicable    |
| 255-257 |      | R duration, lead aVF (msec) |
| ECPRD6  | 6077 | 000-140                     |
|         | 239  | 888 Blank but applicable    |

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions<br>SAS name | Counts | Item description<br>and code            | Notes |
|-----------------------|--------|---|-------|
| 258-260<br>ECPRD7     | 6243   | R duration, lead V1 (msec)<br>000-160   |       |
|                       | 73     | 888 Blank but applicable                |       |
| 261-263<br>ECPRD8     | 6244   | R duration, lead V2 (msec)<br>000-150   |       |
|                       | 72     | 888 Blank but applicable                |       |
| 264-266<br>ECPRD9     | 6246   | R duration, lead V3 (msec)<br>000-170   |       |
|                       | 70     | 888 Blank but applicable                |       |
| 267-269<br>ECPRD10    | 6268   | R duration, lead V4 (msec)<br>000-168   |       |
|                       | 48     | 888 Blank but applicable                |       |
| 270-272<br>ECPRD11    | 6255   | R duration, lead V5 (msec)<br>000-170   |       |
|                       | 61     | 888 Blank but applicable                |       |
| 273-275<br>ECPRD12    | 6216   | R duration, lead V6 (msec)<br>000-158   |       |
|                       | 100    | 888 Blank but applicable                |       |
| 276-279<br>ECPSA1     | 6236   | S amplitude, lead I (uV)<br>0000-1517   |       |
|                       | 80     | 8888 Blank but applicable               |       |
| 280-283<br>ECPSA2     | 6249   | S amplitude, lead II (uV)<br>0000-1540  |       |
|                       | 67     | 8888 Blank but applicable               |       |
| 284-287<br>ECPSA3     | 5991   | S amplitude, lead III (uV)<br>0000-3171 |       |
|                       | 325    | 8888 Blank but applicable               |       |

NHANES I Electrocardiography Data File  
 -----

ECG WAVE MEASUREMENTS

| Positions<br>SAS name | Counts      | Item description<br>and code   | Notes |
|-----------------------|-------------|--|-------|
| 288-291<br>ECPSA4     | 6270<br>46  | S amplitude, lead aVR (uV)<br>0000-2386<br>8888 Blank but applicable |       |
| 292-295<br>ECPSA5     | 5773<br>543 | S amplitude, lead aVL (uV)<br>0000-1878<br>8888 Blank but applicable |       |
| 296-299<br>ECPSA6     | 6077<br>239 | S amplitude, lead aVF (uV)<br>0000-2134<br>8888 Blank but applicable |       |
| 300-303<br>ECPSA7     | 6243<br>73  | S amplitude, lead V1 (uV)<br>0000-3346<br>8888 Blank but applicable  |       |
| 304-307<br>ECPSA8     | 6244<br>72  | S amplitude, lead V2 (uV)<br>0000-3992<br>8888 Blank but applicable  |       |
| 308-311<br>ECPSA9     | 6246<br>70  | S amplitude, lead V3 (uV)<br>0000-3976<br>8888 Blank but applicable  |       |
| 312-315<br>ECPSA10    | 6268<br>48  | S amplitude, lead V4 (uV)<br>0000-3182<br>8888 Blank but applicable  |       |
| 316-319<br>ECPSA11    | 6255<br>61  | S amplitude, lead V5 (uV)<br>0000-3157<br>8888 Blank but applicable  |       |
| 320-323<br>ECPSA12    | 6216<br>100 | S amplitude, lead V6 (uV)<br>0000-2689<br>8888 Blank but applicable  |       |

NHANES I Electrocardiography Data File

ECG WAVE MEASUREMENTS

| Positions<br>SAS name | Counts     | Item description<br>and code                                      | Notes |
|-----------------------|------------|---|-------|
| 324-326<br>ECPSD1     | 6236<br>80 | S duration, lead I (msec)<br>000-120<br>888 Blank but applicable  |       |
| 327-329<br>ECPSD2     | 6249<br>67 | S duration, lead II (msec)<br>000-126<br>888 Blank but applicable |       |

|         |      |                             |
|---------|------|-----------------------------|
| 330-332 |      | S duration, lead III (msec) |
| ECPSD3  | 5991 | 000-130                     |
|         | 325  | 888 Blank but applicable    |
| 333-335 |      | S duration, lead aVR (msec) |
| ECPSD4  | 6270 | 000-102                     |
|         | 46   | 888 Blank but applicable    |
| 336-338 |      | S duration, lead aVL (msec) |
| ECPSD5  | 5773 | 000-130                     |
|         | 543  | 888 Blank but applicable    |
| 339-341 |      | S duration, lead aVF (msec) |
| ECPSD6  | 6077 | 000-116                     |
|         | 239  | 888 Blank but applicable    |
| 342-344 |      | S duration, lead V1 (msec)  |
| ECPSD7  | 6243 | 000-142                     |
|         | 73   | 888 Blank but applicable    |
| 345-347 |      | S duration, lead V2 (msec)  |
| ECPSD8  | 6244 | 000-144                     |
|         | 72   | 888 Blank but applicable    |
| 348-350 |      | S duration, lead V3 (msec)  |
| ECPSD9  | 6246 | 000-140                     |
|         | 70   | 888 Blank but applicable    |

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions |        | Item description           |       |
|-----------|--------|----------------------------|-------|
| SAS name  | Counts | and code                   | Notes |
| 351-353   |        | S duration, lead V4 (msec) |       |
| ECPSD10   | 6268   | 000-144                    |       |
|           | 48     | 888 Blank but applicable   |       |
| 354-356   |        | S duration, lead V5 (msec) |       |
| ECPSD11   | 6255   | 000-140                    |       |
|           | 61     | 888 Blank but applicable   |       |
| 357-359   |        | S duration, lead V6 (msec) |       |
| ECPSD12   | 6216   | 000-122                    |       |
|           | 100    | 888 Blank but applicable   |       |
| 360-363   |        | R' amplitude, lead I (uV)  |       |
| ECPRPA1   | 6236   | 0000-1046                  |       |
|           | 80     | 8888 Blank but applicable  |       |
| 364-367   |        | R' amplitude, lead II (uV) |       |
| ECPRPA2   | 6249   | 0000-2003                  |       |
|           | 67     | 8888 Blank but applicable  |       |



|                    |             |   |
|--------------------|-------------|---|
| 368-371<br>ECPRPA3 | 5991<br>325 | R' amplitude, lead III (uV)<br>0000-1425<br>8888 Blank but applicable |
| 372-375<br>ECPRPA4 | 6270<br>46  | R' amplitude, lead aVR (uV)<br>0000-0516<br>8888 Blank but applicable |
| 376-379<br>ECPRPA5 | 5773<br>543 | R' amplitude, lead aVL (uV)<br>0000-2140<br>8888 Blank but applicable |
| 380-383<br>ECPRPA6 | 6077<br>239 | R' amplitude, lead aVF (uV)<br>0000-1807<br>8888 Blank but applicable |

NHANES I Electrocardiography Data File

-----  
ECG WAVE MEASUREMENTS  
-----

| Positions<br>SAS name | Counts      | Item description<br>and code   | Notes |
|-----------------------|-------------|--|-------|
| -----                 |             |  |       |
| 384-387<br>ECPRPA7    | 6243<br>73  | R' amplitude, lead V1 (uV)<br>0000-1437<br>8888 Blank but applicable |       |
| 388-391<br>ECPRPA8    | 6244<br>72  | R' amplitude, lead V2 (uV)<br>0000-3491<br>8888 Blank but applicable |       |
| 392-395<br>ECPRPA9    | 6246<br>70  | R' amplitude, lead V3 (uV)<br>0000-2911<br>8888 Blank but applicable |       |
| 396-399<br>ECPRPA10   | 6268<br>48  | R' amplitude, lead V4 (uV)<br>0000-2908<br>8888 Blank but applicable |       |
| 400-403<br>ECPRPA11   | 6255<br>61  | R' amplitude, lead V5 (uV)<br>0000-3245<br>8888 Blank but applicable |       |
| 404-407<br>ECPRPA12   | 6216<br>100 | R' amplitude, lead V6 (uV)<br>0000-1560<br>8888 Blank but applicable |       |
| 408-411<br>ECPJ1      | 6236<br>80  | J amplitude, lead I (uV)<br>-233-0139<br>8888 Blank but applicable   |       |
| 412-415<br>ECPJ2      | 6249<br>67  | J amplitude, lead II (uV)<br>-231-0261<br>8888 Blank but applicable  |       |
| 416-419               |             | J amplitude, lead III (uV)   |       |

ECPJ3            5991    -234-0247  
                   325    8888   Blank but applicable

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions<br>SAS name | Counts      | Item description<br>and code   | Notes |
|-----------------------|-------------|--|-------|
| 420-423<br>ECPJ4      | 6270<br>46  | J amplitude, lead aVR (uV)<br>-184-0212<br>8888 Blank but applicable |       |
| 424-427<br>ECPJ5      | 5773<br>543 | J amplitude, lead aVL (uV)<br>-193-0398<br>8888 Blank but applicable |       |
| 428-431<br>ECPJ6      | 6077<br>239 | J amplitude, lead aVF (uV)<br>-256-0179<br>8888 Blank but applicable |       |
| 432-435<br>ECPJ7      | 6243<br>73  | J amplitude, lead V1 (uV)<br>-390-0589<br>8888 Blank but applicable  |       |
| 436-439<br>ECPJ8      | 6244<br>72  | J amplitude, lead V2 (uV)<br>-427-0455<br>8888 Blank but applicable  |       |
| 440-443<br>ECPJ9      | 6245<br>71  | J amplitude, lead V3 (uV)<br>-606-0362<br>8888 Blank but applicable  |       |
| 444-447<br>ECPJ10     | 6267<br>49  | J amplitude, lead V4 (uV)<br>-621-0345<br>8888 Blank but applicable  |       |
| 448-451<br>ECPJ11     | 6255<br>61  | J amplitude, lead V5 (uV)<br>-919-0363<br>8888 Blank but applicable  |       |
| 452-455<br>ECPJ12     | 6216<br>100 | J amplitude, lead V6 (uV)<br>-383-0288<br>8888 Blank but applicable  |       |

NHANES I Electrocardiography Data File

-----  
 ECG WAVE MEASUREMENTS  
 -----

| Positions<br>SAS name | Counts | Item description<br>and code | Notes |
|-----------------------|--------|------------------------------|-------|
|-----------------------|--------|------------------------------|-------|

```

-----
  456-460      Negative T amplitude, lead I (uV)
ECPNTA1      6236      -0549-00000
              80      88888 Blank but applicable

  461-464      Negative T amplitude, lead II (uV)
ECPNTA2      6249      -407-0000
              67      8888  Blank but applicable

  465-468      Negative T amplitude, lead III (uV)
ECPNTA3      5991      -523-0000
              325     8888  Blank but applicable

  469-472      Negative T amplitude, lead aVR (uV)
ECPNTA4      6270      -671-0000
              46      8888  Blank but applicable

  473-476      Negative T amplitude, lead aVL (uV)
ECPNTA5      5773      -588-0000
              543     8888  Blank but applicable

  477-480      Negative T amplitude, lead aVF (uV)
ECPNTA6      6077      -368-0000
              239     8888  Blank but applicable

  481-484      Negative T amplitude, lead V1 (uV)
ECPNTA7      6243      -765-0000
              73      8888  Blank but applicable

  485-489      Negative T amplitude, lead V2 (uV)
ECPNTA8      6244      -0650-00000
              72      88888 Blank but applicable

  490-494      Negative T amplitude, lead V3 (uV)
ECPNTA9      6246      -0609-00000
              70      88888 Blank but applicable

```

NHANES I Electrocardiography Data File

```

-----
                        ECG WAVE MEASUREMENTS
-----

```

| Positions |        | Item description                   |       |
|-----------|--------|------------------------------------|-------|
| SAS name  | Counts | and code                           | Notes |
| 495-499   |        | Negative T amplitude, lead V4 (uV) |       |
| ECPNTA10  | 6268   | -1328-00000                        |       |
|           | 48     | 88888 Blank but applicable         |       |
| 500-504   |        | Negative T amplitude, lead V5 (uV) |       |
| ECPNTA11  | 6255   | -1414-00000                        |       |
|           | 61     | 88888 Blank but applicable         |       |
| 505-509   |        | Negative T amplitude, lead V6 (uV) |       |
| ECPNTA12  | 6216   | -1154-00000                        |       |
|           | 100    | 88888 Blank but applicable         |       |

|                    |             |   |
|--------------------|-------------|---|
| 510-513<br>ECPPTA1 | 6236<br>80  | Positive T amplitude, lead I (uV)<br>0000-0652<br>8888 Blank but applicable   |
| 514-517<br>ECPPTA2 | 6249<br>67  | Positive T amplitude, lead II (uV)<br>0000-0824<br>8888 Blank but applicable  |
| 518-521<br>ECPPTA3 | 5991<br>325 | Positive T amplitude, lead III (uV)<br>0000-0624<br>8888 Blank but applicable |
| 522-525<br>ECPPTA4 | 6270<br>46  | Positive T amplitude, lead aVR (uV)<br>0000-0507<br>8888 Blank but applicable |
| 526-529<br>ECPPTA5 | 5773<br>543 | Positive T amplitude, lead aVL (uV)<br>0000-0619<br>8888 Blank but applicable |
| 530-533<br>ECPPTA6 | 6077<br>239 | Positive T amplitude, lead aVF (uV)<br>0000-0722<br>8888 Blank but applicable |

NHANES I Electrocardiography Data File

-----  
ECG WAVE MEASUREMENTS  
-----

| Positions |        | Item description |       |
|-----------|--------|------------------|-------|
| SAS name  | Counts | and code         | Notes |

-----

|                     |             |  |
|---------------------|-------------|--|
| 534-537<br>ECPPTA7  | 6243<br>73  | Positive T amplitude, lead V1 (uV)<br>0000-1156<br>8888 Blank but applicable |
| 538-541<br>ECPPTA8  | 6244<br>72  | Positive T amplitude, lead V2 (uV)<br>0000-1897<br>8888 Blank but applicable |
| 542-545<br>ECPPTA9  | 6246<br>70  | Positive T amplitude, lead V3 (uV)<br>0000-1760<br>8888 Blank but applicable |
| 546-549<br>ECPPTA10 | 6268<br>48  | Positive T amplitude, lead V4 (uV)<br>0000-1748<br>8888 Blank but applicable |
| 550-553<br>ECPPTA11 | 6255<br>61  | Positive T amplitude, lead V5 (uV)<br>0000-1831<br>8888 Blank but applicable |
| 554-557<br>ECPPTA12 | 6216<br>100 | Positive T amplitude, lead V6 (uV)<br>0000-1691<br>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 transects 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<br>except 1.2.8 | Highest code in<br>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<br>coded in NHANES I |
| WPW pattern                      | 6.4                        |  |
| Artificial pacemaker             | 6.8                        | Coded visually, not<br>coded in NHANES I |
| Ventricular conduction<br>defect | 7.1 or 7.2 or 7.4          |  |
| Atrial fibrillation<br>/flutter  | 8.3                        | Coded visually                           |
| 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<br>block | 7.7          |                     |

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).

$$\begin{aligned} \text{ANG}(1) &= \text{ARCTG} (1.16 \times A(\text{aVF}), A(\text{I})), \\ \text{ANG}(2) &= \text{ARCTG} (A(\text{II}), 1.16 \times A(\text{aVF})), \\ \text{ANG}(3) &= \text{ARCTG} (1.16 \times A(\text{aVR}), A(\text{III})) + 120 \end{aligned}$$

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<br>(LAD) | Borderline left axis deviation  |
| 2.1.2 | from -89 to -30 degrees         | LAD                             |
| 2.2.1 | from 91 to 119 degrees<br>(RAD) | Borderline right axis deviation |
| 2.2.2 | from 120 to 150 degrees         | RAD                             |
| 3.3   | from 149 to 90 degrees          | Extreme axis deviation          |
| 2.4   |                                 | Indeterminate QRS axis          |

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  $\geq 20$   
 Possible infarction  $15 \leq \text{CIIS} < 20$   
 Consider infarction  $10 \leq \text{CIIS} < 15$

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 ( $\bar{x}V$ )           | 0.0217   | 0.0100   |
| Q or S amplitude in V1 ( $\bar{x}V$ )*     | 0.0338   | 0.0203   |
| Q or S amplitude in III ( $\bar{x}V$ )*    | 0.0600   | 0.0287   |
| Negative T amplitude in V6 ( $\bar{x}V$ )  | 0.3158   | 0.1819   |
| Positive T amplitude in aVR ( $\bar{x}V$ ) | -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 ( $\bar{x}V$ )          | 0.0320   | --      |
| R amplitude in V5 ( $\bar{x}V$ )           | 0.0233   | 0.0178  |
| Q or S amplitude in V5 ( $\bar{x}V$ )*     | 0.0693   | 0.0528  |
| Q or S amplitude in I ( $\bar{x}V$ )*      | -0.1545  | -0.1128 |
| Positive T amplitude in V1 ( $\bar{x}V$ )  | 0.1122   | 0.1075  |
| Negative T amplitude in aVF ( $\bar{x}V$ ) | --       | 0.1701  |
| Positive T amplitude in V6 ( $\bar{x}V$ )  | -0.1236  | -0.0939 |
| Intercept                                  | 134.7722 | 88.4357 |

Black Women

| Variables                         | LVM | LVMI   |
|-----------------------------------|-----|--------|
| R amplitude in aVL ( $\bar{x}V$ ) | --  | 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/m<sup>2</sup>  
 Females > 120 g/m<sup>2</sup>

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.

## References

Blackburn H, Keys A, Simonson E, Rautaharju PM and Punsar S. The electrocardiogram in population studies: A classification system. *Circulation* 1960;21:1160-1175.

Levy D, Savage DD, Garrison RJ, Anderson KM, Kannel WB, Castelli WP. Echocardiographic criteria for left ventricular hypertrophy: The Framingham Heart Study. *Am J Cardiol* 1987;59:956-60.

National Center for Health Statistics. Ingram DD, Makuc DM. Statistical issues in analyzing the NHANES I epidemiologic followup study. Vital and Health Statistics, Series 2, Number 92. DHHS Pub. No. (PHS) 94-1395. Public Health Service. Washington. U.S. Government Printing Office. May., 1994.



National Center for Health Statistics. Landis JR, Lepkowski JM, Eklund SA, Stehouwer SA. A statistical Methodology for Analyzing Data from a Complex Survey: The First National Health and Nutrition Examination Survey. Vital and Health Statistics. Series 2, No. 92. DHHS Pub. No. (PHS) 82-1366. Public Health Service. Washington. U.S. Government Printing Office. Sept., 1982.

National Center for Health Statistics. Miller HW: Plan and Operation of the Health and Nutrition Examination Survey, United States 1971-73. Vital and Health Statistics. Series 1, Nos 10a and 10b. DHEW Pub. No. (Stat.) 73-1310. Health Services and Mental Health Administration, Washington. DC. U.S. Government Printing Office. Feb 1973.

National Center for Health Statistics. Engel A, Murphy RS, Maurer K, Collins E. Plan and Operation of the HANES I Augmentation Survey of Adults 25-74 Years, United States, 1974-75. Vital and Health Statistics. Series 1, No 14. DHEW Pub. No. (PHS) 78-1314. Public Health Service. Washington. U.S., Government Printing Office, June 1978.

Plan and Operation of the Second National Health and Nutrition Examination Survey. 1976-1980. Vital and Health Statistics. Series 1, No. 15. DHEW Pub. No. (PHS) 81-1317. Public Health Services, Washington. DC. U.S. Government Printing Office.

Prineas RJ, Crow RS and Blackburn H. The Minnesota Code Manual of Electrocardiographic findings. Standards and Procedures for Measurement and Classification. John Wright. PSG Inc. Boston, Bristol, London, 1982

Rautaharju PM, Wolf HK, Eifler WL, Blackburn H. A simple procedure for positioning precordial ECG and VCG electrodes using an electrode locator. Journal of Electrocardiology 1976;9:35-40.

Rautaharju PM, Warren J, Jain U, Wolf HK and Nielsen CL. Cardiac infarction injury score: An electrocardiographic coding scheme for ischemic heart disease. Circulation 1981;64:249-256.

Rautaharju PM, LaCroix AZ, Savage DD, Haynes S, Madans JH, Wolf HK, Hadden W, Keller J, Cornoni-Huntly J. Electrocardiographic estimate of left ventricular mass vs. radiographic cardiac size and the risk of cardiovascular disease mortality in the epidemiologic follow-up study of the First National Health and Nutrition Examination Survey. Am J Cardiol 1988;62:59-68.

Rautaharju PM, MacInnis PJ, Warren JW, Wolf HK, Rykers PM, Calhoun HP. Methodology of ECG Interpretation in the Dalhousie Program: NOVACODE ECG classification procedures for clinical trials and population health surveys. Methods of Information in Medicine 1990;29:362-74.

Rautaharju PM, Manolio TA, Siscovick D, Zhou SH, Gardin LM, Furberg CD, Borhani NO, Newman A. Classification accuracy of electrocardiographic criteria for left ventricular hypertrophy in normal weight and overweight older adults: The Cardiovascular Health Study. Annals Noninvasive Electrocardiology 1996;1:121-32.

Rowland M, Parsons V, Makuc D. Simplified design structures for NHANES I variance estimation. Proceeding American Statistical Association, 1988:773-76.

U.S. Department of Health and Human Services (DHHS). National Center for Health Statistics. Third National Health and Nutrition Examination Survey, 1988-94, Plan and Operations Procedures Manuals (CD-ROM). Hyattsville, Md.: Centers for Disease Control and Prevention, 1996. Available from National

Technical Information Service (NTIS), Springfield, Va. Acrobat .PDF format;  
includes access software: Adobe Systems Inc. Acrobat Reader 2.0).