

97



INSTRUCTION MANUAL

Data Collection

PART **15a**

HANES II

Examination Staff Procedures Manual for the Health and Nutrition Examination Survey, 1976-1979

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Office of Health Research, Statistics, and Technology
National Center for Health Statistics



INSTRUCTION MANUAL

Data Collection

PART

15a

HANES II

Examination Staff Procedures Manual for the Health and Nutrition Examination Survey, 1976-1979

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Office of Health Research, Statistics, and Technology
National Center for Health Statistics

CONTENTS

Page

PART I. INTRODUCTION

Chapter 1. The Health and Nutrition Examination Survey	
General -----	1-1
Purpose and Plan-----	1-2
Description of the Examination-----	1-2
Chapter 2. Quality Control in Data Collection	
General -----	2-1
Recording-----	2-2
Replicate Data -----	2-2
Chapter 3. Responsibilities of Examination Staff Members	
Medical Policy Regarding the Examination-----	3-1
Responsibilities of All Staff Members-----	3-1
Responsibilities for Completing the Control Record -----	3-13
Responsibilities for Completing the Report of Findings to Physician -----	3-14
Responsibilities for Checking HANES Documents in the Field --	3-14
Chapter 4. Emergency Medical Procedures	
Procedure-----	4-1

PART II. PROCEDURES

Chapter 5. Coordinator	
General -----	5-1
Beginning of Stand-----	5-1
Before the Examination Session -----	5-1
During the Examination Session-----	5-1
End of Stand-----	5-3
Communication Between FOM and Examination Staff -----	5-3
Chapter 6. Dietary Interview	
Procedure-----	6-1
Guidelines for Completing Dietary Forms -----	6-5
Guide for Use of Food Models-----	6-16
Chapter 7. Physician's Examination	
General -----	7-1
Format for the Examination -----	7-1
Examination Procedure-----	7-2
Recording of Findings-----	7-3
Criteria and Definitions-----	7-4

Contents-Con.

	Page
Chapter 8. Blood Pressure	
Equipment-----	8-1
Procedure-----	8-1
Chapter 9. Venipuncture	
Equipment-----	9-1
Procedure-----	9-1
Hematology-----	9-1
Other Blood Assessments-----	9-2
Shipping Instructions-----	9-3
Chapter 10. Urine Collection and Testing	
Equipment-----	10-1
General-----	10-1
Collection Procedure-----	10-1
Testing Procedures-----	10-2
Chapter 11. Electrocardiography and Spirometry	
Equipment-----	11-1
Electrocardiography-----	11-6
Spirometry-----	11-12
Chapter 12. Allergy Test	
Equipment-----	12-1
General-----	12-1
Procedure-----	12-1
Emergency Procedure-----	12-4
Antigen Care-----	12-5
Chapter 13. X-Ray	
Restrictions-----	13-1
Radiation Badges-----	13-1
X-Ray Exposures-----	13-1
Procedures-----	13-2
Chapter 14. Body Measurements	
Equipment-----	14-1
General-----	14-1
Measuring and Recording-----	14-1
Procedure for Measuring Examinees 8 Years and Over-----	14-2
Procedure for Measuring Children Under 8 Years Old-----	14-5
Measurement Procedure for Neck and Lower Back of Examinees	
18 Years and Over-----	14-6
Field Checks-----	14-9
Replicates-----	14-10

Contents-Con.

	Page
Chapter 15. Audiometry and Speech Screening Examination	
Equipment-----	15-1
Setup-----	15-1
Daily Field Checks—Audiometer-----	15-2
Equipment Care-----	15-3
Field Calibration-----	15-3
Environmental Noise Survey-----	15-5
Audiometric Testing Procedures-----	15-6
Speech Screening Examination-----	15-12
Speech Screening Examination Sentences-----	15-15
Chapter 16. Questionnaires	
General-----	16-1
Health History Supplement (Ages 12-74 Years)-----	16-1
Behavior Questionnaire (Ages 25-74)-----	16-2

PART I. INTRODUCTION

Chapter 1

THE HEALTH AND NUTRITION EXAMINATION SURVEY

General

In 1956 the Congress authorized the U.S. Public Health Service to conduct a continuing National Health Survey to obtain information on the health of the American people. This information is obtained in several ways—a household health interview survey, a family of surveys of health resources, and a health examination survey. In the latter, actual health examinations and tests can yield morbidity information that is unobtainable through the other programs of the National Health Survey.

There are several advantages to such a survey. Information can be obtained about diagnosed conditions including those which persons may fail to report or may be incapable of reporting in a survey based upon individual interviews and previously undiagnosed, unattended, and nonmanifested chronic diseases. In addition, all procedures, tests and measurements can be carried out in a uniform and standard manner.

The data collected by this survey are therefore useful for a variety of reasons. The obvious are to determine the prevalence of specific diseases and to obtain baseline data on certain nutritional, physical, psychological, and physiological measurements for better understanding of departures from norms. The data also help public officials and medical care providers to make more efficient use of health funds in planning for medical and health care services, research, and education.

Analysis of the data can also be made in relation to numerous socioeconomic and demographic data to determine such things as missing nutrients from the diets of parts of our population and differing health patterns between areas of the U.S., to name but two.

Since the first survey began in 1959, some 45,000 Americans of all ages have participated voluntarily in four separate surveys. Each of the first three surveys has had a target population of a specific age group with the examination content focused on certain specified health aspects of that subpopulation. The fourth survey differed in its intent and purpose from the first three in that it surveyed persons between the ages of 1 and 74 rather than those of a smaller age segment and that for the first time an extensive evaluation was to be made of the nutritional status of that population. In addition, measures were taken of the prevalence of chronic pulmonary disease, disabling arthritis of the hip or knee, and cardiovascular disease in adults from 25 to 74 years. This survey, named the Health and Nutrition Examination Survey (HANES I), was completed in late 1975.

The individuals in all of these surveys were selected through the use of a nationwide probability sample of the civilian noninstitutionalized population of the United States. The use of such a procedure makes it possible to obtain the desired statistics efficiently, economically, and in such a manner that the statistical reliability of the results is determinable. In all, more than 90 reports relating to findings of these surveys have been published and widely distributed.

Purpose and Plan

The current program, HANES II, will provide the first look at changes in the nutritional status of the population over time through data on dietary intake, laboratory tests, body measurements, and clinical assessments of persons 6 months to 74 years old. In addition, the prevalence of the following conditions in certain age segments of the population will be measured: diabetes, kidney disease, heart disease, liver disease, hypertension, allergies, disc degeneration in the cervical and lumbar spines, pulmonary function, and hearing and speech problems.

Description of the Examination

Examinations are given in two mobile health examination centers, each of which consists of three specially built and equipped trailers. The examination teams include physicians, nurses, dietary interviewers, and medical and laboratory technicians. There is no cost to participants, and transportation to and from the examination is provided.

Questionnaires are used to obtain basic demographic and socioeconomic characteristics, medical history data, and information on dietary intake for all persons in the sample.

The examination consists of a general medical examination by a physician and, depending on age, some or all of the following: an electrocardiograph; X-rays of the chest and cervical and lumbar spines; audiometry; spirometry; allergy tests; and anthropological measurements. For women there is an optional breast examination. In addition, numerous laboratory tests are performed on whole blood, serum, plasma, and urine.

At the mobile examination center urine specimens are screened for the presence of glucose, albumin, blood, urobilinogen, bilirubin, and ketones. Hematological tests are performed including determination of hemoglobin, hematocrit, red and white cell counts, and screening for hemoglobinopathies. Biochemical analyses performed on specimens of serum or plasma include assays for vitamins A, C, and B12; serum albumin; serum folates; serum cholesterol; triglycerides; bile salts; SGOT; alkaline phosphatase; lead; zinc; copper; iron; iron binding capacity; creatinine; ferritin; protoporphyrin; carboxyhemoglobin; pesticides; and syphilis. Biochemical testing is performed in a thoroughly standardized manner at the laboratories of the Center for Disease Control at Atlanta, Georgia. Personnel of the center also assist in developing procedures for obtaining and shipping specimens and for the quality control procedures used in the field. Pesticide measures are performed by the Environmental Protection Agency, and lipids are measured by the George Washington University, Lipid Research Clinic.

All information collected is held in strict confidence. Clinical and laboratory data from the examination are mailed to the examinee's physician or medical facility if authorized by the examinee. No treatments or medical advice are given to the examinees by the examining staff. It is hoped that any necessary followup care will be directed by the examinee's own physician.

Chapter 2

QUALITY CONTROL IN DATA COLLECTION

General

There are two sources of error that may enter into a sample survey—sampling error and nonsampling error. The sampling error—error due to making measurements on a sample rather than on the entire population—can be quantified and is the concern of all statisticians in sample survey design.

The less heralded but equally important nonsampling error is often neglected in sampling texts but is infallibly present in all data gathering ventures. It is on the control of nonsampling error that quality control centers. Much time and effort in the Health and Nutrition Examination Survey are devoted to reducing nonsampling error and to collecting data that are of a high degree of quality.

One type of nonsampling error which occurs in voluntary surveys is the bias introduced by nonresponse. In the three cycles before the HANES I program, the response rates were 86.5, 96.0, and 90.1, respectively. These high response rates resulted from advance planning and publicity, from much diligent work by interview personnel, by proper handling of examinees by the entire staff, the young age groups in Cycles II and III, and the generally favorable attitude of the public toward surveys and government programs. With respect to the latter, it has been recognized both in the private sector and by government agencies that it has become increasingly difficult over the past 10 years to obtain good response rates.

One significant change in the design of HANES II which may help to increase the response rate is a reduction in the geographic size of the sample area from which the sample persons are selected. This will result in decreasing the travel time and distance for many examinees from their residences to the examination center. Improvements in interviewing procedures, followup procedures, and visual aids will also help the survey obtain a HANES II response rate that is higher than that in HANES I.

More closely related to the purposes of this manual are the nonsampling errors which may be introduced by variabilities and biases associated with the examiners, and the mechanical devices used. Many machines, some simple and some complex, are used in HANES. With proper calibration and maintenance the errors associated with these devices can be controlled. Instructions for the calibration and maintenance of equipment are found in this manual. Bearing in mind the potential uses of the data we adopt procedures that will reduce examiner and subject errors; but in general we cannot design procedures that will eliminate errors. However, certain types of examiner and subject errors can be readily identified and controlled.

Several measures are taken to assure completeness and consistency in the recording process. All questionnaires are reviewed for omissions and inconsistencies. If errors are noted, correct information is obtained by phone or from the examinee when he comes in for the examination. Errors in recording some measurements are reduced by having a second person act as a recorder. In addition, all data gathered in the examining center are reviewed by a designated exam staff member before the examinees leave. Records of unusual occurrences which may affect the validity of the data are also maintained.

Although emphasis is placed on doing examinations in a uniform and standard manner in the staff training (and retraining) periods, drift in technique is apt to occur in lengthy surveys such as HANES. It is intended that this manual be used as a reference to help standardize procedures and reduce errors throughout the entire HANES.

Recording

Just as uniformity and standardization are important in performing the procedures of the health examination, these same two characteristics are vital to recording the observations or measurements which are the result of the procedures. Accuracy and precision again are important, as well as an additional characteristic—legibility. A scrawled entry which cannot be read is no entry at all—it is lost data.

Completeness in recording is something that is often overlooked. We do not mean here, long, drawn-out wordy entries. Rather we do mean being sure not to omit entries—of course the entries should be accurate, precise, and legible.

We will have unavoidable losses of data—no X-rays on some, inability to obtain optimal performances of some procedures, and so forth. The examining staff are expected to use discretion regarding these unavoidable losses—to stop procedures occasionally when it is apparent that examinees cannot cooperate despite your best efforts. It is the avoidable loss of data that is the responsibility of each staff member to prevent. When no entry is possible, indicate this and the reason. Most sections of the record now make provision for this and should be used when necessary. Care should be taken not to write in any of the spaces set aside for coding.

To summarize:

- A good record is the other half of a good observation; neither is adequate without the other.
- Recording requires UNIFORMITY, ACCURACY, PRECISION, LEGIBILITY, and COMPLETENESS.
- Each staff member should review each case record section as soon as he has finished making entries to be sure there are no avoidable omissions, other errors, or shortcomings.

Replicate Data

Despite precautions there are biases and variable measurement errors that cannot be or are not judged important enough to be eliminated. Another objective of the quality control program, therefore, is the determination of the extent of these errors. In HANES the primary means for evaluating both types of error is by replicate measurements. Replicate data are obtained basically in two ways: by reevaluating or rereading a hard document or by reproducing an actual measurement, either by the usual procedure or by a standard procedure. Although hard documents such as the weight and height measurements are reevaluated, the replicate program is primarily concerned with reproducing actual measurements.

During the actual operation of the survey, the primary use of replicate data is in indicating areas where retraining or reevaluation of procedures is needed. When the reports of findings of the survey are published, data from the replicates will be used to apprise the reader of the extent to which the data may be affected by measurement error and to call his attention to this problem.

Replicate data are gathered in many specific areas of the examination with varying degrees of frequency. For example, replicate measurements are made as frequently as on every examinee for measurements such as spirometry and hematocrit. A body measurement replicate is done every fourth examination session; thus we have these replicates on about 3-4 percent of the examinees. Additional blood is drawn from a systematic subsample of examinees. The blood sample is split and sample numbers assigned so that the paired samples cannot be identified as originating from single examinees by the laboratory doing the determinations. Evaluation performed upon receipt of results will also be used in the final evaluation of measurement process error. In addition, each laboratory has its own quality control procedures which include the use of standards and repeated determinations. Although replicates are performed for a different purpose the data are preserved and in previous Division of Health Examination Statistics surveys have proved useful for indicating the extent of error in final evaluations.

Chapter 3

RESPONSIBILITIES OF EXAMINATION STAFF MEMBERS

Medical Policy Regarding the Examination

We are in the business of collecting data for statistical analyses. We are not set up to treat or manage a particular medical problem, nor are we meant to do any such treatment. Indeed, in most instances the examining physician will not be licensed within the State in which the examinations are being conducted. Because of these as well as other reasons certain policies must be followed.

An individual examinee should not be given any information on the findings of the examination except where medical advice of a very general, noncontroversial nature would be beneficial to the examinee. A single examination often does not allow an adequate interpretation of findings nor the best specific advice to give to an examinee. Only the examinee's personal physician or clinic physician who has the individual's long-term records available and who is primarily involved with the long-term care and followup of the examinee should interpret the findings for the individual and decide what to tell the person. For this reason reports of findings are sent to the physician or clinic the examinee indicates. For each person undergoing the examination the report summary is sent to the physician along with a Center for Disease Control (CDC) laboratory report. In addition, an electrocardiogram (ECG) tracing and a copy of the chest X-ray are sent if the examinee received those procedures. The examinee is encouraged to contact his physician or clinic for results.

Whenever a condition is found (such as abdominal mass or otitis media) which in the opinion of the examining physician requires early medical care, the examining physician should contact the personal physician or clinic named on the consent form the examinee has given, indicating the presence of the condition after consulting with other staff members to determine whether other findings should also be reported.

When in such a circumstance the examinee has not indicated a physician, appropriate referral should be made depending upon the locality, using the advice of local medical authorities. This may vary from referral to a medical center clinic or emergency room to referral to a private physician nearby listed on the medical society roster for such matters. The medical advisors of the survey should be informed of all physician, nurse, or clinic contacts.

In other cases when it is advisable or necessary to transfer medical findings, laboratory data, X-rays, or electrocardiograms to the examinee's physician before routine reporting of the results, the physician should check that a consent form has been signed and send either a copy of the report form or an official Health and Nutrition Examination Survey (HANES) letter with the phone number and address of the examination center.

As a matter of policy, when male physicians are examining female examinees either the nurse or another adult female should be present in the examining room.

Responsibilities of All Staff Members

Membership in the Health and Nutrition Examination Survey carries with it many responsibilities. Not the least of these is your responsibility to recognize that

you are one member of a team of professional and paraprofessional persons upon whom certain demands have been placed in order to accomplish the overall task of the Health and Nutrition Examination Survey. You should be aware of and respect the job demands placed upon other staff members, should maintain an attitude of tolerance and consideration for fellow members of the team, and should willingly perform the extra tasks that may occasionally be assigned to support other staff members in the performance of their duties.

Each member has a responsibility to the Public Health Service for promoting good public relations. The Public Health Service will be judged by the actions of the staff both on and off duty. You must be discreet in speech and actions. You should refrain from any discussions about an examinee which might be overheard and from any discussions of the survey which might be overheard and unfavorably misinterpreted. You should exercise good judgment in any discussion of controversial subjects. You should be conscious of the customs of the area and should avoid any actions which might reflect unfavorably upon the Public Health Service or interfere with the work of the survey. Your personal appearance and behavior must be governed by these same considerations.

The examinee should be treated courteously as a person, not as a sample number. Exchanges of information between staff members for the better understanding of an examinee must be discreet.

Each individual staff member is the first and best guarantor of the quality of the data being collected. As such you have a responsibility for quality in every single step of the examination process. The most obvious methods of assuring quality are to perform procedures with accuracy, precision, and in a uniform manner according to instructions and to record completely, accurately, uniformly, and legibly. You are urged to suggest areas where quality control procedures need to be instituted and methods for their implementation.

All staff members may be required to drive a government, private rental, or privately owned automobile to transport examinees to and from the examination center or to accompany the examinees by taxicab or public transportation. Staff members may be requested to perform tasks not directly related to their specific professional skills in order to implement the overall organization. Staff members are responsible for appropriate care and safeguarding of expensive portable equipment such as cameras, tape recorders, etc., used during the examination, including storing and locking in instances where applicable.

1. Coordinator

In addition to the general responsibilities of all staff members it is the responsibility of the coordinator to:

- a. Coordinate the flow of examinees through the examination center according to the procedure described in Chapter 5.
- b. Carry out the other coordinator duties described in Chapter 5.
- c. Try to make each examinee as comfortable as possible while he is in the examination center.
- d. Complete and review certain parts of the physician's "Report of Findings" and to review certain completed records according to the instructions in this chapter.
- e. Check all rooms before leaving the trailers to see that all expensive portable equipment is stored and locked, and to see that all doors are locked when she leaves.

- f. See that certain data are transmitted from the field according to the instructions in Chapter III of the HANES Field Staff Operations Manual.

2. Health Technicians

a. Responsibilities related to examinations

In addition to the general responsibilities of all staff members it is the responsibility of the health technicians to:

- (1) Arrive for work 30 minutes before the first examinees scheduled.
- (2) Do the necessary calibrations and maintenance before each session as specified in this manual.
- (3) Carry out all parts of the examination completely and in a uniform way according to the procedures described in this manual.
- (4) Do the following exams: X-rays, allergy testing, ECG, spirometry, audiometry and speech testing, and body measurements.
- (5) Administer the Health History Supplement and Behavior Questionnaire.
- (6) Screen examinees before pulmonary function testing unless the physician has already seen the examinees. All examinees who the technicians think have contraindications to testing should, before testing, be examined by the physician who will decide whether or not any test should be omitted.
Since maximum expiration puts strain on many areas of the body, absolute rules would be voluminous for screening examinees before spirometry. Hence, a check must be made to determine if there is any reason why the examinee should not perform this maneuver. For young children ask the accompanying parent if there is any reason why the child should not blow into the spirometer. For older examinees the technician can question the sample person directly. In each case explain the strain of blowing maximally. Ask specifically if he has had heart disease, angina or chest pains, tuberculosis, surgery on his abdomen or chest in the last 6 weeks, or a hernia or respiratory tract infection. Ask the older females if they are pregnant. Each examinee with a serious complaint should be referred to the physician before spirometry.
- (7) Make a record on the unusual occurrence form of any exam not done, done on a defective machine, or done in a nonstandard way.
- (8) Inform the coordinator and chief technician of all equipment failures that prevent you from doing examinations. The coordinator needs to know so that she can make the necessary adjustments to the examinee flow system.
- (9) Check all technician parts of the examination record for completeness, accuracy, and consistency.
- (10) See that the physician has seen the ECG's before the examinees leave the examination center.
- (11) See that the physician has seen the X-rays before the examinees leave the examination center.
- (12) Check the X-rays, repeat them if necessary, and duplicate the PA chest film.
- (13) Complete and review certain parts of the physician's "Report of Findings" according to the instructions in this chapter.

- (14) Act as recorders for body measurements.
 - (15) See that certain data are transmitted from the field according to the instructions in Chapter III of the HANES Field Staff Operations Manual.
- b. Responsibilities related to the maintenance of work stations
- Each of the technicians will be responsible for the maintenance, supplies, and duties described later for one of the three work stations—spirometry and allergy, ECG and audiometry, and X-ray and body measurements. The rotation of the technicians at the stations will occur after a set period of time has elapsed, a minimum of 1 week. The length of time between rotations will be fixed by the chief technician and supervisory technician. The rotation system must be fair to all the technicians and also must not bias the data being gathered. The rotation pattern will continue in sequence from one stand to the next. For example, the technician in X-ray at the end of one stand should be in ECG at the beginning of the next stand. The technician responsible for a station during the first part of a stand should be responsible for opening that station on setup day. Likewise, the technician responsible for a station the last part of a stand is responsible for the closing of that station and for seeing that the data and transmittals from that station are complete and correct. The chief technician is ultimately responsible for seeing that all data and transmittals collected by the technicians are correct and complete.
- c. Additional responsibilities for the technicians at the spirometry and allergy station
- (1) Replenish the necessary supplies for the spirometry test and the allergy test.
 - (2) Do the spirometer calibrations before each session.
 - (3) Check and file the spiro tracings in sample number order daily.
 - (4) Keep current the transmittals for spirometry.
 - (5) Maintain all the equipment in the spirometry room.
 - (6) Check the spirometry data book to see that the entries are correct.
 - (7) Close down the allergy testing room and spirometry room at end of each day, i.e., turn off the equipment, return the allergen testing trays to the refrigerator.
- d. Additional responsibilities for the technician at the ECG and audiometry station
- (1) Replenish the necessary supplies for the ECG and audiometry room.
 - (2) Do the ECG weekly calibrations and daily checks.
 - (3) Do the audiometric and speech weekly calibrations and daily checks.
 - (4) Keep the transmittals for the two ECG tracings current.
 - (5) Maintain all the equipment in the ECG and audiometry rooms.
 - (6) Label and keep account of the audio speech tapes, the digital ECG-spiro tapes and when applicable the analog ECG-Spiro tapes.
 - (7) Clean the ECG electrodes.
 - (8) Close down the ECG and audiometry rooms at the end of each day, i.e., turn off the equipment, clean the electrodes.
 - (9) Tear and fold the two copies of the ECG and place one copy for the doctor to review and initial. File both sets in numerical order each day.

- (10) Check the ECG log book and audio unusual occurrence form to see that the entries are correct.

e. Additional responsibilities for the technician at the X-ray and body measurement station:

- (1) Replenish the necessary supplies for the X-omat, X-ray darkroom, and body measurement room.
- (2) Check the height-weight scale, skinfold calipers, and baby board daily.
- (3) Warm up the X-ray tube before each session.
- (4) Prepare the X-omat for the session.
- (5) Do the X-ray calibration at the beginning of each stand.
- (6) Do the body measurement calibrations at the beginning and end of each stand.
- (7) Change the date on the X-ray marker daily.
- (8) Label and file in numerical order all X-rays with their envelopes. See that the envelope numbers agree with the film numbers.
- (9) Make sure all PA chest films have been duplicated.
- (10) Keep the height photos in numerical order and the transmittals current.
- (11) Keep the chest, cervical, and lumbar spine X-ray transmittals current.
- (12) Maintain all the equipment in the X-ray room, dark room, and X-omat.
- (13) Make sure the doctor initials the chest X-rays.
- (14) Check the unusual occurrence forms in the X-ray and body measurement rooms to see that the entries are correct.
- (15) Close down the X-ray room, dark room, X-omat, and body measurement room at the end of each day.

f. Responsibilities related to examinee flow

- (1) Be familiar with the rules of the examinee flow system in Chapter 5.
- (2) Follow the rules of the flow system under the direction of the coordinator. During the first part of the morning sessions it is important to do the ECG's as early as possible on those examinees receiving the glucose tolerance test (GTT). Thus at this time it may be helpful to have one technician doing ECG's while the other two techs do mostly allergy tests and X-rays until all the ECG's on GTT examinees are done. Then later in the session, when there will be more younger examinees in the trailers, the X-ray room will more likely be free for baby board measurements.
The coordinator is in the end responsible for the smooth functioning of the flow system; thus her decision prevails if there is any difference of opinion over a flow system problem.
- (3) Try to see that under ordinary circumstances each technician does about the same number of examinations of each type as the other technicians do.

g. Additional responsibilities of the chief health technician

The chief technician may delegate some of his work station duties to other health technicians in order to complete the following responsibilities as chief health technician.

- (1) Provide supervision and guidance over all health technician procedures including all examination procedures; equipment calibrations; and completion of beginning and end of stand inventories and equipment checklists, data log books, unusual occurrence forms, quality control records, and reports of findings.
 - (2) Evaluate the quality of all health technician data, provide any necessary feedback to the health technicians, and send completed evaluation forms to headquarters at the end of each stand.
 - (3) Maintain records of all calibrations.
 - (4) Perform minor repairs and periodic equipment maintenance.
 - (5) Train new health technicians to do the examinations according to the instructions in this manual including applicable theory where appropriate. This also applies to temporary help when required.
 - (6) Report all problems relating to malfunctioning of equipment to the field operations manager (FOM). The chief tech and FOM should decide upon the type of action required and their individual responsibilities in seeing that the problem is resolved. The FOM must be informed of all maintenance and repairs of equipment involving billing even though he may not have the total responsibility for resolution of the problem.
 - (7) Act as liaison between the health technicians and the headquarters supervisory health technician and biomedical engineer on matters pertaining to all procedures and equipment involved in the work of the health technicians.
 - (8) Assure that the data are collected according to the manual procedures, and correct any departures from the written instructions.
 - (9) Inform the examining physician if you have reason to believe any examination procedures should be eliminated for an examinee for physical or mental reasons. The physician will decide whether or not to cancel any part of the exam.
 - (10) Provide supervision and guidance over other staff members who might, for various reasons, be required to perform health technician procedures.
 - (11) Be ultimately responsible for the quality and completeness of the data gathered by the health technicians.
- h. Technician responsibilities at the beginning of each stand
- (1) Complete the inventory of all supplies, return the original to the coordinator, and note additional supplies needed.
 - (2) Plug in the voltmeter to trailers 1 and 3, and check the readings.
 - (3) ECG
 - (a) Remove the shipping restraining hardware.
 - (b) Untape the door on the digital cabinet and paper takeup roller.
 - (c) Open the control drawer on the central terminal and inspect electronic cards. Make sure each card is in its socket.
 - (d) Check the cable in back of cabinet to assure all plugs or connectors are in tight.
 - (e) Attach the ECG examinee transmitter.
 - (f) Attach the spirometry examinee transmitter.
 - (g) Mount the scratch tape

- (h) Check the operating functions of the complete ECG-spiro data system.
 - (i) When satisfied that all equipment is operating (see spirometry setup), run a setup tape.
 - (j) Mount a data tape.
 - (k) Organize the data log book.
 - (l) Check the batteries of the defibrillator by discharging a 300-watt charge across the dummy load 6 times. This should be done with the defibrillator disconnected from the charger.
- (4) Spirometry
- (a) Remove the restraining strap from spiro piston.
 - (b) Untape the barometer.
 - (c) Call the local airport or weather bureau to obtain station barometer pressure and altitude.
 - (d) Verify that the barometer is operating properly.
 - (e) Check the operation of the Gould recorder and oscilloscope.
 - (f) Verify the integrity of the calibration of the complete spirometric testing system.
 - (g) Do a leak test on the spirometer.
 - (h) Organize the data log book.
- (5) Body measurements
- (a) Assemble the anthropometers, and check them and the calipers.
 - (b) Disengage the lock on the weight scale.
 - (c) Calibrate the standing height and weight scales, and send the calibrations to the Quality Control Section.
 - (d) Check the baby board digital readout against the metric scale on the board.
- (6) Audiometer
- (a) Set up the audiometer, language master, recording microphone, and tape recorder.
 - (b) Do the audiometer calibrations and send copies to Jean Roberts and Ken Stewart.
 - (c) Do a speech calibration.
- (7) X-ray room
- (a) Remove all restraining brackets and bars according to the instruction book.
 - (b) Have the transformer matched to the incoming line.
 - (c) Check the MAS at all MA stations on the control panel.
 - (d) Do a spin top calibration. Send one copy to the headquarters biomedical engineer and keep one copy in the mobile examination center (MEC).
- (8) X-omat
- (a) Fill and rinse with water of 90°F.
 - (b) Replace the developer filter.
 - (c) Mix the chemicals.
 - (d) Check the water pressure.
 - (e) Check all the settings and chemical temperatures.
- i. Technician responsibilities at the end of each stand

- (1) Complete the inventory of all supplies. Give it to the coordinator to send to headquarters.
- (2) Spirometry
 - (a) Turn off the Spirometry Marquette Patient Transmitter (P.T.).
 - (b) Disconnect and coil the cable which runs between the spirometry and ECG rooms. Store it beside Marquette cabinet.
 - (c) Move the spirometer's piston to the 10-liter position and secure with restraining bar.
 - (d) Stopper the spirometer part.
 - (e) Make sure the spirometer, Tecktronic scope, and Gould recorder are secure.
 - (f) Place the cover over the Gould.
 - (g) Make sure the equipment is turned off.
- (3) ECG
 - (a) Wind the analog tape onto supply reel.
 - (b) Remove the reel and store in the supply cabinet.
 - (c) Remove the digital tape from the recorder.
 - (d) Turn all machines off.
 - (e) Secure the Marquette cabinet to the wall with two holding pins.
 - (f) Tape the front of the digital recorder cabinet closed.
 - (g) Disconnect the examinee cable from the ECG Marquette P.T. Unplug the P.T.
 - (h) Clean all electrodes and store them with the cable.
 - (i) Store the P.T. on floor and secure it for travel.
 - (j) Remove the shelf beneath ECG table.
 - (k) Lower the other shelves in the room and the ECG table.
 - (l) Secure the stool and other furniture for transit.
- (4) Audiometer
 - (a) Disconnect the ear phone cable, tape recorder, and language master.
 - (b) Disconnect the ear phones from the head band.
 - (c) Wrap and store with audiometer: ear phones, cords, ear phone head band, examinee response switch, and monitor phone.
 - (d) Place the machine in the box.
 - (e) Disconnect the speech microphone, microphone amplifier, B&K sound level meter and Revox.
 - (f) Remove the adapter ring from coupler, place protective grid over diaphragm, and move it from the coupler to the store box. Replace the adapter ring on the coupler.
 - (g) Unscrew the artificial ear coupler from the B&K meter, wrap, and store it.
 - (h) Wrap and store in the body measurement table: B&K meter, 1" microphone diaphragm packed in wooden box, ½" microphone diaphragm packed in small tube, B&K amplifier and ½ microphone preamp, language master and power supply, B&K 1000 Hz calibrator, cables, language master cards, artificial ear coupler, 500 gram weight, and Beltone microphone phone arm.
- (5) Body measurements
 - (a) Check the skin fold calipers.

- (b) Return the calipers to their cases and return cases to the drawer.
 - (c) Store the audio equipment; lock and tape the table doors shut.
 - (d) Secure the table with straps.
 - (e) Shift the scale weights to the right and lock or tape them in place.
 - (f) Secure the scale platform with a wooden wedge placed between the platform and scale upright frame.
 - (g) Use elastic cords to further secure the scale platform.
 - (h) Place the 25 and 50 lb weights around the edge of the scales so the weights do not do any damage if they shift during transit.
 - (i) Lock the scale mechanism with the lever by moving it to the vertical position (Lever is located behind the upright frame.)
 - (j) Unplug the weight scale and the light on the height scale.
 - (k) Push the height scale to the top of the bar and tape it in place. Do not remove the camera but tape it securely to the upright frame.
 - (l) Secure the stool to the wall with rubber straps.
 - (m) Check the baby board operation.
 - (n) Secure the foot board on the baby board so that it will not move during transit.
 - (o) Store the baby board in a convenient place, e.g., under the X-ray table.
- (6) X-omat
- (a) Turn off the main power breaker on the left side.
 - (b) Empty the replenisher tanks, rinse, and refill with hot water.
 - (c) Open the drain valves in the dark room and drain fixer, developer, and water. Close the drains and fill all three tanks with water. Remove and dispose of the developer filter. Return the trap lid.
 - (d) Open the replenisher rate valves (front right).
 - (e) Remove the two cross over rollers, detector entrance roller assembly, and the squeegee or dryer roller assembly; and clean them using water and Scotch Brite pad.
 - (f) Turn on the power and push the replenisher switch (button) and hold it for 5 minutes.
 - (g) Drain the insert tanks by opening drain valves, remove the developer, fixer, and washer transport rollers. Scrub the insert tanks to remove all chemical deposits. Rinse and fill the insert tanks with hot water. Repeat step f. (Check to make sure there is sufficient water in the replenisher tanks so as not to draw air through the pumps.)
 - (h) Drain all the tanks and wipe out the insert and replenisher tanks.
 - (i) Scrub the transport rollers and gears with Scotch Brite pads until all deposits are removed; rinse and stand them up to dry.
 - (j) Clean the area where replenisher tanks set and the shelf where blower motor sets (accessible when rear panel is removed).
 - (k) Remove, rinse, and wipe down the dryer air tubes and transport rollers. Replace the dryer tubes and transport rollers.
 - (l) Inspect the transport rollers for deposits. If deposits are found reclean with a Scotch Brite pad. If no deposits are found replace the rollers in appropriate insert tank.
 - (m) Replace the cross over and squeegee assemblies.

- (n) Replace the detector entrance roller assembly in the machine.
 - (o) Replace the cover, clean the outside of X-omat, loading table, and dryer bin. Tape the panels and cover in place.
 - (p) Check that all water and mixing valves are off. Close the drains. Turn the power off.
- (7) X-ray dark room
- (a) Lock the film bin and tape it around the edge.
 - (b) Check to see that the duplicator is anchored firmly in the corner of the counter.
 - (c) Place the small film separators on the floor and secure in place.
 - (d) Remove the shelf from the holders and place it on the floor. Place the 14 x 17 cassettes between the wall and film bin.
 - (e) Close the door and make sure it is secure.
- (8) Securing X-ray equipment
- (a) Turn the machine off at the control panel on the wall of the dark room.
 - (b) X-ray floor to ceiling tubestand
 - (i) Turn the tube column so the tube faces dark room wall.
 - (ii) Fasten down the two floor channels cross tracks, one in front and one in back of the stand.
 - (iii) Attach the "U" bracket and hinged assembly with the bolt and keeper pin at the ceiling rail.
 - (iv) Lock the head and the bracket using keeper pin.
 - (v) Place the bolt in the counter weight in the tube stand.
 - (c) Put the bucky at the foot of the radiographic table and fasten in place with a pin and thumb screw.
 - (d) Cassette changer
 - (i) Install a screw into the base of cassette changer to secure the lucite sliding door.
 - (ii) Lower the cassette changer to its lowest position and install two bolts into the counterweights (one in each column).
 - (iii) Install two brackets and four bolts into the side of each column so the cassette changer is secure.
 - (iv) Attach rubber strap to the front track and to base of cassette changer to secure the bucky door.

3. Laboratory Technicians

In addition to the general responsibilities of all examination staff members it is the responsibility of the laboratory technicians to:

- a. Arrive for work at the time the first examinees are scheduled.
- b. Perform the basic hematology, urinalysis, and sample preparation on examinee specimens obtained.
- c. Check out all equipment before the receipt of the first whole blood and urine at the beginning of each examination session.
- d. Record all values on a daily worksheet and on the individual specimen identity cards.
- e. Record all abnormalities found in the hematology (after verification by repeating the tests) on the daily worksheet.

- f. After verifying the packing list, as described in the laboratory manual, ship all required specimens daily to CDC.
- g. Perform all required quality control procedures daily or weekly as prescribed by the laboratory manual and send the appropriate forms to CDC weekly. Keep the graphs of the hematology standards current and posted.
- h. Complete an inventory of all supplies at the beginning of each stand. Give a copy to the coordinator to send to headquarters. Keep the FOM apprised of the status of the dry ice supply.
- i. See that the laboratory equipment is properly maintained. If repairs or maintenance are necessary, inform the FOM to decide upon the type of action required and each person's role in seeing that the problem is resolved. The FOM must be informed of all maintenance and repairs of equipment involving billing even though he may not have the total responsibility for resolution of the problem.
- j. Complete and review certain parts of the physician's "Report of Findings" according to the instructions in this chapter.
- k. Assist the nurse in drawing bloods, particularly during the morning sessions.
- l. See that certain data are transmitted from the field according to the instructions in Chapter III of the HANES Field Staff Operations Manual.

4. Nurse

a. Responsibilities related to examinations

In addition to the general responsibilities of all examination staff members it is the responsibility of the nurse to:

- (1) Arrive for work 15 minutes before the first examinees scheduled.
- (2) Draw the appropriate amount of blood from all examinees according to the instructions in this and the CDC laboratory manual.
- (3) When time allows, assist the physician in his examination of females over 10 years of age.
- (4) Administer the GTT questionnaire.
- (5) Help with arriving examinees if the coordinator asks.
- (6) Try to provide to each examinee a feeling of continuity throughout the examination, in this way perhaps making the examinee less anxious and more comfortable during his stay in the exam center.
- (7) Review the physician's examination form and certain parts of the physician's "Report of Findings" for completeness according to the instructions in this chapter.
- (8) See that certain data are transmitted from the field according to the instructions in Chapter III of the HANES Field Staff Operations Manual.

b. Additional responsibilities

- (1) See that letters to examinee's physicians concerning medical findings requiring immediate attention get mailed promptly.
- (2) See that the appearance of the examination areas, the equipment, and the inventories of supplies for physician's examinations and venipuncture are maintained.
- (3) Change Cidex solutions weekly at least.
- (4) Recharge the otoscopes daily and over each weekend.
- (5) Keep Glucola stocked in the refrigerator.

- c. Responsibilities at the beginning of each stand
 - (1) Check the new supplies with the new inventory list and put them away.
 - (2) Complete the beginning of stand inventories and give them to the coordinator.
 - (3) Set up the physician's and venipuncture rooms for use, making sure all equipment works and supplies are adequate. Notify the FOM immediately if any supplies are needed for the examinations.
 - (4) Check the drugs, oxygen tank, and amber bag.
 - d. Responsibilities at the end of each stand
 - (1) Do the physician's and venipuncture room inventories.
 - (2) Give the unusual occurrence form from the physician's and venipuncture rooms to the coordinator.
 - (3) Pack the physician's and venipuncture rooms for travel.
 - (4) See that certain data are transmitted from the field according to the instructions in Chapter III of the HANES Field Staff Operations Manual.
5. Physician

In addition to the general responsibilities of all examination staff members it is the responsibility of the physician to:

- a. Be present in the trailers while any testing procedures are being carried out by other personnel. To this end the physician should report for duty approximately 15 minutes before examinations are scheduled to begin. He may leave only when all procedures except questionnaires have been completed and no adverse reactions are expected to occur.
- b. Conduct the physical examination as described elsewhere in this manual in a uniform manner, insuring complete data collection on all those findings which are of primary importance to the survey. Before the examination begins, review the medical history in the presence of the examinee while there is opportunity for additional clarification or amplification of the history.
- c. See that any significant examination findings that require medical attention before the regular report of examination findings will be available are mailed to the physician that the examinee has designated. See that the examinee is advised of this and urged to contact his personal physician for additional examination and treatment if necessary.
- d. Assist in the blood-drawing and ECG recording when requested. If the nurse is absent from work, the physician should do those parts of the examination normally done by the nurse.
- e. Read all X-rays and ECG's before the examinee leaves the examination center. Initial those of acceptable quality, and have those of unacceptable quality repeated.
- f. Consult with the chief health technician and coordinator about any contraindications to the examination procedure discovered by himself or any other exam staff member. The physician is the final arbiter in all purely medical matters.
- g. Be sure that the cardiac resuscitation apparatus is functioning and that the oxygen equipment is ready for use. Be sure that the supply of emergency drugs is accessible and ready.
- h. When an examinee is disabled for any reason during the exam session

render first aid only and thereafter arrange transportation to an appropriate medical facility for treatment. If indicated, call an ambulance, and then accompany the examinee to the source of adequate medical care.

- i. Complete the physician's section of the "Report of Findings" so that any significant new medical findings are called to the attention of the examinee's physician. This should include suspect X-rays and ECG's.
- j. Promptly notify the FOM if because of illness or any other reason he is unable to discharge any of his duties.
- k. Defer to the coordinator on decisions pertaining to the examinee flow.
- l. Be familiar with the "Medical Policy Regarding the Examination."

6. Dietary Interviewers

a. Responsibilities of dietary interviewers

In addition to the general responsibilities of all examination staff members it is the responsibility of each of the dietary interviewers to:

- (1) Arrive for work 15 minutes before the first examinees scheduled.
- (2) Conduct interviews with all examinees to obtain a 24-hour dietary recall, information about the frequency with which certain foods are eaten, and administer the dietary supplement.
- (3) Collect dietary data during home visits to examinees whose dietary data are not collected during their time at the examination center.
- (4) Insert the appropriate codes for each food reported on the 24-hour dietary recall.
- (5) Check forms prepared by herself and the other dietary interviewer for completeness and accuracy before they are sent to headquarters according to the instructions in this chapter.
- (6) Keep a daily log of persons interviewed.
- (7) Help with arriving examinees when requested to by the coordinator.
- (8) See that certain data are transmitted from the field according to the instructions in Chapter III of the HANES Field Staff Operations Manual.

b. Additional responsibilities of the dietary coordinator

- (1) Oversee and coordinate the work of dietary interviewers, especially regarding consistency of interviewing techniques and application of food codes.
- (2) Contact nutrition personnel in health, welfare, school system and/or other agencies regarding necessary background information before examinations begin at each stand.
- (3) See that all dietary records are accounted for and sent to headquarters at the end of each stand. The dietary interviewer will assist in this function.

Responsibilities for Completing the Control Record

Each examiner is responsible for filling in the section of the control record pertaining to the procedure he performed. This involves entering the time of the start and end of a procedure and the examiner number. If a procedure is not done, the reason must be recorded under "Procedure or part of overall procedure not done." If a part of the procedure is not done, the reason for the omission should be noted on the control record.

Responsibilities for Completing the Report of Findings to Physician

These reports will be mailed from headquarters. Each examinee will have a report sent which will include a copy of the chest X-ray, the ECG tracing, and results of almost all of the lab work performed at CDC.

1. Coordinator

Enter on the report the name and address of the physician or clinic to whom results are to be sent. This information can be obtained from the authorization form. Stay within the box outlines since the form has been designed for a window envelope. Enter the name and address of the examinee from the top of the medical history form. See that the date of examination is entered from the control record. The coordinator is responsible for seeing that all staff members have made their appropriate entries and that each form is complete.

2. Physician

A box is provided to check if there are no significant findings. If there are significant findings for which no treatment had been sought and/or no history given, they should be reported. If the "no findings" box is not checked or no significant findings are reported, the coordinator will return the form to the physician to complete. Also enter the first blood pressure taken.

3. Health Technicians

The technician recording the body measurements is responsible for entering the date of examination, age, sex, height (in inches), and weight. The technicians doing the allergy test and audiometry are responsible for those entries. The X-ray and ECG boxes will be checked at headquarters when the report is mailed.

4. Laboratory Technicians

Enter each day values for all of the blood and urine tests done in the examination center. These can be entered from the results recorded on the laboratory worksheet.

Responsibilities for Checking HANES Documents in the Field

1. Records to be checked.

- a. Examination Case Record
- b. Health History Supplement
- c. 24-Hour Recall
- d. Dietary Frequency
- e. Dietary Supplement
- f. Medication/Vitamin Usage
- g. Behavior Questionnaire

2. What to check for

- a. These may be a whole section or only a part. There may be a positive or "yes" answer to one part which necessitates something being written in the second part which has, however, been left blank.

b. Contradictory entries

An example would be a statement that the examinee had never seen a doctor followed by extensive descriptions of medical care in a following section. Another example might be a "no" answer to a question of trouble seeing, but a "yes" answer on trouble with vision even when wearing glasses.

c. Miscellaneous errors including

- (1) Writing something in an "other" category which should have been specified in an included code, for example, on the Physicians Examination form, "conjunctival injection" written in under "other" (code 141) when a code (112) for conjunctival injection is available.
- (2) Two answers where only one is allowed.

3. Assignments

- a. Nurse: Physician's Examination, Liver Function Test questionnaire, Glucose Challenge questionnaire, and Health History Supplement
- b. Coordinator: Behavior Questionnaire and the remainder of the case record.
- c. Dietary interviewer: Dietary forms administered by the other dietary interviewer.

All records should be checked over so that corrections can be made or missing data obtained while the examinee is still in the exam center.

The nurse, coordinator, and dietary interviewers should check their forms during the examination session and request the appropriate staff members to make the corrections indicated. Technicians and the coordinator should pay special attention to checking over Behavior Questionnaires that are self-administered since these are especially prone to errors. After checking a record, the person doing the checking should place his or her initials in the lower left-hand corner of the document.

4. Importance of review

The objective of the review is to see that we obtain the best data possible. Missing data are no data, and while imputation procedures can be applied in some instances, there is no substitute for complete and accurate data. The information obtained on these documents will be given directly to persons in data preparation who will code and punch only what they see in front of them, without giving thought to correcting apparent errors. This will provide misleading information which becomes greatly magnified in the process of inflating the data from our sample to national estimates. If caught in time through computer editing procedures, some corrections can be made but the cost of these corrections in terms of time and money is very high. We hope that you will provide every assistance possible in doing your assignments to the best of your abilities.

Chapter 4

EMERGENCY MEDICAL PROCEDURES

Procedure

In the event of a medical emergency at the mobile examination center, the following procedures will be followed.

1. The best method is prevention. The examining physician can at his discretion with good medical judgment void certain procedures such as respiratory tests if the testing will lead to any endangering of the examinee's health.
2. Before examinations begin the FOM will have the responsibility for obtaining information on the types and availability of emergency medical services in the area in which the mobile examination center is located. This should include emergency medical services available from police or fire rescue squads, other county or local rescue squads, and hospital ambulance services, as well as the nearest medical facility. The FOM will select the best services available from the standpoint of convenience to the mobile examination center and availability of service and equipment. In some cases it may be desirable to select two. He will then post the names and phone numbers of the services he has selected in a conspicuous place near the phones in the center and the offices. For other reasons, the number of the nearest police and fire stations will also be posted.
3. The following emergency equipment will be available, inventoried by the nurse and kept in the physician's room. All equipment will be checked by the nurse and the physician at the start of each stand.
 - a. Oxygen
 - b. Bag and mask
 - c. Disposable oral airway—small, medium, and large (4 of each)
 - d. Defibrillator
 - e. Drugs
 - (1) Drug List
 - (a) Atropine 1/150 gr in single dosage form which must be reconstituted for use. Four doses supplied.
 - (b) Valium injectable 5 mg/cc. Four vials supplied.
 - (c) Epinephrine 1:1000 in small vials. Four vials supplied.
 - (d) 50 percent oral glycerol solution. Four 3- or 4-oz bottles supplied.
 - (e) Xylocaine 1 percent already at MEC.
 - (2) Use of the drugs
 - (a) Myocardial infarction—atropine for bradycardia, xylocaine for arrhythmia, epinephrine for cardiac arrest
 - (b) Seizures—valium IV. In small children do not push more than 1cc, (5 mg) at start for respiratory depression is common.
 - (c) Severe asthmatic attack—epinephrine. The childhood dose is 0.01 ml/kg with a maximum of 0.04 cc.
 - (d) Allergic reaction severe—epinephrine. See Chapter 12 for the emergency procedure in case of a severe allergic reaction.

4. All emergency procedures and the use of all emergency equipment will be handled by the physician.
5. The use of this equipment is for emergency situations only.
6. The primary concern of all the field staff is to get the person to the nearest medical facility and the emergency equipment is not to be used in lieu of this.
7. All persons seriously ill who received emergency care at the examination center will be accompanied to the hospital by the physician. The person's private physician will be contacted as soon as possible by the nurse.
8. A short report will be made and signed by the physician and the nurse about the medical problem and how it was handled. This report will be sent to the medical advisor at headquarters.

PART II. PROCEDURES

Chapter 5

COORDINATOR

General

Efficient coordination of the flow of examinees through the examination center is the most important function of the coordinator. In addition to this, the coordinator has other responsibilities which are described in this chapter.

Beginning of Stand

1. Complete the inventory of all supplies. Send the original along with the original inventories collected from the nurse, health techs, and lab techs to headquarters, and note additional supplies needed. Also, let the FOM know what supplies are needed.
2. Be sure that each examining room has an "unusual occurrence" form posted in it.

Before the Examination Session

1. Sometime before each session see that the charts for that session are ready for use. You should advise the field management assistant (FMA) of any discrepancies in sample numbers, but don't change a sample number without first confirming the change with the FMA. Review the medical histories, then give them to the examining physician to review. Check the daily schedule for any notes from the administrative office about unusual requests or instructions. If there are any they should be noted on the examinee's control record.
2. Arrive for work 20 minutes before the first scheduled examinee.

During the Examination Session

1. Rules of the examinee flow system
 - a. Basic rule for pairing examinee with examiner
 - (1) If several examinees are waiting, the examinee who has been waiting the longest since he was last seen should be served first.
 - (2) If several examiners are available to an examinee, the following priorities determine who serves the examinee:

<i>Procedure</i>	<i>Examinees who get procedure</i>
VP/Glucola	GTT, 20-24
VP	All except LFT and GTT
Liver Challenge (X-Nog) ¹	LFT

<i>Procedures</i>	<i>Examinees who get procedure</i>
Change	All
Spirometry	6-24
ECG/VP/Glucola	GTT, 25-74
Physician	All
Allergy Test/Health History/ Behavior Questionnaire	6-74/12-74/25-74
Dietary Interview	All
Body Measurements	All
X-ray	25-74
ECG	25-74 except GTT
Audiometry/Speech Test	4-19/4-6
Change	All

¹ The coordinator is responsible for administering the X-Nog to examinees as soon as possible after they arrive at the exam center. Venipuncture (VP) for liver function test (LFT) examinees is to be done 2 hours \pm 30 minutes after X-Nog is given.

b. Exceptions to the basic rule

- (1) As soon as one examinee is sent to ECG/VP/Glucola the next one who is ready should be held for ECG/VP/Glucola and not be assigned to anything else first. At this time hold the nurse for VP's on GTT examinees until all those examinees have had their first VP's.
- (2) The nurse is responsible for doing the second and third VP's on the examinees who get the GTT and the VP's on the examinees who get the liver function test. The nurse may interrupt any examination to insure that she will get the GTT blood specimens at 1-hour \pm 5 minutes and 2 hours \pm 5 minutes after the Glucola is given. The nurse may also interrupt any examination to get a liver test VP 2 hours \pm 30 minutes after the X-Nog is given. Laboratory techs may be asked to draw blood if the nurse is too busy to draw it on time.
- (3) Before body measurements can be assigned, two techs must be available, one to measure the other to record.
- (4) Spirometry must be done before allergy testing.

c. Other rules

- (1) The order of exams within the ECG/VP/Glucola block is 1) ECG, 2) VP, and 3) Glucola.
In order to expedite the flow of examinees on mornings with more than 5 GTT examinees on the schedule, it may be necessary to change the order of the exams within this block to 1) VP, 2) ECG, and 3) Glucola. If this happens there should be no more than 45 minutes between the venipuncture and the Glucola administration.
- (2) To save time within the allergy/health history/behavior questionnaire block, administer the allergens first, then do the health history and behavior questionnaire while waiting to make the 10 minute and 20 minute allergy readings.
- (3) The physician's examination of females must be chaperoned. The nurse should chaperone in the afternoons when she has time.

2. Duties not directly related to examinee flow
 - a. Be responsible for urine collection as described in chapter 10.
 - b. Quickly review for completeness and consistency each chart as it is returned by the examiner. Have all errors corrected before the examinee leaves the examination center.
 - c. See that transportation from the examination center is available for each examinee when he is ready to go.
 - d. See that any necessary remuneration is given to each examinee before he leaves.
 - e. Stay until the last examinee leaves the center. All examiners except the physician can leave when finished with all their exams after first checking with the coordinator. The physician must be in the examination center during the whole examination session unless there are only questionnaires left to be administered.
3. Body measurement replicates

An intertechnician body measurement replicate is to be done every fourth session on the examinee who arrives first at the exam center. The sessions on which replicates are to be done are shown on the schedule sheet. For the sessions during which a replicate is done, you should write the examinee's sample number in the appropriate space on the schedule sheet and assign the original body measurements on that examinee to a technician according to the usual flow system rules. You should assign the replicate measurements in a *random* way to one of the other technicians and write that technician's number in the appropriate space on the schedule sheet.

End of Stand

1. Send the following forms to Headquarters, Quality Control Section:
 - Schedule Sheet
 - Copies of body measurement forms of examinees in the 600 series of sample numbers
 - Copies of audiometry forms
 - Unusual occurrence forms
2. Complete the inventory of all supplies. Send a copy along with the copies of the inventories collected from the nurse, health techs, and laboratory techs to headquarters in a separate envelope.

Communication Between FOM and Examination Staff

The coordinator is the channel of communication between the field operations manager and the examination staff as far as operational matters within the examination center are concerned. She should report to the FOM any problems that occur during the examination which require contact with the family, physician, school, etc. She should inform the exam staff of any schedule changes and reasons for them as she receives them from the administrative office. She should also inform the FOM as soon as possible of any equipment repairs required in the exam center.

Chapter 6

DIETARY INTERVIEW

Procedure

1. Obtaining background information

During the first few days at each new stand the dietary coordinator is responsible for obtaining background information about local foods and available food programs and sharing it with the dietary interviewer.

a. Background information

Information about food customs, food terminology, and specialty and cultural foods typical of the area will be learned by meeting with the public health and/or Agricultural extension nutritionists, or hospital or clinic dietitians. Assistance in identifying and contacting the appropriate persons will be provided by headquarters staff. During the informal meeting the topics to be covered are outlined in table A.

Table A. Examples of information to be discussed during visit to nutrition/dietetic personnel at each new stand

FOODS OF ETHNIC OR CULTURAL SIGNIFICANCE TYPICAL TO AREA, ETC:

- Those likely to be used during survey period.
- Food value, preparation methods and data on food composition.
- If limited to geographic area, is it within survey area?
- Location of stores or markets where items can be seen or purchased.
- How extensive is home growing, canning, or freezing?

FOOD TERMINOLOGY:

- Local names/colloquialisms for common foods or food preparation methods.

BACKGROUND ABOUT FOOD PROGRAMS:

- Availability and location of school breakfast program—type of meal served?
- Availability of school lunches—are they type A?
- Availability of summer school and/or day care feeding programs.
- Vending machines in schools—kinds of foods available.

POSSIBILITIES/SUGGESTIONS FOR REFERRALS FOR DIETARY FOLLOWUP:

- Availability of diet counseling for persons on therapeutic diets.
- What services are available to homemakers needing assistance re: food budgets, food preparation, nutrition information, etc.
- Procedures for making referrals.

Separate telephone calls or visits may be necessary to obtain additional information about 1) the type of school breakfast or lunch programs served in the area, and 2) pertinent information about food stamp or donated commodities

programs. Headquarters staff and local public health or extension nutritionists will provide assistance regarding persons to contact for this information

b. Visits to grocery stores and markets

These visits are to be made at the beginning of each stand in order to obtain information that will make dietary interviews easier to conduct, understand, interpret, and code. The following are some of the purposes of "market checks:"

- (1) To become acquainted with trade or brand names, local food terminology, new products, and ethnic eating patterns
- (2) To observe the quality and types of meat, fish, poultry, breads, and vegetables and fruits available.
- (3) To note package and can sizes, particularly those which have not been observed at previous locations.

Additional visits to grocery stores or markets at each location are usually necessary to check unit sizes and new or unfamiliar items. Responsibility for such visits is shared by the dietary interviewer and dietary coordinator.

2. Home visits

a. Persons to be seen

Any unusual situation within the mobile examination center preventing the collection of dietary data will necessitate a home visit by a member of the dietary staff.

b. Scheduling visits

Appointments for home visits should be scheduled by a member of the dietary staff contingent upon the specific situation.

When a home visit is necessary, the visit should be completed within 48 hours of the examination.

c. Making the visit

Except in unusual circumstances home visits by dietary staff should be made before 7 p.m. Every effort should be made to see persons in their homes or places of employment during normal work hours Monday through Saturday.

3. Log book

a. Description

Two dietary logs are maintained at each location—one in each of the interviewing rooms at the examination center. The main purpose of the log is to keep a current, accurate record of all persons interviewed, when and where they were seen, and by whom.

b. Maintaining the log

The log book in each interview room contains the name, sample number of persons interviewed at the examination center or at home, and interviewer number and pertinent comments recorded by the interviewer who saw the individual. A new page is begun daily with the data inserted at the top of the page. Information about examinees seen at home is recorded under the date they are scheduled at the center.

4. Transmittal of completed forms to headquarters

Log books are used to verify that all dietary interview forms have been checked and sent to headquarters; therefore each log entry should be accounted for at the end of the stand.

After forms are checked against the log, complete form HRA-92, "Record of Transmittal." Circle the appropriate sample numbers to account for all records being mailed. The total number of examinees interviewed should correspond with the total number of examinees recorded by the coordinator.

Completed forms of dietary data are to be mailed by "Registered Mail" to headquarters at the end of each stand. All forms from a stand must be completed (i.e., coded and checked by another interviewer) and mailed before interviewing begins at a new stand.

The dietary coordinator is responsible, with the assistance of the dietary interviewer, for accounting for forms and preparation for mailing at the end of each stand. Packages should be securely wrapped in Jiffy Bags using paper tape (NO GLASS tape), reinforced if necessary so that the contents are not crumpled in transit.

The following forms are to be filled out or checked for completion by the dietary staff and sent to headquarters with the transmittal sheet at the finish of each stand.

Medications or Vitamins Form
Dietary Supplement Form
24 Hour Recall—Dietary Frequency Form
Diabetes Subsample Log Sheet

Send packages by "Registered Mail—Return Receipt Requested" and address as follows:

Mr. Sidney Abraham, Chief
Nutrition Statistics Branch, DHES
National Center for Health Statistics, HRA
5600 Fishers Lane
Rockville, Maryland 20852

5. Provision of nutritional advice or counseling

The purpose of dietary interviews is to collect specific information about food intakes and dietary habits. It is important that such information be obtained without approval, disapproval, or any advice from the interviewer.

At the completion of the interview the respondent may be given any or all of the following publications that the dietary interviewer feels are appropriate.

Food for Fitness. U.S.D.A., leaflet No. 424, 1967.

A daily food guide which describes the 4 food groups which are the basis of an adequate diet for all persons.

Facts about Nutrition. U.S.D.H.E.W., P.H.S. Pub. 917, 1968.

Contains a brief explanation of the needs for and sources of vitamins and minerals. Daily food needs of persons of various ages and conditions are outlined.

Your Money's Worth in Foods. U.S.D.A. Home and Garden Bulletin No. 183, 1970. Directed to homemakers. Emphasis is on shopping for foods and meal planning.

Food Is More Than Just Something To Eat. U.S.D.A. & H.E.W. with the Grocery Manufacturers of America, and the Advertising Council.

The distribution of nutrition literature is on a selective basis and should be based on the recipient's expressed interests and need as well as his ability to use the material. As much time as possible should be spent reviewing the selected publications with the recipient.

Individuals who have questions and/or problems related to prescribed diets should be referred to community resources or to the hospital or physician initiating the prescription. Persons with specific questions about food budgets, use of food stamps, requests for recipes, and so forth should also be referred to community resources. The dietary coordinator will know or will obtain information about the location and types of such resources.

6. Visitors to the mobile examination center

From time to time dietitians, nutritionists, and other professionals may contact the dietary staff about visiting the examination center. Explain to such persons that to avoid congestion and to protect the confidentiality of examinees, visiting times are limited to times when the center is not operating, e.g., the afternoon of a day scheduled as a split shift.

Arrangements for visitors to tour the center should be made in collaboration with the field operations manager, and generally it is desirable to refer prospective visitors to him directly. The dietary coordinator or at least one dietary interviewer should plan to be on hand when visitors are scheduled at the mobile examination center.

7. Tape recording dietary interviews

In order to help dietary interviewers maintain consistent interviewing practices and observe established instructions and procedures, each interviewer will record at least two complete interviews at each location.

The selection of subjects, interviewers, and dates for recording will be determined randomly at headquarters and forwarded to the dietary coordinator before the beginning of each new stand. Completed tapes are to be mailed in Jiffy Bags to:

Nutritionists
Nutrition Statistics Branch, DHES
National Center for Health Statistics, HRA
5600 Fishers Lane
Rockville, Maryland 20852

The following guidelines will be used in connection with tape recording dietary interviews.

- a. Permission of the examinee must be obtained before the recorder is started. For example you may state "as part of a quality control procedure we record randomly selected dietary interviews. May I have your permission to record our interview?" If the person hesitates you may add "the tape will be used only to control and improve our interviewing techniques and you will not be identified." If he still hesitates, proceed with the interview but *do not record* it. Proceed to ask each succeeding examinee for permission until the required number of interviews has been completed.

- b. On days interviews are to be recorded the equipment should be set up before the examinee is admitted to the interviewing room.
- c. Each interviewer should start with a new or clean tape. Read onto the tape before commencing the interview: name of interviewer and dietary interviewer number, sample number of interviewee, date and place of interview, and stand number.
- d. Before the tape is sent to headquarters the interviewer should listen to it (preferably with other dietary staff) to note strengths and weaknesses in her techniques, areas needing improvement, etc. Self-evaluation forms are to be completed and mailed with the transmittal forms to headquarters.

Guidelines for Completing Dietary Forms

1. General

a. Background information

Every effort will be made to obtain a 24-hour dietary recall and data about food frequency on each examinee examined by means of individual interviews with those ages 12 and over. Information about the food intakes of persons under age 12 will be obtained from the individual primarily responsible for feeding the child (parent, grandparent, babysitter, etc.). In the case of school age children both child and parent (or other responsible adult) may participate in the interview.

The sequence for completing the forms is the 24-hour recall first, the food frequency second. Information obtained about frequency is used as a cross-check of the 24-hour data.

b. Identifying information

(1) Columns 1-23 and 75-80

The first 23 columns of the 24-hour dietary recall form identify the examinee. Columns 1-15 and 17-22 are from the U.S. Bureau of the Census Form HES-30 that has been completed for the household. Information to complete column 23 is obtained from the completed Medical History form (HES-31 or HES-32). The identifying data, except for column 16, are coded by the field management assistant before the forms are released to the dietary interviewer.

Column	Item and explanation	Code
1-5	Sample number—Refers to the number assigned to the examinee and is different for each respondent.	Actual number
6-11	Segment number—Identifies a group of households within a small geographic area such as a city block.	Actual number
12-13	Serial number—Identifies the household within a segment.	Actual number
14-15	Column number—Refers to the line listing the respondent on the U.S. Bureau of Census form HES-30.	Actual number

Column	Item and explanation	Code
16	Respondent—The person or persons interviewed	1—Examinee 2—Spouse 3—Parent 4—Grandparent 5—Combination of above 6—Other
17-22	Date of Birth—Record the month, day, and year of the examinee's birth.	Month 01-12 Day 01-31 Year last two digits
23	"Sex"—Record according to information on Medical History form. If examinee is pregnant, code "3" if she has not reached the 5th month; code "4" if she has entered her 5th month of pregnancy.	1—Male 2—Female 3—Pregnant (first half) 4—Pregnant (second half) 5—Lactating 6—Lactating and in first half of pregnancy 7—Lactating and in second half of pregnancy
24-28	Weight—Pounds Note: Record Height on right of col. 24-28	Leave Blank
29-34	Month, Day, Year of Recall	Leave Blank
75-77	Interviewer's Code—Record the number assigned.	Actual Number
78	Completion Code—Record appropriate code. When "2" is used indicate in the space provided why you feel data are unsatisfactory.	1—Completed, satisfactory 2—Completed, unsatisfactory 3—Respondent refused 4—Respondent not available 5—Respondent incapable 6—Other
79-80	Card Number.	Precoded

2. 24-hour dietary recall

a. Purpose

To obtain a record of the previous day's total food and beverage intake from midnight to midnight. Questions are also asked about the use of vitamin and mineral supplements, salt intake, recent changes in diet, and meals eaten away from home.

b. Obtaining and recording the 24-hour dietary recall

(1) Conducting the interview

After introducing yourself and seeing that the examinee is comfortably seated and at ease explain briefly the purpose and content of the dietary interview.

“As you know one of the reasons for this study (or the Health and Nutrition Examination Survey) is to learn more about the diets and nutrition of people in this country. The information you give me will become a part of information collected from a large group of people. I will ask you about how often you eat certain foods. I would also like you to tell me everything you ate or drank yesterday.

“Starting with the first thing you ate yesterday, at midnight or after, please tell me everything you ate or drank. I need to know how each food was prepared, for example, baked, fried, or boiled. Also I need to know about things like sugar in coffee, jelly on bread, and so forth. The amounts are important, too, and I will show you models to help you show me how much you had.”

Record foods as the respondent reports them. If he seems to have a difficult time beginning you may say:

“It may help you to remember what you ate if you think about what you did (_____ day).”

“When did you first eat or drink anything after midnight on ____ day?” “What time did you get up yesterday?”

If the respondent is able to recall foods eaten it is a good plan to allow him to talk freely without interruption at the beginning. As he continues his recall you may relate his activities to possible food intake. For example, if he was at work in the morning ask if he stopped for a break and if he took any food or drink while on his break. If he went to the movies ask if he had any refreshments before, during, or after the show. As time and places where foods are eaten are mentioned record in “Time of Day” and “Food Source” columns. All food items eaten at one time need not be listed consecutively, but the time and food source code must be repeated if items do not represent consecutive times and food source. Approximate times are sufficient.

Obtain information about the size or amount consumed. Food models generally are used to determine the size of portions eaten. Ask the respondent to relate the amount he ate to the appropriate food measurement model (spoon, glass, cup, mound, etc.). *Although models are the preferred way to report amounts of food consumed, it is possible to record any food in grams.* For details about proper use of models refer to section “Guide for Use of Food Models.”

Information about brand names or the cost of individual items is helpful in determining amounts of candies, snack foods, drinks, and the like. Sometimes the location of the food served is useful, for example, the carton of milk served at school is 8 oz. You may determine portion sizes of other items sold at local or chain-operated stores.

Often, it is easier to obtain portion sizes and details about preparation after the respondent has completed his recall of the previous day's intake; interruptions

to check sizes or preparation method may cause the person to lose his train of thought.

Usually it is necessary to *probe* to get information about consumption of foods like butter, jelly, gravy, salad dressings, and some beverages. Ask "What else did you have at that time (or with that meal)?" "Was that (bread, vegetable, etc.) eaten plain or with something on it?"

When it appears that respondent has underreported a meal you may review what he states he has eaten to help "jog" his memory, as: "You had a slice of toast, tomato juice, and a fried egg for breakfast—did you have something else to eat or drink?" or "Did you put anything on the toast?" "For lunch you had creamed chicken and peas—was there anything else on your plate?" Do not suggest an answer but try to help the respondent recall the details of all the food eaten the previous day.

Remember to inquire about "after 12 midnight" meals or snacks for the adults; and snacks at neighbors' or from a store near school for children.

Refrain from suggesting meal patterns or food accompaniments. People do not always eat when, what, or how much one thinks that they might; they do not always use a spread on bread; they do not always use salad dressing on salad. Strive for objectivity in all your questions.

(2) Ingestion period (column 36)

All four ingestion periods must be accounted for whether anything was consumed or not. Each ingestion period must have a time of day (col 57-60) recorded. If there is an ingestion period for which no food was consumed, record as "skipo." If more than one between meal snack was eaten "3" may be coded as often as necessary. Total day "5" will seldom be used. It refers to one or more food item prepared once and eaten throughout the day. Code "5" cannot be used with other codes. Refer to table below; if a "skipo" for ingestion period 1, 2, 3, or 4 is reported at the beginning of the 24-hour period on Line Card No. 01 a time is required (0700). No other "skipo" requires a time (col. 57-60).

PUNCH 4 LINE CARD FOR EACH FOOD ITEM

ING PER (56)	FOOD CODE (37-41)				FOODS AND BEVERAGES CONSUMED		WORK AREA FOR COMPUTATIONS (42-46)	SIZE OF EDIBLE PORTION SERVED			TIME OF DAY (57-59)	FOOD SOURCE CODE (61)	LINE CARD NO (62-65)
	37	40	41		FOOD ITEM	DESCRIPTION		I (42-46)	II (47-51)	III (52-56)			
1	0	9	9	9	9			1	SKIPO		0700		01
													02
													03
													04
													05

NOTE/ For key-punching purposes, columns 57-60 must be recorded (as shown above) if no food was consumed at the beginning of 24-hour recall

The ingestion period for meals is coded according to the descriptive information provided by the respondent rather than strictly by time of day food was eaten. Thus if a respondent calls his 1 a.m. meal "dinner" code it as ingestion period "4." If the food reported is not identified as a specific meal or snack, try to determine from the respondent what meal it represented or if it was a "snack" and code accordingly.

Generally, "1" refers to the breakfast meal; "2" to the noon meal; and "4" to the evening, dinner, or main meal of the day.

The only exception to the above is when the 24-hour recall cannot be completed. When completion code "3," "4," "5," or "6" is used it is not necessary to account for all ingestion periods.

(3) Food code (columns 37-41)

At the completion of the interview insert the appropriate food code from the Food Code Book developed for HANES or U.S. Department of Agriculture (USDA) Handbook No. 8.

For assistance in coding new or unusual items the dietary coordinator checks with headquarters, Nutrition Statistics Branch. New codes are added or code values modified only by headquarters.

Lead zeros are used when the food code has less than five digits.

(4) Food item and description

Record in these columns the exact food or beverage consumption as reported by the examinee. Include as much identifying information as possible.

- Name of item, including brand name if pertinent.
- Description (raw, dry, frozen, edible portion, or as purchased, size, and/or price of item).
- Preparation method (fried, broiled).
- Major ingredients if a mixed dish for which no code is available.

It is desirable to write each food item in a mixed dish on a separate line for ease in subsequent coding.

Food item	Description	Size of edible portion		
		I	II	III
Pork Stew	w/Pork composite	1.5	H	
	Potatoes	1.	Unit	
	Peas	0.33	Z	
	Carrots	0.66	Z	
	Gravy	0.25	S	

(5) Work area for computations (if needed)

Use the work area to enter any necessary information to describe the item and the probable amount if the specific amount cannot be entered in columns 42-56 immediately. For example, the food item is reported to be the size of Σ (a dimensional model) and additional calculations are needed to arrive at the weight - *or* - the respondent cannot estimate size by one of the "acceptable models," necessitating additional calculations. If the Greek letter models are used, they are always recorded here. **DO NOT ERASE** information used to describe items. Show all arithmetic used in calculations. This is invaluable as the data are checked.

(6) Size of edible portion served (columns 42-56)

These columns determine the basis on which the nutrient intakes are calculated. Determine from the respondent the size of the serving eaten by relating to the appropriate food measurement model.

I (columns 42-46).—These columns are to be used to record the number of units or part of a unit consumed. This is always a numeric entry. The numbers recorded here may be integers, decimal fractions, or mixed numbers.

Examples: 1. (Integer)
 0.50 (Decimal fraction)
 1.50 (Mixed numbers)

Remember that:

All integers must be recorded with a trailing decimal (e.g., 1.). All decimal fractions must be recorded with leading zero and decimal point clearly marked (e.g., 0.50).

II (columns 47-51).—These columns are used to record the model letter code or abbreviation code which describes the measure of the food item consumed. This is always an alphabetic entry. Greek letters may *not* be used.

The possible acceptable entries are: (Do not use a period after the abbreviation.)

MODEL CODES

A, S	Cups
B, V, Q	Glasses
SS, CC, M, E	Spoons
C, S, Z, J	Mounds
A, W, C, S	Bottles/cans
H, S, C, U, Y, SM, MED, LG	Meats
E	Butter
D, Q	Pie
E, M, G, H, CC, MM	Discs

ABBREVIATION CODES

GM or GMS	gram
OZ	ounce
PT	pint
QT	quart
HFGAL	half gallon
LB	pound
Cup	cup
TBSP	tablespoon
TSP	teaspoon

UNIT or UNITS

SKIPO

Refer to the section "Guide for Use of Food Models" for further information about models.

III (columns 52-56).—These columns are used to modify the number of units or portion of a unit consumed which was recorded in I (columns 42-46). Columns 52-56 are not used frequently.

Two arithmetic symbols are used to indicate the type of computation desired. "X" denotes multiplication; "/" division. The numbers which follow these symbols will always be numerical entries—integers or

decimal fractions. The rules for recording these numeric entries are the same as for I (columns 42–46). Examples of modification:

- Household serving to individual amount when models are not applicable. Respondent states she ate about 1/3 pint of ice cream. Record:

I	II	III
1.	PT	/3.

- Meat or disc model thickness must be modified. For example, respondent indicates the thickness of the disc was the “4” on the ruler, record “X 4.” in columns 52–56. If meat eaten was one-fourth the thickness of the model record “X 0.25” in columns 52–56.
- Meat model represents bone and/or fat that was not eaten. Use figures to modify (correction factor) from “Yield of Edible Portion from Meat Cooked with Bone and/or Fat” (Section on weights and measures).
- When Column III is used to modify the thickness of a meat model as well as to correct for the bone and uneaten fat, multiply the two correction factors to arrive at the factor to use.

Example: Only the lean portion of a pork chop was eaten. Cooked chop covered two-thirds the surface area of model C and was one-half as thick as the model.

Calculation: .49 is yield of lean meat from pork chop. 0.5 represents one-half the model thickness $0.49 \times 0.5 = 0.245$.

Record:

I	II	III
0.66	C	X 0.25

For boneless, lean cooked meat use discs for squares. Thickness is measured by ruler (EX: X 0.25).

(7) Time of day (columns 57–60)

Times are recorded on 2400 hour day beginning with 0100 for 1 a.m. and ending with 2400 for midnight. Thus 0930 is 9.30 a.m., 1200 is noon, and so forth. The approximate time each meal or snack was eaten is recorded. Time to the nearest one-half hour is satisfactory unless respondent reports it more precisely. *When Ingestion Period is coded “5,” Time of day should be coded “0007.”*

(8) Food source (column 61)

Usually information about the place where food was eaten is obtained as the respondent reports his food intake. If this is not the case inquire about, for example, “was your breakfast eaten at home?” or “where did you have the coffee and cake in the afternoon?” *“Home” is considered the food source for all food prepared and served at home; it also is the source of a packed lunch taken from home.*

Ready-to-eat food brought into the home (fried chicken, hamburgers, etc.,) is coded according to the source, that is “Restaurant” or “Other.”

“Restaurant” includes cafeterias and other self-service facilities, lunch counters as well as sitdown restaurants. *“Other”* includes food from

vending machines, street vendors, or food eaten at homes of neighbors or relatives.

“School” includes any milk or any meal served in school room or cafeteria at school.

(9) Additional information (columns 64–69)

Column	Item and explanation	Code
64	<p>Relation of 24-hour intake to usual eating pattern. Determine significant changes in amounts or types of food eaten in recall period. Place or time of eating, number of meals, or variation in activity should not be recorded although such factors should be explored with respondent to determine if they have caused a different-from-usual amount of food to be reported.</p>	<p>1-Same pattern as usual Pattern of recall different from usual because: 2-Respondent ill 3-Respondent lacked money 4-Recall was for Sunday or holiday 5-Another reason</p>
65	<p>Recent changes in diet (within past year). <i>Prescribed Diet</i>—Diet received at clinic or doctor’s office is coded “4” even if given and explained to respondent by a nurse.</p>	<p>0-No change 1-yes: eating more 3-yes: eating less 4-yes: on diet prescribed by physician</p>
66	<p>Meals usually eaten in restaurants and school lunch. This includes meals eaten in cafeterias, at lunch counters, drive-ins, etc. Code the number of times a week respondent usually eats a <i>meal</i> at such places. Between-meal snacks at restaurants are not counted.</p>	<p>0-Never, seldom 1-1 to 3 times 2-4 to 6 times 3-7 times or more</p>
67	<p>Consumption of vitamin/mineral supplements.</p>	<p>0-Not taken 1-Taken regularly 2-Taken irregularly</p>
68, 69	<p>Type of supplement. To determine if vitamin and/or mineral product, ask respondent the Brand Name, or manufacturer’s name. Interviewer may need to refer to the revised vitamin-mineral Reference list Guidelines and the Medication</p>	<p>0-Unknown, prescriptions 1-Multiple vitamins 2-Multiple Vitamins with additional supplements 3-Multiple vitamins and minerals 4-Multiple vitamins and</p>

Column	Item and explanation	Code
	or Vitamin form brought to the interview by the examinee.	minerals with additional supplements 5-Iron 6-Multiple vitamins with Iron 7-Iron with additional supplements 8-Geritol 9-Vitamin E 10-Vitamin E with additional supplements 11-Vitamin A 12-Vitamin A with additional supplements 13-Vitamin D 14-Vitamin D with additional supplements 15-Vitamin C 16-Vitamin C with additional supplements 17-Calcium 18-Calcium with additional supplements 19-Magnesium 20-Magnesium with additional supplements 21-Zinc 22-Zinc with additional supplements 23-B-Vitamin/B-Complex 24-B-Vitamin/B-Complex with additional supplements 25-Potassium 25-Potassium with additional supplements 27-Fluoride 28-Fluoride with additional supplements 29-Miscellaneous: code liver oil, brewer's yeast, kelp, lecithin yeast tablets, alfalfa tablets, liver tablets, formula 25, iodine, bone meal, bone marrow, protein pills, amino acid pills,

Column	Item and explanation	Code
70	Use of salt at the table (respondents over age 20 only). Code the frequency with which salt shaker is used to season nood after it ha been served. Code "8" for respondents under age 20.	energol-wheat germ concentrate 30-Not applicable 0-Rarely, never 1-Occasionally, seldom 2-Frequently, always 8-Not applicable

3. Food frequency

a. Purpose

To describe the pattern of use of selected foods and food groups within the past 3 months. If it is determined that the respondent's food intake has changed decidedly within 4-5 weeks of the interview (for example, he is on a newly prescribed diet for diabetes or weight control), the food frequency pattern should be based on his intake pattern before beginning the diet.

b. Obtaining and recording food frequency data

(1) Definitions

Number of times refers to how often the food item is eaten. When a range (as 3-4 times) is given use the lower figure. The amount eaten is not recorded. If two servings of vegetable for example are eaten at a meal, this constitutes one time.

Precoded
Actual number
00-None
77-Less than once weekly
99-Unknown

Interval—Record in the one appropriate box the code to indicate the number of times the food item is eaten during a day or week.

0-None
1-Daily
2-Weekly
7-Less than once weekly
9-Unknown

Note: If No. of times columns are coded 00, 77, or 99, one interval column must be coded respectively 0, 7, or 9.

Example:

	No. of Times		Interval				
	0	5	0	D1	W2	7	9
Eggs	0	5			2		

This indicates eggs are eaten 5 times a week.

(2) Recording the data

Food or food group	Explanation of food item
1. Milk and milk products	Includes milk drunk as a beverage or used on cereals; flavored milk drinks; cocoa made from milk; skim milk, yoghurt, buttermilk; ice milk; ice cream or puddings made with milk; cheese and cheese dishes. EXCEPTION: CREAM CHEESE
2. Meat	Includes beef, pork, lamb, veal, luncheon meats, canned meats, and frankfurters
3. Poultry	Includes chicken, turkey, duck, game birds, cornish hen, etc.
4. Organ meats	Includes liver, kidney, heart, spleen, etc.
5. Fish or shellfish	All varieties of fish and shellfish regardless of whether canned, fresh, frozen, or dried or salted.
6. Eggs	Includes eggs eaten, e.g., fried, boiled, poached, deviled, or egg salad. DOES NOT INCLUDE EGGS IN COOKED OR BAKED DISHES (AS CUSTARDS, PUDDINGS.)
7. Soups	Includes milk and water-based; gravies and sauces (meat and vegetable based.)
8. Fats and oils	Includes butter, margarine, salad oils, salad dressings, bacon, cream cheese, cream, peanut butter, non-dairy cream, olives, and imitation sour cream and mayonnaise.
9. Legumes and nuts	Includes dry beans and peas like pinto beans, red beans, black-eyed peas, peanuts, soy beans, soy products, etc.
10. Cereals and grain products	Includes breakfast cereals either dry as cornflakes or cooked such as oatmeal; grain products such as bread, rolls, biscuits, muffins, cornbread, crackers, and unsalted pretzels.
11. Fruits and vegetables	<p>a) All kinds, fresh, canned, frozen, cooked or raw; juices, including Tang or fruit drinks.</p> <p>b) Fruits and vegetables rich in vitamin A.</p> <p>c) Fruits and vegetables rich in vitamin C.</p>

Food or food group	Explanation of food item
12. Sugar & primarily sugar products	Includes all candy, Koolaid, soft drinks, lemonade, limeade, etc.
13. Desserts and sweets	Includes cake, pie, cookies, fruit puddings, jello, doughnuts (cake-type and yeast-type), sherbet, sweet snacks. EXCEPTIONS: ICE CREAM, ICE MILK.
14. Miscellaneous	Includes mustard, gelatin, malt, beverage powders, chili powder, seeds, low fat salad dressings, artificial milk, etc.
15. Mixed protein dishes with carbohydrates (starches)	Includes casseroles, pot pies, pizza, spaghetti with meat, etc. EXCEPTIONS: PLAIN CHEESE DISHES.
16. Alcohol beverages	Includes beer, wine, and distilled liquors
17. Sugar free and low caloric beverages	Includes coffee (regular, Sanka and decaffeinated) tea, bouillon, consomme, and carbonated drinks.
18. Salty snacks	Includes potato chips, corn chips, puffed snacks, cheese snacks, salted popcorn, etc.
19. Baby foods	Baby foods, baby formulas

Guide for Use of Food Models

For the Health and Nutrition Examination Survey, a computer will be used for determining the nutrient values of food consumed. The program for processing the data is adapted from a program developed at Tulane University¹ and is based on a food composition table which includes the 2483 food items appearing in U.S. Department of Agriculture Handbook No. 8 (1963), table No. 1, plus additional foods as needed to comply with those respondents report they consume. The food table (dietant) lists nutrients based on the amount of each nutrient in 100 grams of the specific food item.

1. Background

- a. Food portion models are used by the dietary interviewers to secure from respondents the amounts of foods consumed. These models also were developed by nutritionists at Tulane University^a and were designed so that the computer can take the alphabetic code assigned to each model, make necessary mathematical computations based on the size of the model, and arrive at 1) the gram weight of a food consumed then, 2) the nutrients from the amount of food consumed. An oversimplified explanation of what will occur is demonstrated by the following example:

^aMoore, M.C. et al. Using Graduated Food Models in Taking Dietary Histories. J.A.D.A. 51:447-450, 1967.

(1) A respondent may answer: "I ate applesauce in the amount of twice model 'S' yesterday."

(a) The interviewer will record as follows:

Food code (37-41)	Food item	Columns (42-46)	Columns (47-51)
00029	Applesauce	2.	S

(b) The computer will automatically know the gram weight of applesauce based on the food code numbers recorded in columns 37-41, understand that model "S" refers to 3/4 cup, and make necessary calculations.

(2) The respondent may have answered: "I consumed green salad in the amount of twice model 'S' yesterday."

(a) The interviewer will record as follows:

Food Code (37-41)	Food item	Columns (42-46)	Columns (47-51)
05687	Green salad with dressing	2.	S

(b) The computer's automatic calculations know that the gram weight and nutrient values for green salad with dressing are different from applesauce since the food code number is different. It will then make necessary calculations to get nutrient values for this different item although *measured* with same model.

Thus THE CORRECT USE OF THESE MODELS WILL ELIMINATE THE TEDIOUS, TIME-CONSUMING procedures of converting each household measure to the correct gram weight of the food consumed.

2. Description of food models

It is important to understand that the models are not intended to be models of any one food. Rather they are models designed to *assess portion size*.

These are the models and their alphabetic codes that you will find in the kit:

Model	Type measure	Alphabetic code	Numeric equivalent	Approximate household measurement Equivalent
Cups	Cup	A	10.00	1¼ cups
		S	06.00	¾ cup
Glasses	Cup	B	11.00	1⅜ cups
		V	09.00	1⅛ cups
		Q	05.00	⅝ cup
Spoons	Cup	SS	00.70	1½ tbsp

Model	Type measure	Alphabetic code	Numeric equivalent	Approximate household measurement Equivalent
Mounds and Bowl	Cup	CC	00.50	1 tbsp
		M	00.30	½ tbsp
		E	00.20	1 tbsp
		C	16.00	2 cups
		S	06.00	¾ cup
		Z	02.50	⅓ cup
Bottles/cans	Cup	J	14.00	1¾ cups
		A	10.00	1¼ cups
		W	12.00	1½ cups
		C	16.00	2 cups
Meats	Weight	S	06.00	¾ cup
		H	01.50	1½ oz
		S	06.00	6 oz
		C	16.00	1 lb
		U	31.00	2 lb
		SM	01.00	1 oz
		MED	02.50	2½ oz
		LG	05.00	5 oz
		Y	03.00	3 oz
French bread	Unit	UNIT		34 gms
Butter/ margarine	Weight (pat)	E	00.20	⅕ oz
Pie	Weight	D	04.00	4 oz
		Q	05.00	5 oz
Discs and squares	Weight	E	00.20	⅕ oz
		M	00.30	⅓ oz
		CC	00.50	½ oz
		MM	00.60	⅔ oz
		G	01.00	1 oz
		H	01.50	1½ oz
Boxes	Dimension	π 20.4 cubic in. (1¾" x 2¾" x 4¼") Σ 6.25 cubic in. (2½" x 2½" x 1") Δ 15.9 cubic in. (1/10 of 10" circle 3¼" high)		

The numeric equivalent indicates the MEASURE (*either weight or volume*) depending upon the food item. If the model's equivalent is 10.00 and this is a weight measure food item, the equivalent is interpreted by the computer to mean 10 ounces. On the other hand, if this is a cup measure food item, the computer would interpret the numeric equivalent of 10.00 to mean 1¼ cups (10.00 x ⅓ cup.)

An alphabetic code letter is used on more than one type of model. For example, the code letter "S" appears on a cup and also on fish. This is because the numeric equivalents are the same—the fish model is 06.00

indicating 6 ounces while the cup model is 06.00, but this would indicate $\frac{3}{4}$ cup (06.00 x $\frac{1}{8}$ cup).

3. Use of models

- a. It is necessary that data be recorded in a specific and consistent way. Therefore, each interviewer must be thoroughly familiar with the portion size models and the appropriate method of using them. The *Food Code Book* developed for use in HANES indicates the preferred model(s) for recording each food item. Also, a *Guide for Use of Food Models* is available. This guide indicates the preferred model (which is generally the manner in which that food item is measured) and alternates. It also indicates which models cannot be used for each food group. Improper recording of food models can result in either gross overestimation or underestimation of nutrient intake. Use of incorrect models slows down computer processing as the computer will reject items coded incorrectly.

Three basic principles:

- (1) Food items which generally are recorded by a *weight* measure are recorded by models and measures based on *1 ounce (28 grams)*. This is referred to as a WEIGHT MEASUREMENT. No other method of recording may be used for recording these items.
- (2) Food items which generally are recorded by a *volume* measure are recorded by models and measures based on weight of $\frac{1}{8}$ cup of the specific food. This is referred to as a CUP MEASUREMENT. No other method of recording may be used for recording these items.
- (3) Food items which generally are recorded by a "*unit*" (examples: 1 apple, or 1 banana, or 1 egg) are based on a reference weight for the unit. This is referred to as a UNIT MEASUREMENT. No other method of recording may be used for recording these items.

THE ONE EXCEPTION THAT HOLDS FOR ANY FOOD, REGARDLESS OF THE THREE ABOVE PRINCIPLES, IS THAT ANY FOOD MAY BE RECORDED IN GRAMS.

- b. The models should be taken from the desk drawer or suitcase at the time portion size is being determined rather than being spread out ahead of time. Give the respondent a choice of all appropriate models each time, with the *models being arranged from the smallest to the largest* in a row. For example, if he says he ate a "*bowl of stew*" he would be shown the bowl model and/or *all bean mound models—Z, S, J,*—so that he could choose the size that most nearly corresponds to the amount he ate. Use either the bean or rice models when a mound model is selected. Generally the choice is dictated by the type of food being considered—rice models for light-colored foods such as cereal, ice cream, or canned fruits; bean models for food such as stews, soups, and most vegetables.
- c. The reported intake will not always correspond to the exact size of the model.
 - (1) Special symbols can be used whenever the respondent uses two models to describe the size serving. The symbols are as follows:

Symbol	Definition	Use
=	(range)	Respondent states the serving size is between two models.
+	(add)	Respondent ate the equivalent of two models.
-	(subtract)	Respondent served one model, had the equivalent of another model leftover.

When using these special conditions, the *smaller* model must be recorded to the *left* of the sign.

Examples: (Refer to kit to note size of two models.)

$$S = A$$

$$S - A$$

$$S + A$$

- (2) Glasses (B, V, Q). Marks are placed at the $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ volume level. These marks must be used to indicate the amount consumed if it is less than the top mark. The top mark shows the full volume of the glass as it is considered by the computer. Example: Glass Model B at the full level *mark* is $1\frac{3}{8}$ cups, if "filled to the brim" it would be more than "1B."
- (3) Meat (C, U). Lines appear on the sides of these models. They represent 0.25, 0.50, 0.75 and all of the thickness. These lines will be needed should the respondent state the amount consumed was a different thickness from the model.
Use of the meat models needs special attention as the weight equivalent of these models may represent the weight of meat plus bone and/or fat. When using the meat models it is essential to determine if the model selected by the respondent represents bone and fat as well as meat. Then the interviewer must determine if some or all of the fat was eaten. The appropriate factor is then applied (columns 52-56) so that the computer will correct for the bone and fat or for the bone only if the fat was consumed.
- (4) Thickness models are to assist with dimensions or with thickness of disc, square, and rectangular models. Each thickness model is $\frac{1}{8}$ " thick, which is the thickness on which the disc is based. Note that $\frac{1}{8}$ " thickness is marked "1;" 2 units equal " $\frac{1}{4}$ " and would be recorded as "2." Always record the number on the top thickness model if several are stacked together to arrive at the thickness of food consumed. Modification of thickness when using disc, square, and rectangular models should be made according to the chart showing thickness and model designation (code book).
- (5) Boxes—Greek letter code. These models are for use in estimating dimension and subsequently weight of those items so indicated in the "Guide for Use of Food Models."

At the completion of the interview the gram weight of edible portion must be determined if a Greek letter box was used during the interview to describe the amount eaten. Note the example:

Respondent eats a piece of pound cake one-half the size of model marked π .

Step one: Arrive at the total number cubic inches consumed. Since $\pi = 20.44$ cu. in., one-half that size would mean the piece of pound cake was the equivalent of 10.22 cu. in.

Step two: Secure gram weight for a specific size of the food item. By referring to a standard reference such as USDA Bulletin No. 72, it may be noted that a piece of pound cake $3\frac{1}{2}'' \times 3'' \times \frac{1}{2}''$ (5.25 cu. in.) weighs 30 gms.

Step three: Calculate grams per cubic inch.
$$\text{gms per cu. in.} = \frac{\text{number of grams}}{\text{number of cu. in.}}$$

If 5.25 cubic inches weighs 30 gms, 1 cubic inch weighs 5.7 gm (30/5.25)

Step four: Calculate gram weight of item consumed. Thus, the piece of pound cake consumed which was 10.22 cubic inches, would weigh 58 gms. (10.22 cu. in. \times 5.7 gms per cu in. rounded to the nearest whole number.)

Step five: Transfer to proper columns.

<i>Cols.</i>	<i>Cols.</i>
(42-46)	(47-51)
58.	GMS

Chapter 7

PHYSICIAN'S EXAMINATION

General

HANES is designed to gather data for statistical analysis. Rather than have a general clinical examination performed in the manner most familiar to the examining physician, we have a physical examination structured to gather data on physical conditions pertinent to nutrition and certain chronic diseases. This section of the manual, which describes the method of performing the examination and specifies the method of recording findings, should be followed explicitly.

Other chapters of the manual (Responsibilities of Examination Staff Members, and Emergency Medical Procedures) describe the other obligations and duties of the examining physician.

Format for the Examination

Certain procedures are to be deleted on the basis of age and are indicated on the examination form.

Sitting

Blood pressure and pulse

HEENT

Hair, skin, skull, glands

Ears

Nose

Eyes

Mouth

Neck

Nodes and trachea

Chest (including heart)

Inspect

Auscult

Reclining

Heart

Inspect

Palpate

Auscult

Abdomen

Inspect

Percuss

Palpate

Arteries

Musculoskeletal

Knee

Hip
Straight leg raising

Sitting

Extremities
Lower
Upper
Neurological
DTR's
Chvostek

Standing

Inguinal Hernia
Musculoskeletal
Back
Knees
Skin
General appearance and behavior

Supine and Sitting

Blood pressure

Examination Procedure

1. *Blood pressure and pulse:* While the examinee is sitting, check his blood pressure and pulse in the right upper extremity. (Count the pulse for at least 30 seconds.)
2. *HEENT examination:* Perform a routine HEENT. Make a special note of characterizing the hair, checking the skin for seborrhea, the skull for bossing, and looking for parotid enlargement. Inspect the external ear and, with an otoscope, examine the auditory canal and tympanic membrane. Check each nostril for patency with inspiration during alternate unilateral occlusion and examine each nostril with an otoscope. Check the eyes (lids, conjunctiva, cornea) and mouth (lips, tongue, buccal mucosa) for findings linked with malnutrition and other pathology.
3. *Neck examination:* Observe the neck at rest for thyroid visibility during swallowing of small aliquots of water. Repeat with the neck extended to judge thyroid size and contour. Palpate the neck for thyroid contour and tenderness, lymph nodes, and tracheal deviation.
4. *Chest examination:* Inspect the chest paying particular attention to the skin of the upper back and to the costochondral junctions for signs attributable to malnutrition. Auscult the chest with care to cover representative areas for all lung segments.
5. *Cardiovascular examination:* While the examinee is sitting, and then when he is supine, palpate and auscult the heart. Check especially for cyanosis and venous distention. Check the peripheral pulses—note the character of the artery as well as the quality of the pulsation.
6. *Abdominal examination:* Inspect the abdomen for evidence of past surgery and for stigmata of malnutrition. During quiet respiration in the supine position, percuss the liver. Use palpation and fist percussion to elicit CVA

tenderness. With the examinee's knees and hips flexed to relax the abdominal musculature, palpate the abdomen. While he is standing erect, palpate for hernia.

7. *Musculoskeletal examination*: Examine the knees and hips for deformities and signs of inflammation, check for tenderness and for pain with active and passive motion, and perform the straight leg raising test. With the examinee seated check the legs for calf tenderness and check the extremities for evidence of arthritis and epiphyseal swelling. Also at this time check the extremities for pretibial edema, hyperpigmentation and pellagrous dermatitis, follicular hyperkeratosis, xerosis, mosaic skin, petechiae, and ecchymoses. With the examinee standing check the cervical, thoracic, and lumbar spine for deformities, limited range of motion, and pain with motion by having the examinee flex, extend, laterally bend, and rotate the spine. Check for sciatic notch and sacro-iliac tenderness. With the examinee bending forward (as in touching toes) check for exacerbation or relief of scoliosis (including rotary component). While the examinee is standing, again check the knees for deformities (and the legs for varicosities).
8. *Neurological examination*: While the examinee is seated test for knee jerks, ankle jerks, and facial spasm (Chvostek sign).
9. *Dermatological examination*: Check the skin regionally during the other parts of the examination as described previously—see "Folder I" on the trailer for illustrations of findings linked with malnutrition.
10. *General appearance and behavior*: Take special note of the general appearance and behavior of the examinee which might reflect organic or functional disorders (e.g., endocrine imbalance, chromosomal disorders, psychosis) which would confound evaluation of nutritional status or reflect malnutrition.
11. *Blood pressure*: At the close of the physician's examination the blood pressure should be taken while examinee is both in the supine and sitting positions.

Recording of Findings

The examination forms contain spaces for structured responses, open ended responses, and summaries of diagnostic impressions. Since the structured responses will be used for computer analysis, certain criteria for and/or definitions of these responses will be given below to insure comparability of data collected by numerous physicians. The open ended responses are for recording both common and rare findings (which have not been put into structured form because of rarity or secondary importance to the goals of the survey) so that a more complete medical record will be available if information beyond the structured responses is needed in the future. The summary and diagnostic impressions allows a reviewer to quickly synthesize the physician's findings on a given examinee and to ascertain the physician's subjective as well as objective evaluations.

Unless otherwise noted in the instructions, positive responses should be recorded with checks in the appropriate boxes. A correction should be made by circling the response to be negated and checking the correct box.

Either the "Findings" or "No findings" box should be checked when they occur. If there are no findings for any section of the examination, check the "No findings" box; if there are findings check the "Findings" box as well as the individual boxes for whatever findings there are.

The letters "R" or "Rt.," "L" or "Lt.," and "B" mean right, left, and both, respectively.

At the end of the chart are forms for reporting findings to physicians. Record there any significant medical findings which need to be reported to a physician or check the box to indicate that there are no significant new medical findings to be reported.

Criteria and Definitions

1. *Pulse and blood pressure:*

Record the pulse as the number of radical pulsations per minute and the systolic and diastolic blood pressure in even digits to the nearest 2 mm. pressure.

2. HEENT

- a. *Dry staring hair:* Dry, wirelike, unkempt, stiff, and often brittle hair which sometimes may exhibit some bleaching of the normal color.
- b. *Dyspigmented hair:* Definite change from normal pigment of the hair, most usually evident and best seen by carefully combing hair strands upward and viewing the orderly array of hair in good light. Dyspigmentation includes both change of pigment (usually lightening of color) and depigmentation—not to be confused with dyed or tinted hair. Dyspigmentation is always bandlike in character and is usually associated with some change in texture of hair in the dyspigmented band. In some ethnic groups, particularly Negroid groups, the pigment may be slightly reddish in color. In others, especially among straight black-haired peoples, the bandlike depigmentation ("flag sign") is common. Dyspigmentation is only rarely observed in adults.
- c. *Easily pluckable hair:* A condition in which the shafts of hair are readily removed with a minimal tug when a few strands are grasped between the finger and thumb and gently pulled. In such cases there is no reaction from the child, indicating a lack of pain associated with removal of the hair.
- d. *Abnormal texture or loss of curl:* Changes in texture of the hair to a soft, silklike hair. Loss of curl is self-explanatory.
- e. *Circumcorneal injection (bilateral):* increase in vascularity by new ingrowth of capillary loops, with particular concentration around the cornea in the absence of obvious causes other than nutrition.
- f. *Conjunctival injection (bilateral):* Generalized increase in the vascularity of the bulbar conjunctivae in the absence of obvious infection.
- g. *Angular blepharitis:* A fissure located in the lateral palpebral angle of the eyelids which presents as a crack in the epidermis similar to the cracks found at the angles of the mouth in angular stomatitis.
- h. *Pupils and Iris:* Irregularity of pupil contour.
- i. *Xerosis (conjunctivae):* The conjunctivae, upon exposure when holding the examinee's lids open and having the examinee rotate his eyes, appear dull, lusterless, and exhibit a striated or roughened surface.
- j. *Lesions of cornea (other):* Use oblique moving illumination with small flashlight to look for opacities, surface debris, deposits in the anterior chamber and cataract.
- k. *Bitot's spots:* Small circumscribed, grayish or yellowish-gray, dull, dry,

foamy, superficial lesions of the conjunctivae. Seen most often at the lateral aspect of the bulbar conjunctivae of children. Usually bilateral. Not to be confused with pterygium.

- l. *Keratomalacia*: Corneal softening with deformity, either localized (usually central part of lower half of cornea) or total.
- m. *Xerophthalmia*: Xerophthalmia is recorded when the bulbar conjunctiva and cornea are dry and lusterless with a decrease in lacrimation. It is rarely associated with evidence of infection but in extreme cases is associated with keratomalacia.
- n. *Lids and Sclera*: Lid edema, lid infection, and ptosis.
- o. *Angular lesions of lips*: Record only if definitely present bilaterally when the examinee's mouth is held half open. May appear as pink or moist, whitish, macerated, angular lesions which blur the mucocutaneous junction. Angular lesions are recorded only when there is definite break in continuity of epithelium at the angles of the mouth.
- p. *Angular scars of lips*: Scars at the angles which, if recent, may be pink; if old, may appear blanched.
- q. *Cheilosis*: Different from ordinary chapping. The lips are swollen or puffy and appear as if the buccal mucosa extends out onto the lip. There may be desquamation. This category may be used to include vertical fissuring of the lips. If associated with herpes labialis, note under "Other findings."
- r. *Filiform papillary atrophy of tongue*: The filiform papillae are exceedingly low or absent, giving the tongue a smooth or "slick" appearance which remains after scraping slightly with an applicator stick.
- s. *Fungiform papillary hypertrophy of tongue*: The fungiform papillae can be seen and felt when a tongue blade is drawn lightly over the anterior two-thirds of the tongue.
- t. *Geographic tongue*: Irregularly outlined and distributed areas of atrophy with irregular white patches resembling leukoplakia.
- u. *Fissures of tongue*: Linear lesions or cracks with a definite break in the continuity of the epithelium.
- v. *Serrations or swelling of tongue*: Tooth impressions at sides of tip, often noted when tongue is swollen.
- w. *Scarlet, beefy tongue*: Entire tongue is red, angry in appearance, with or without denudation or fissures. Not just a modification of the natural color due to the loss of papillae. Associated almost always with subjective symptoms of hypersensitivity, burning, and even taste changes.
- x. *Magenta tongue*: A tongue the color of alkaline phenolphthalein.
- y. *Nasolabial seborrhea*: A definite greasy, yellowish scaling or filiform excrescences in the nasolabial area which become more pronounced on slight scratching with the fingernail or a tongue blade.
- z. *Visible enlarged parotids*: Due to difficulties in assessing parotid enlargement, record as positive the presence of bilateral enlargement only if clearly visible.
- aa. *Bossing of skull*: Record abnormal prominence or protrusion of frontal or parietal areas.

3. Thyroid evaluation

The World Health Organization (WHO) criteria used for grading goiter are:

Grade 0: Persons without goiter. By definition these are persons whose thyroid glands are less than 4 to 5 times enlarged.

Grade 1: Persons with palpable goiters. The thyroid is considered to be more than 4 to 5 times enlarged although not visible with head in normal position. Most of these will be readily visible with the head thrown back and the neck fully extended.

Grade 2: Persons with visible goiters. Persons with goiters which are easily visible with the head in normal position, but which are smaller than those in Grade 3. Palpation may be helpful in determining the mass of the gland but is not needed for diagnosis.

Grade 3: Persons with very large goiters. The goiters of persons in this category can be recognized at a considerable distance. They are grossly disfigured and may be of such a size as to cause mechanical difficulties with respiration and the wearing of clothes. (Perez, C., Scrimshaw, N.S., and Munoz, J.A.: Technique of endemic goitre surveys. In endemic Goitre; p. 369, see esp. p. 376, World Health Organization Monograph Series No. 44, Geneva, 1960.)

Other thyroid findings: Record any tenderness, nodularity, enlargement of the isthmus, or other abnormal thyroid findings not included in grading thyroid size.

4. Chest evaluation:

- a. *Beading of ribs:* A definitely palpable and visible enlargement of the costochondral junctions.
- b. *Follicular hyperkeratosis of upper back.* This lesion has been likened to "gooseflesh" which is seen on chilling, but it is not generalized and does not disappear with brisk rubbing of the skin. Readily felt, it presents a "nutmeg grater" feel. Follicular hyperkeratosis is more easily detected by the sense of touch than by the eye. The skin is rough, with papillae formed by keratotic plugs which project from the hair follicles. The surrounding skin is dry and lacks the usual amount of moisture or oiliness. Differentiation from adolescent folliculosis can usually be made by recognition of the normal skin between the follicles in the adolescent disorder. Follicular hyperkeratosis is distinguished from perifolliculosis by the ring of capillary congestion which occurs about each follicle in scorbutic perifolliculosis.
- c. *Wheezing on auscultation:* Record any wheezing, inspiratory or expiratory, as focal or diffuse.
- d. *Decreased breath sounds:* Record if there is diffusely decreased breath sounds. (Focal or discrete areas of decreased breath sounds should be recorded under "Other findings.")
- e. *Breast Masses:* Palpate in both upright and supine positions. If a mass is found, characterize with regard to location, size, contour, consistency, tenderness and mobility.

5. Cardiovascular evaluation:

- a. *Cyanosis:* Record definite cyanosis which is thought to be related to generalized hemoglobin desaturation. (Focal phenomena, e.g., one extremity cyanotic should be recorded under "Other findings.")
- b. *Irregular pulse:* Record any irregularities of pulse except physiological variations.

- c. *Cardiac murmur*: Record all murmurs. Grade, location, radiation, and any other pertinent description should be given as well as an opinion as to the origin of the murmur.
6. Abdominal evaluation:
- a. *Hepatomegaly*: Record livers palpable 2 centimeters or more below the right costal margin.
 - b. *Splenomegaly*: Record all palpable spleens.
 - c. *Uterine enlargement*: Record all enlarged uteri including those enlarged secondary to pregnancy.
 - d. *Umbilical hernia*: Record all umbilical hernias. If a hydrocele is present write it in under "Summary of Diagnostic Impressions" with its ICDA code.
 - e. *Inguinal and femoral hernias*: Record all hernias and note next to boxes if bilateral.
 - f. *Potbelly*: Record if abdomen appears abnormally distended and enlarged with due recognition of the usual contour of the young child.
 - g. *Masses*: If masses are present, check box 287. Record the number(s) of the location(s) (see diagram for number of locations) of the mass(es) to the right of 288. Use the number which locates the center of the mass. Check box 289 and write in a description of the masses, identify each by its number location, e.g., (7) 3 cm. diameter firm, fixed, nontender.
 - h. *Scars*: If scars are present, check box 290. Record the number(s) of the location(s) of the scar(s) to the right of 291. Use the number which locates the center of the scar. Check box 292 and write in a description of the scars, identifying each by its number location, e.g., (7) 3 cm well-healed appendectomy scar.
7. Musculoskeletal evaluation:
- a. *Bowed legs (genu varum)*: Bilateral concave deformities of the thighs and tibiae should be recorded, even if mild.
 - b. *Knock knees (genu valgum)*: Bilateral convex deformities of the knees and tibiae should be noted only if marked.
 - c. *Epiphysial enlargement of wrists*: This can be more easily felt than seen and should be recorded, particularly if present at the ulnar epiphysis.
 - d. *Ortolani's maneuver*: With the infant lying supine, the examiner straightens and adducts the legs. The examiner's thumb rests along the inside and the other fingers extend along the outside of the infant's thigh. The hips and thighs are flexed to 90° and one leg is then abducted with the examiner's fingers gently pressing the trochanter of the femur upward and forward. The normal hip in a relaxed infant can be abducted to almost 90°. If dislocation is present resistance may be felt between 45° and 60° and a click felt as the dislocated femoral head slips into the acetabulum.
8. Neurological evaluation
- a. *Absent knee jerks*: Record bilaterally absent knee jerks—unilateral absence should be described under "Other findings."
 - b. *Absent ankle jerks*: Record bilaterally absent ankle jerks—unilateral absence should be described under "Other findings."
 - c. *Positive Chvostek sign*: When in tapping the malar process of the temporal bone on both sides of the face with a percussion hammer, a twitching of

the perioral muscles of the same side is elicited, this is a positive Chvostek sign. A positive sign indicates hyperirritability of the neuromuscular system as found in spasmodophilia (tetany) due to calcium deficiency.

- d. *Apathy*: This should be noted and recorded if it is marked, particularly in young children. It has importance in relation to protein-calorie deficiency (PCD).
- e. *Marked hyperirritability*: This refers to behavior (not to reflexes) and should be recorded only if marked.

9. Skin evaluation

- a. *Follicular hyperkeratosis, arms*: See 4b.
- b. *Hyperpigmentation, hands and face*: Asymptomatic with no inflammatory component. It is seen most frequently on the dorsum of the hands and lower forearms, particularly when skin hygiene is poor. The skin is rough, dry, and often has a grayish, cyanotic base. There is not the sharp line of demarcation at the border of the lesion such as one sees in pellagra.
- c. *Dry or scaling skin (xerosis)*: Xerosis is a clinical term used to describe a dry and crinkled skin which is made more obvious by pushing the skin parallel to the surface. In more pronounced cases it is often mottled and pigmented and may appear as scaly or alligator-like pseudoplaques, usually not greater than 5 mm in diameter. The nutritional significance of it is not established. Differential diagnosis must be made between this condition and changes due to dirt, exposure, and ichthyosis.
- d. *Perifolliculosis*: Congestion around the follicles which does not blanch upon pressure. (See discussion of follicular hyperkeratosis above.) There is an early ring of capillary engorgement around some hair follicles which does not disappear on pressure. It is more frequently encountered on the dependent parts such as the legs. Swelling and hypertrophy of the follicles may occur, at which time the skin becomes rough. Follicular hyperkeratosis and perifolliculosis may coexist.
- e. *Petechiae*: Record petechiae which you as a physician judge to be due to abnormalities of the examinee. Do not record normal responses to minor trauma as positives. Qualify by describing distribution and severity, e.g., minimal pigmented purpuric eruption on the legs. If deemed contributory, a tourniquet test may be performed on the upper extremity with the blood pressure cuff adjusted between systolic and diastolic pressures for 5 minutes, and the results described.
- f. *Mosaic skin*: This is usually found on the lower legs and constitutes a dry, atrophic alteration of the skin with a mosaic-like pattern and a certain luster of the surface. It is associated with conditions where the superficial layers of the skin are subject to stretching (increased tension) due to underlying edema, e.g., in protein deficiency.
- g. *Pellagrous dermatitis*: Areas of dry dermatitis-like lesions on the dorsal surface of hands, cheeks, forehead, and if exposed on the neck (Casals necklace).
- h. *Ecchymoses*: Record ecchymoses which you as a physician judge to be due to abnormalities of the examinee. Do not record normal minor responses to known minor trauma.

10. Examiner's subjective impression of nutritional status:

This will be the examining physician's subjective appraisal of the state of

nutrition of the examinee. Indicate whether or not you judge the examinee to have "normal nutrition" or "abnormal nutrition." Obesity is considered to be "abnormal nutrition."

11. External ear:

Record if the ears are pierced. Check "Operative scar" only for mastoid operation scars. Check and write under "other" additional findings which are significant cosmetically and/or which might impair hearing.

12. Auditory canal:

Check "Completely occluded" if there is not sufficient tympanic membrane visible to characterize the membrane under "Drum" (below), and check as "Partially occluded" all other cases in which there is obstruction of or protrusion into the auditory canal. For all positive responses check the cause of the obstruction; write cause under "Other" for causes other than cerumen.

13. Drum:

Check "Not visible" only if "Completely occluded" is checked above. Check as many structured responses as apply in the description of the membrane, e.g., dull, bulging, and fluid may all be checked under R ear. However, do not check two responses for one code number. If the membrane is perforated, check either "With discharge" or "Without discharge." Check "Other" and write in a description if the structured responses need to be supplemented.

14. Nares:

Check "Acute" or "Chronic" if the naris is obstructed (use physical appearance plus history to judge if obstruction is acute or chronic). Check as many responses under "Other significant findings" as are necessary to describe the nares.

Nasal Polyps—These are soft, smooth, pale, movable tumors usually multiple.

15. Neck:

Check "Adenopathy," "Tracheal deviation," or "Other (describe)" to describe significant clinical findings (except thyroid) in the neck.

16. Chest:

In the structured response chart check the columns corresponding to the observed abnormalities at the levels of the lobes over which the findings are observed. (If needed, see diagrams present in the MEC for normal distribution of pulmonary segments and lobes.) Other auscultatory findings, and findings on inspection, percussion, or palpation should be checked and written in under "Other chest findings."

17. Heart:

- a. *PMI*: Check whether the PMI is "Felt" or "Not felt." If felt, check the number of the closest interspace and check the relationship to the mid-clavicular line.
- b. *Thrills*: Check whether a thrill is "Absent" or "Present." If present, check systolic and/or diastolic to time the thrill, and check either base or apex to

ocate the maximum intensity of a given thrill. For multiple thrills, record only the most intense one.

- c. *Heart sounds*: Check the structured response which best describes the first heart sound and the one which best describes the second heart sound.
- d. *Murmurs*: Check "None" if no murmurs are heard. If a murmur or murmurs are heard, place checks under the appropriate period—systolic and/or diastolic—to indicate the timing when categorizing by type and location of the murmur(s) or the component(s) of murmur(s) within each period—systolic and diastolic. When typing systolic murmurs, check "Organic" if any systolic murmur or systolic component of a murmur is thought secondary to a cardiovascular lesion; and check "Functional" if no systolic murmur or systolic component of a murmur is thought secondary to a cardiovascular lesion. Check "Don't know" only if a reasonable clinical judgment cannot be made. Follow the same guidelines for typing diastolic murmurs. Note that "Functional," "Organic," and "Don't know" are to be considered mutually exclusive responses within each period (systole, diastole). In locating and grading a murmur, record the grade of the murmur by checking the grade as judged at its point of maximum intensity in the appropriate period column to the right of the structured location response which best approximates the location of its point of maximum intensity. Unless there are both systolic and diastolic components to a murmur, check only one grade-location response for each murmur; for multiple murmurs make multiple responses. (However, there should be only one response at a given location within a given period.) To locate the origin of each murmur or component thought secondary to a cardiovascular lesion ("Organic" will have been checked), check in the appropriate period column (systolic, diastolic, or both) to the right of the location of the cardiovascular lesion thought to be the origin of the murmur; e.g., for pulmonic stenosis check to the right of 254 in the box numbered 1. Make multiple responses for multiple murmurs of "Organic" origin. Check "Other" if the location of other than 251–256 and check "Don't know" if the murmur is thought to be organic but a reasonable clinical judgment of the origin cannot be made.
- e. *Other cardiac and cardiovascular findings*: If there are significant cardiac or cardiovascular findings for which there are no other appropriate responses in either the heart or arterial evaluation sections, check "Yes" and then check the structured or open ended (under "Other") response which applies. Check "No" if this space is not needed to describe cardiac or cardiovascular findings.

18. Arterial evaluation:

Check the structured response ("Normal," "Sclerotic," "Tortuous," or "Sclerotic and Tortuous") which best characterizes each artery listed, and check the structured response ("Normal," "Bounding," "Diminished," or "Absent") which best characterizes each pulse listed. If the dorsalis pedis pulse is absent and the posterior tibial pulse is present, check "Absent" for dorsalis pedis and write in "posterior tibial" after "Other" and check its character. If the dorsalis pedis and posterior tibial pulses are both absent, check "Absent" for dorsalis pedis and write in "popliteal" after "Other" and check the character of the popliteal pulse.

19. Joints:

To record findings in joints, locate the box for the finding to be recorded (i.e., tender, swelling, deformity, limitation, Heberden's nodes, pain on motion, other) and the joint involved. Within the box check right, left, or both to indicate the location of involvement for shoulder, elbow, wrist, ankle, feet, knees, and hips and check the total number of digits involved on each side for the MP and DIP joints. Check the total number of digits involved on the right and on the left for each finding (note this is the total number of digits involved and not the digit involved).

- a. *Back*: Check the described deformities if observed; check the location of any tenderness or limitation of motion. If there is pain with motion, check the location at the right of the motion which elicits the pain—"diffuse" should be checked if all three locations (cervical, thoracic, low back) are involved, but do not check thoracic or low back in these instances. "Uncertain" should be checked if pain occurs but the site cannot be specified. The severity of pain in flexion and extension of the neck is graded 0-none, 1-doubtful, 2-minimal, 3-moderate, and 4-maximum. If there is limitation of motion on flexion of the lumbar spine, check box M4c(368) and describe as limitation of flexion, lumbar spine.
- b. *Straight leg raising*: For the SLR test, check negative or positive for both the right and the left. Also, for "Increase with dorsiflexion," check either "Yes" or "No" for both the right and left.

20. Other systems:

Record here system findings which cannot be noted in other parts of the form, e.g., Reticuloendothelial—marked inguinal and axillary adenopathy plus cervical adenopathy, pallor, and petechiae previously noted. But if only petechiae and cervical adenopathy were observed, they would have previously been recorded and need not be recorded here.

21. Blood pressure:

Record the systolic and the diastolic blood pressures to the nearest even digit for both the recumbent and the sitting positions and note the time to the nearest minute of the determination.

22. Summary of diagnostic impressions

On the last page of the physical examination recording form under the heading "Summary of Diagnostic Impressions" findings should be summarized. Diagnostic impressions may be on the basis of physical exam, history, X-ray, laboratory findings, etc. Certainly not all findings should be listed, but those deemed significant in relation to disease or certain condition states should be listed. However, in order to facilitate data processing all entries under other categories should be listed and given ICD codes. It is preferable to summarize findings by condition such as "osteoarthritis" rather than by listing symptoms or signs. After completing the examination, indicate whether the examinee is "normal" or "abnormal." If abnormal, summarize findings according to the directions briefly outlined above. Cardiovascular (including venous disease), musculoskeletal, and respiratory findings should be listed in their appropriate sections with other findings below.

Following each such listing, indicate the seeming severity of each, checking whether it appears to be either minimal, moderate, or severe. This will be strictly subjective and based on your own appraisal. Should there arise some difficulty in deciding between two of the possible classifications, the lesser of the two should be selected.

Then indicate the certainty of the diagnosis using a scale ranging from 0 to 9 according to the following criteria:

- 0-not at all certain
- 2-little bit certain
- 4-somewhat certain
- 6-fairly certain
- 8-very certain
- 9-extremely certain

The range is continuous and any number representing a degree of certainty between two of the listed scale numbers may be selected. When selected, the number should be written in the appropriate space.

Each condition should finally be coded according to the *Eighth Revision International Classification of Diseases, Adapted for Use in the United States*, which has been modified for use in HANES. A complete listing of these HANES modified codes are kept in each caravan. Since the vast majority of examinees with findings will have one or more of a small number of common conditions, the more probable conditions with the appropriate code numbers are listed below:

Modified ICDA Codes for Use in HANES

- I. Infective and Parasitic Disease (000-136)
 - 011.X Pulmonary Tuberculosis
 - 044.X Polio, Late Effects of
 - 111.0 Tinea Versicolor
- II. Neoplasms (140-239)
 - See specific Neoplasms as classified
 - 214.X Lipoma
 - 227.0 Hemangioma of Skin
- III. Endocrine, Nutritional and Metabolic Diseases (240-279)
 - 240.X Simple Goiter
 - 241.X Nontoxic Nodular Goiter
 - 242.X Hyperthyroidosis (Hyperthyroidism) with or without Goiter
 - 243.X Cretinism
 - 244.X Hypothyroidism (acquired)
 - 250.X Diabetes Mellitus
 - 274.X Gout
 - 277.X Obesity not specified as of Endocrine Origin
- IV. Diseases of Blood and Blood Forming Organs (280-289)

- 280.X Iron Deficiency Anemias
 - 282.X Hereditary Hemolytic Anemias including Sickle Cell Disease
 - 287.X Purpura and other Hemorrhagic Conditions
- V. Mental Disorders (290–315)
- 295.X Schizophrenia
 - 296.X Affective Psychoses
 - 300.X Neuroses
 - 303.X Alcoholism
 - 309.X Mental Disorders not specified as Psychotic; associated with Physical Conditions; includes Brain Syndrome
 - 309.2 Due to Brain Trauma
 - 309.3 Due to Circulatory Disturbance
 - 309.6 Due to Senile or Presenile Brain Disease
- VI. Diseases of the Nervous System and Sense Organs (320–389)
- 324.X Meningitis or Encephalitis, late effects of
 - 342.X Paralysis Agitans (Parkinson's Syndrome)
 - 343.X Cerebral Spastic Infantile Paralysis
 - 344.X Other Cerebral Paralysis
 - 344.1 Hemiplegia
 - 345.X Epilepsy
 - 346.X Migraine
 - 350.X Facial Paralysis
 - 353.X Neuralgia or Neuritis of Sciatic Nerve
 - 360.X Conjunctivitis and Conjunctival Infection
 - 367.X Retinitis
 - 373.X Strabismus
 - 374.X Cataract
 - 375.X Glaucoma
 - 377.0 Vascular Lesions of Retina
 - 377.1 Degeneration of Retina
 - 379.X Blindness
 - 380.X Otitis Externa
 - 381.X Otitis Media without Mastoiditis
 - 382.X Otitis Media with Mastoiditis
- VII. Diseases of Circulatory System (390–458)
- 394.X Disease of Mitral Valve
 - 395.X Disease of Aortic Valve
 - 401.X Essential Benign Hypertension
 - 402.X Hypertensive Heart Disease
 - 403.X Hypertensive Renal Disease
 - 412.X Chronic Ischemic Heart Disease
 - 413.X Angina Pectoris
 - 427.0 Congestive Heart Failure
 - 427.3 Heart Block
 - 427.4 Atrial Fibrillation or Flutter
 - 427.9 Other and Unspecified Disorders of Heart Rhythm (Other than PAT, AF, VF, Heart Block)
 - 429.0 Cardiac Enlargement and Hypertrophy

- 436.X Stroke
 - 440.X Arteriosclerosis
 - 443.0 Raynaud's Syndrome
 - 443.9 Intermittent Claudication, PVD, not otherwise specified
 - 451.X Phlebitis and Thrombophlebitis
 - 454.0 Varicose Veins, with Ulcer
 - 454.1 Varicose Veins, with Stasis Dermatitis without Ulcer
 - 454.9 Varicose Veins other, without Ulcer
- VIII. Disease of Respiratory System (460–519)
- 460.X Cold
 - 461.X Acute Sinusitis
 - 462.X Acute Pharyngitis
 - 463.X Acute Tonsillitis
 - 464.X Acute Laryngitis and Tracheitis
 - 465.X URI of unspecified or multiple site
 - 466.X Acute Bronchitis
 - 491.X Chronic Bronchitis
 - 492.X Emphysema
 - 493.X Asthma
 - 500.X Hypertrophy of Tonsils and Adenoids
 - 504.X Deviated Nasal Septum
 - 505.X Nasal Polyp
 - 507.X Hay Fever
 - 507.1^b Allergic Rhinitis
- IX. Disease of Digestive System (520–577)
- 529.1 Geographic Tongue
 - 533.X Peptic Ulcer, site unspecified
 - 550.X Inguinal Hernia not obstructed
 - 551.0 Femoral Hernia not obstructed
 - 551.1 Umbilical Hernia not obstructed
 - 551.3 Diaphragmatic Hernia, not obstructed
 - 564.1 Irritable Colon
 - 571.X Cirrhosis of Liver
 - 573.0 Hepatitis, not otherwise specified
 - 574.1 Cholelithiasis with Cholecystitis or Cholangitis (chronic)
 - 574.9 Cholelithiasis without Cholecystitis or Cholangitis
 - 575.X Cholecystitis, without mention of Calculus
- X. Diseases of the Genitourinary System (580–629)
- 590.0 Chronic Pyelonephritis
- XI. Complications of Pregnancy, Childbirth and the Puerperium (630–678)
- XII. Diseases of the Skin and Subcutaneous Tissue (680–709)
- 680.X Boil and Carbuncle
 - 684.X Impetigo
 - 690.X Seborrhic Dermatitis
 - 691.X Atopic Dermatitis, Infantile Eczema, Neurodermatitis

^bThis is an artificial code not included in the ICDA codes.

- 692.X Contact Dermatitis
- 695.2 Erythema Nodusum
- 696.X Psoriasis
- 706.1 Acne Vulgaris
- 708.9 Hives
- 709.9 Intertrigo, Vitiligo

XIII. Diseases of the Musculoskeletal System and Connective Tissue (710–738)

- 712.X Rheumatoid Arthritis
- 713.0 Osteoarthritis
- 714.0 Traumatic Arthritis
- 715.X Arthritis, unspecified
- 717.9 Fibrositis, Myalgia, Myositis
- 718.X Rheumatism, unspecified
- 725.0 Displaced Cervical Intervertebral Disc
- 725.1 Displaced Lumbar and Lumbosacral Intervertebral Disc
- 728.0 Pain in Neck
- 728.7 Low Back Pain
- 730.X Bunion
- 731.X Synovitis or Bursitis
- 735.0 Scoliosis
- 735.1 Kephosis
- 736.X Flat Foot

XIV. Congenital Anomalies (740–759)

- 752.1 Undescended Testicle
- 756.4 Pectus Excavatum
- 757.4 Congenital Clubnail

Miscellaneous

- 780.3 Abnormal Involuntary Movements (Atheosis, Tremor)
- 780.4 Disturbance of Coordination (Ataxia, Muscular Incoordination)
- 989.X Insect Bites

Chapter 8

BLOOD PRESSURE

Equipment

Stethoscope
Sphygmomanometer
Cuffs—9.5 cm and 13 cm

Procedure

In the examination three blood pressures are to be taken—the first at the beginning of the examination with the examinee sitting, the second at the end of the physician's examination with the examinee supine, and the third immediately after the second with the examinee sitting on the edge of the examination table. The physician takes all three blood pressures.

In order to standardize the recording of blood pressures, several guidelines are given below. These follow, in general, the recommendations of the American Heart Association (AHA) and are listed in the publication *Recommendations for Human Blood Pressure Determinations by Sphygmomanometers*. It is important to remember that despite these attempts at standardization there are several inherent sources of error in the auscultatory method of measuring the blood pressure; these sources introduce a mean error of ± 8 mm Hg into the individual readings regardless of attempts to achieve consistency.

1. The cuff should be at least 20 percent wider than the diameter of the arm. An adult 13 cm cuff and a pediatric 9.5 cm cuff are provided. Choose the cuff that satisfies the 20 percent criterion or that covers approximately two-thirds of the arm. A cuff which is too narrow will give a higher reading.
2. The operator should be at eye level with the manometer.
3. The meniscus should be checked for zero-level calibration each week. This requires simply a check of the meniscus level with an uninflated cuff.
4. The rate of fall should be steady and slow enough to detect the precise levels of first and last sounds. If it is too slow, intermittent trapping of blood occurs between systolic and diastolic levels; a rate of 2–3 mm Hg per heartbeat is recommended.
5. Determination of diastolic pressure is a controversial point. The AHA has decided that “the point of complete cessation (of sounds) is the best index of diastolic pressure.” If there is no cessation of Korotkoff's sounds, “the point of muffling should be taken as diastolic pressure.” Note on the form if muffling was used as diastolic pressure; e.g., 120/70 muffled.
6. Readings should be made to the nearest 2 mm interval on the measurement scale.

Chapter 9

VENIPUNCTURE

Equipment

For list and setup of equipment see the laboratory manual.

Procedure

The venipuncture is done in the hematology room by the nurse. The primary area from which the blood is to be drawn is the antecubital fossa; the dorsum of the hand is a secondary site. Cleanse the area with alcohol and apply an appropriately-sized tourniquet proximal to that site. Once the needle is inserted into the vein, release the tourniquet in order to permit free circulation and flow of blood.

If a finger stick is necessary, one of the middle fingers is selected and punctured with a lancet along the lateral side of the finger where there are fewer nerve endings. Cleanse the finger with alcohol and dry with gauze before finger puncture. Facilitate blood flow by a *gentle* pressure on the finger. Avoid undue "milking" as this will induce excess tissue fluid and dilution of the blood and invalidate the hematology samples.

Detailed discussion of the procedures and application of the equipment is provided in the laboratory manual. At the end of the procedure, withdraw the needle and apply pressure and a Band-Aid to the venipuncture site. Label each tube with the examinee's number and take the tubes to the laboratory for processing.

Hematology

The basic procedures and reporting methods are explained in the laboratory manual. Lists of equipment and specifications are also included. It is the responsibility of the laboratory technicians to follow these procedures carefully to insure work of the highest quality and uniformity.

The following tests are performed for *each* examinee if sufficient specimen is available:

- Hemoglobin (cyanmethemoglobin)
- Hematocrit (spun hematocrit)
- Red cell count (Coulter)
- White cell count (Coulter)
- Blood film (sent to CDC)

These tests constitute a basic hematology package that is done entirely in the field facility. All tests are performed in duplicate and all results are recorded on a daily work sheet by the laboratory technicians. All clinically borderline results are to be repeated immediately. To facilitate the reporting of any abnormal result the hematocrit should be done before the other laboratory work is completed. This allows the cell indices to be calculated immediately.

Once it has been ascertained that a particular result is abnormal, according to predetermined guidelines prepared by CDC, the laboratory technician should

report the result directly to the examining physician. The technician should also see that an abnormal findings report is initiated when the abnormal result has been verified.

Other Blood Assessments

The blood assessments listed in table B by age group and material on which the test is performed, require an elaborate separation and handling system in the field laboratory which is described in detail in the laboratory manual.

Table B. Blood assessments by age and material for analysis

Whole Blood (EDTA)					
Age Group	3 years	3-11 years	12-19 years	20-74 years GTT	20-74
Label ColorCode	Red	Green	Yellow	Blue	Orange
	Lead	Lead ¹ Carboxy Hemoglobin	¹ Lead ¹ Carboxy Hemoglobin	¹ Lead ¹ Carboxy Hemoglobin	¹ Lead ¹ Carboxy Hemoglobin
	Protoporphyrin ² RBC Folate	Protoporphyrin ² RBC Folate	Protoporphyrin ² RBC Folate	Protoporphyrin ² RBC Folate	Protoporphyrin ² RBC Folate
Serum					
		Ferritin	Ferritin	Ferritin ³ Bile Acids (x-nog load) Cholesterol	Ferritin Cholesterol Triglyceride
	Iron TIBC ² Folate ² B ₁₂	Iron TIBC ² Folate ² B ₁₂ Vitamin A Copper Zinc Albumin	¹ Pesticides Creatinine Syphilis Iron TIBC ² Folate ² B ₁₂ Copper Zinc Albumin	¹ Pesticides Creatinine Syphilis Iron TIBC ² Folate ² B ₁₂ Copper Zinc Albumin	Syphilis Iron TIBC ² Folate Copper Zinc Albumin Glucose Tolerance 75g load (0, 1, 2 hr) Vitamin C
		Vitamin C	Vitamin C	Vitamin C	Vitamin C

¹ Test to be performed on even numbered samples only.

² Anemia subgroup only

³ To be tested on 35-74 age group only CDC will perform bilirubin, SGOT, and Alkaline Phosphatase on samples with elevated bile acids.

Shipping Instructions

1. Beginning of stand and general instructions
 - a. Working with the FOM, determine from the local post office the times airmailed packages are picked up in order to connect with the best flights to Atlanta, Baltimore, and Washington, D.C. Shipments to Atlanta will be scheduled daily; shipments to Washington and Baltimore will be scheduled either on Saturday or Tuesday mornings. **IMPORTANT:** Since the materials packed in accordance with the instructions below will remain frozen or cool about 2½ days, shipments to Washington and Baltimore should not arrive there on weekends or on Federal holidays.
 - b. For all shipments of whole blood, serum, or urine, the shippers should not be packed with specimens and dry ice (or coolant) until just before transport to the postal drop.
 - c. A supply of dry ice must be maintained for shipping specimens each day. A 6-pound block 10" × 10" × 12" should be sawed at the plant into 1" slabs, giving ten 6-pound slabs 10" × 12" × 1". Then each of these should be sawed lengthwise giving 6" × 10" × 1" cakes (3-pounds). Surplus cakes of ice for daily needs should be stored for later use in an extra shipper under the trailer. When storing the ice, minimize the exposed surface area by reassembling as much of the block as possible in the storage container. Some shipments require a coolant to keep the materials cool during the shipment (**NOT FROZEN**). The laboratory techs should keep two coolant packs in the freezer at all times; replace the one used daily to maintain the inventory for weekend shipments or other unexpected demands for these items.
 - d. When packing the shippers, use asbestos gloves to handle the dry ice to avoid burning the hands. Glasses or an eye shield should also be worn if the dry ice cakes are to be broken into small pieces. The cakes should be wrapped in a single sheet of paper and taped shut before placing them in the shipper. Then, remove the bagged specimens from the freezer and pack them in the bottom of the shipper as tightly as possible to prevent them from rattling about; use crumpled newspaper to fill holes and to even the top to 4¼" from the top of the shipper. Place a dry ice cake on top so that it sinks ¼" below the rim. Pack the sides with crumpled paper. Place the polyfoam lid on top of the shipper; do not pack so that it has to be forced down.

Place a plastic envelope containing the appropriate transmittal sheets on top of the polyfoam lid. Secure the outer carton lid on the shipper with filament tape if no straps are available.

If a coolant is required instead of dry ice, use the special small shippers provided by CDC; put label or stamp **REFRIGERATE-PERISHABLE** on each shipper using coolant. Pack the shipper and coolant so the contents do not rattle about. Secure the polyfoam lid. **DO NOT FORGET TO REPLACE THE USED COOLANT IN THE FREEZER.**
 - e. Cover or remove previous address labels on all shippers. Express Mail Service (EMS) best accomplishes the required timely delivery of specimen shippers. This service is available from specified postal facilities in or near most cities to be sampled in HANES II. The correct procedure for use of Express Mail Service follows:

On arrival at the stand the FOM should contact the postal service to

determine the nearest branch offering EMS and if service is available to the required delivery points. The local postmaster should be sent a letter outlining our schedule of shipments and destinations along with the address and telephone number of Health Examination Field Operations Branch (HEFOB) and Phil Howley's name in case any questions arise regarding charges after the close of the stand.

There are two types of EMS, regular and programmed. If regular service is not available to the destinations required, it *may* be possible to establish programmed service. This, however, requires some special effort and may depend on the cooperation of the EMS manager at the originating postal facility. The postal service generally eschews establishing such service for the short term project.

The local post office will provide appropriate labels for our use. Billing will be handled directly by HRA, and no accounting information is required. If EMS is not available (and it will not be for all stands), the shippers should be sent and stamped "Air Mail-Special Delivery."

It is the responsibility of the laboratory technicians to verify with the FOM the type of service available.

- f. Attach a "Human Blood" label to the top of the shipping carton. The Human Blood label should also contain afterhours delivery instructions.
- g. Send one copy of the transmittal records in the shippers, the other copy to the same address in a separate envelope. This is to ensure against loss and considerable time lags in detecting missing shippers.

2. Daily shipments

- a. All vials listed below are to be frozen in an upright position and placed in a whirl bag with an additional HANES II label attached. Bags are to be shipped to CDC on a *daily basis*, but the serum and whole blood should be *solidly frozen* when placed in the shipper.

Vials with the Transmittal form for Deck 411	Vials with the Transmittal form for Deck 420
1	10
2	11
3	12
5 a, b, c	14
6	18
7	19
8	20
9	21

15 Bile Salts¹

Vial with the
Transmittal form for Deck 415

17 Creatinine¹

¹ Will be shipped to CDC until
notified of a change in destination.

A large shipper should be packed with 12 lbs of cake ice. If the 3 lb cakes mentioned in 1-c. above have evaporated to about three-fourths of an inch wide, use five cakes instead of four. A franked airmail label bearing the CDC address should be secured to the outside of the shipper. General instructions on packing with dry ice are applicable.

- b. The LAVENDER TOP TUBES should be sent daily to CDC. General instructions on packing using a COOLANT are applicable. The small special shipper provided by CDC should be attached to the shipper

mentioned in 2-a. either with bands or securely taped. To prevent loss place a franked address label on this shipper also.

3. Weekly shipments (Saturday or Tuesday mornings)

a. Carboxyhemoglobin (Vial 4) DO NOT FREEZE

No. 4 vials should be accumulated in the *refrigerator* until the weekly shipment is to be made. The transmittal form for Deck 405 should be completed on a daily basis as the vials are processed on each individual. Specimens should be cooled before being shipped.

The No. 4 vials are to be shipped in the small special shipper(s) provided by CDC for the LAVENDER TOP TUBES: general shipping instructions apply using a COOLANT to refrigerate the specimens in transit.

AN AIRMAIL SPECIAL DELIVERY LABEL or EXPRESS MAIL LABEL should be stamped with the address below and securely attached to the shipper. One copy of the transmittal form for Deck 405 should be included in the shipper in a whirl bag.

Johns Hopkins University
Department of Environmental Medicine
School of Hygiene and Public Health
615 North Wolfe Street
Baltimore, Maryland 21205
Attention: Dr. Radford, Ms. Steinberg

If questions arise or if it is necessary to send a shipper Wednesday through Friday during any week, call:

Dave Larson 301/443-2597
Robert Murphy 301/443-1604
Ms. Steinberg 301/955-3295

b. Cholesterol/Triglyceride (Vial 13)

No. 13 vials should be accumulated in the freezer until the weekly shipment is to be made. The transmittal form for Deck 430 should be completed on a daily basis as the vials are processed on each individual. Approximately 40-45 No. 13 vials are to be shipped in the small blue ilastic shipper(s) provided by the Lipid Research Clinic (LRC), George Washington University; general packing instructions with dry ice apply. Three cakes (9 pounds) of dry ice, if possible, should fit into the shipper in the slots provided on the bottom of the shipper and on top of the vials.

A FRANKED AIRMAIL SPECIAL DELIVERY OR AN EXPRESS MAIL LABEL stamped with the address below, or when available, labels provided by the LRC should be securely attached to the shipper. Old labels should be discarded. One copy of the transmittal form for Deck 430 should be included in the shipper in a whirl bag.

Lipid Research Clinic
Room 520
Ross Hall
2300 Eye Street, N.W.
Washington, D.C. 20052
Attention: Dr. Muesing

If any questions arise or if a shipper has to be sent Wednesday through Friday, call:

Dave Larson 301/443-2597
Robert Murphy 301/443-1604
Dr. Muesing 202/676-2991

c. Pesticides (Vial 16)

The special glass containers provided by the Environmental Protection Agency (EPA) will be identified by g vial 16 (5 cc. of serum) and a label with the sample number only (20 cc. of urine). These containers should be accumulated in the freezer until the weekly shipment is to be made. The transmittal form for Deck 400 should be completed on a daily basis as the vials are processed on each individual. The vials must be frozen in an upright position and be solidly frozen before shipping. Each bottle is to be wrapped individually with a gauze swab which is secured to the bottle with a rubber band.

Approximately 20-25 containers are to be shipped in the special metal shippers provided by EPA. REVERSE the address label transmitting the shipper to the site; the FRANKED LABEL should now have the address below or something similar. Secure the edge of the label with a piece of tape. The shipper is to be sent AIRMAIL SPECIAL DELIVERY and should have a PERISHABLE-PACKED IN DRY ICE label visible from all sides on the outside. General packing instructions for DRY ICE shipping apply. The shipper should be packed with 12 pounds (three cakes) of dry ice.

U.S. Environmental Protection Agency
Office of Pesticide Programs
Ecological Monitoring Branch (WH-569)
41 M Street, S.W.
Washington, D.C. 20460

Attn: National Human Monitoring Program for Pesticides Room
E-423

If any questions arise or if a shipment must be sent that may arrive on Saturday, Sunday, or a Federal holiday, call:

Dave Larson 301/443-2597
Robert Murphy 301/443-1604
Frederick Kutz 202/755-8060
Sandra Strassman 202/755-8060

Chapter 10

URINE COLLECTION AND TESTING

Equipment

Graduated 200 cc cups

General

The manner of collection of urine specimens and the tests done on them vary by age, sex, and test group of the examinee. The coordinator is responsible for seeing that the urine is collected according to the instructions in this chapter.

Urine is to be collected on all examinees 6 years of age and over.

The coordinator or other staff member is to give the examinee properly labeled urine cups and have him void at the time he is changing clothes. If a urine specimen is not obtained at that time, the coordinator is responsible for getting it sometime during the examination. However, a urine specimen obtained from a GTT examinee who has drunk any fluids is **NOT TO BE USED FOR EXAMINATION OF THE SEDIMENTS.**

If the laboratory needs additional urine the coordinator is responsible for obtaining a second specimen from the examinee before he leaves.

Collection Procedure

1. *Group A:* Males and females, 6–11 years old (GREEN LABEL)

Give the examinee a urine cup labeled with his sample number and “UR-1.” Ask the examinee for a urine sample; no special instructions are needed for this group. When the examinee returns to the reception area, record the time on the Control Record. Take the urine bottle to the laboratory as soon as possible.

2. *Group B:* Males and females, 12–19 years old (YELLOW LABEL); males and females, 20–74 years old (BLUE LABEL); and GTT females, 20–24 years old (ORANGE LABEL)

(Note that the blue label group is the group that does not have the GTT).

Give the examinee a urine cup labeled with his sample number and a “UR-2.” Ask the examinee for a urine sample up to the 35cc. line marked on the cup. (The coordinator should mark the line with a magic marker before giving the cup to the examinee.) Ask the examinee to empty his bladder into the toilet after filling the cup to the 35 cc. line. Ask the examinee to take the cup to the lab and return to the reception area. Record the time on the Control Record. If the examinee has not given a urine sample by the end of the exam, ask him to furnish the specimen at that time with the time recorded as above. If the lab tech reports that the specimen is inadequate, obtain another specimen from the examinee before he finishes his exam, with the same

instructions as above. This time a white sample number label should be attached to the urine cup.

3. *Group C: GTT Males, 20–74 years old (ORANGE LABEL)*

Give the examinee two urine cups, one cup with sample number label “UR-2” and the other with label “UR-3.” Ask the examinee for a urine sample up to the 35 cc. line marked on container “UR-2” by the coordinator. Then ask him to switch containers and fill container “UR-3” as much as possible. Ask the examinee to take the two containers to the lab and return to the reception area. Record the time on the Control Record.

4. *Group D: GTT Females, 25–74 years old (ORANGE LABEL)*

Give the examinee a urine cup with sample number label “UR-4.” Ask the examinee for a urine sample and say that “it is very important to urinate a little bit into the toilet before starting to fill the container.” Ask the examinee to take the cup to the lab and return to the reception area. Record the time on the Control Record.

Testing Procedures

The processing of urine in HANES II can be divided into five procedures: Dip N-Multistix, pesticide sample preparation, GC culture preparation, specific gravity determination, and cell-cast counts. The only priority as to the allotting of urine for the procedures is for the GC culture. The 12 cc. quantity for the GC culture has the highest priority on the first catch. This is necessary because 2 hours must be allowed between voids to allow for sufficient bacteria to accumulate for a second measurement attempt.

1. Dip N-Multistix

Lab technicians will do a dip stick test on all of the examinees who provide urine specimens. These shall be done one sample at a time following the instructions on the Multistix bottle. They should then record the results on the laboratory worksheet for Deck 425. The sequence of doing the dip stick test is shown in the laboratory manual.

- a. Dip N-Multistix into the urine.
- b. Read test areas:

<i>Test area</i>	<i>When</i>
pH	immediately (time not critical)
protein	immediately (time not critical)
glucose	10 seconds after wetting
ketones	15 seconds after wetting
bilirubin	20 seconds after wetting
blood	20 seconds after wetting
nitrite	30 seconds after wetting
urobilinogen	60 seconds after wetting

2. Pesticides

The test group is identified by even number yellow labels and all blue labels. This is a half-sample of those examinees 12–74 years of age. A urine sample of 20 cc is poured into a special vial provided by EPA. If less than 15 cc of

urine is available from the first catch ask the coordinator to obtain an additional specimen. The initial inadequate urine sample should be stored in the special EPA vial provided in the refrigerator until the additional specimen is available. The two catches of urine should be mixed in the catch vial and then repoured into the EPA vial for transmittal. Complete the transmittal form for Deck 400.

3. GC culture

This test group is identified by YELLOW LABEL marked "UR-2" and BLUE AND ORANGE LABELS marked "UR-2" from examinees under 40 years of age. This group excludes those under 40 years with an orange label marked "UR-4." A sample of 12 cc. is to be centrifuged 20 minutes at 2400 rpm. Pour off the clear supernate and use the vortex shaker to resuspend the sediments. Place a cotton swab in the sediment and streak the plate.

- a. The streaking pattern to be used is as follows:
 - (1) Start at the top edge of the plate. Streak back and forward from edge to edge until the top one-half of the plate is covered.
 - (2) Turn the plate clockwise 90°. Start at the new top edge of the plate and streak back and forward from edge to edge until the top one-half of the plate is covered.
 - (3) Turn the plate clockwise 90°. Start at the new top edge of the plate and streak back and forward from edge to edge until the top one-half of the plate is covered.
- b. The swab should be dipped in the suspension often to cover the plate with an ample amount of sediment.
- c. Through the course of streaking, the swab should be slowly rolled. Place the plate in the incubator. The temperature in the incubator should be between 32°C and 35°C. The preparation of the plates should be started immediately and should be completed one hour after the urine collection. Indicate on worksheet for Deck 425 that the GC plate was made. If insufficient specimen for the GC culture exists report the problem to the coordinator. The coordinator should try to collect a second urine specimen after the examinee has waited at least 2 hours after the previous void.

4. Microscopic examination of sediments

This procedure is to be done on urine specimens with orange labels marked "UR-3" and "UR-4." This group of males 20-74 years of age and females 25-74 years of age receive the GTT.

- a. Centrifuge a 12 cc. urine sample for 5 minutes at 2500 rpm. Pour off the clear supernate and use the vortex shaker to resuspend the sediments. Using a coverslip, examine a drop of sediment with the microscope. For the counting of white and red blood cells examine ten high power fields and for the casts, examine 10 low power fields.
- b. Cell counts—record results on the worksheet for Deck 425. Count up to 10 high power fields (HPF) for red blood cells and white blood cells.
 - (1) Count up to 509 red cells. If there are 000-509 red cells, enter the number in spaces provided (decimal point automatically provides the average number of cells per HPF). For example, if there are 107 red cells in 10 HPFs, enter 107. If 54, enter 054. If more than 509 red cells

have been counted, but the field is not packed with red cells, check box 1 51-¾ Full. If packed, check 2 Full.

- (2) Use exactly the same procedure for counting white blood cells.
 - (3) If obviously packed, check "Packed." It is not necessary to count then to 509.
- c. Cast counts—record results on the worksheet for Deck 425.
- (1) Kinds of casts to be counted
 - (a) Hyaline
 - (b) Waxy
 - (c) Granular
 - (d) Erythrocyte
 - (e) Leukocyte
 - (f) Epithelial
 - (2) Count up to 10 Low Power Fields (LPF) for casts.
 - (a) Note the number of each kind of cast. For example, if there are 18 granular casts, write 018 under "Granular Casts." If there are also 46 hyaline casts, write 046 under "Hyaline Casts." If there are more than 509 of any particular kind of cast, check the box for more than 50 and stop counting that kind of cast. For example, if there are 509 hyaline casts and 56 granular casts in less than 10 LPF's you should keep on counting for granular casts, but you may check the box for more than 50 (>50) for hyaline casts. Such high cast counts can be expected to be very rare in our examinees.
- d. Time sediments are to be read: Record the time when the cell and casts have all been read for each examinee. This time entry is essential because it is the only indication that the test was done if all results were negative, i.e. no cells, casts, or other findings were present.
- e. Other findings: This column is to be used to enter any other urinary findings. The entry is to be a qualitative observation, i.e., many bacteria or few crystals.

5. Specific Gravity Determination

- a. This measurement is done on urine specimens with orange labels marked UR-3 and UR-4. This is the group receiving the GTT males 20–74 years of age and females 25–74 years of age. The recording of results is done on the worksheet for Deck 425.
- b. Introduction: The TS Meter and Concentrimer have been designed for simple, rapid microanalysis. Although these instruments actually measure refractive index, different models are calibrated for special or general use.

Model 10400: TS Meter

Scales are calibrated in terms of protein concentration of plasma or serum (grams/100ml) and specific gravity of urine.

Determinations are precise, rapid, and require only a drop of fluid sample. One simply reads the value on the appropriate scale as seen through the eyepiece where the sharp boundary between dark and light fields crosses the scale. The instruments are temperature compensated for temperatures between 60°F and 100°F so that the reading need not be adjusted for either the temperature of the sample or the temperature of the room in which used.

c. Operating Instructions:

- (1) Hold the instrument in a horizontal position.
The recommended loading procedure, in order to reduce evaporation to a minimum, is to close the instrument with dry clean prism and cover surfaces and then place the sample liquid on the exposed portion on top or bottom of the measuring prism so that the liquid will be drawn into the space between the prisms by capillary action. Take care to avoid lifting the cover plate before the reading is made. A dropping pipette may be used to transfer the sample to the measuring prism.
- (2) To hold the instrument for reading place a middle finger on the name-plate and press the plastic cover gently but firmly. This spreads the minimal volume of sample in a thin even layer over the prism. Expose it to the illuminating source of the AO refractometer illuminated stand. To obtain the optimum contrast between light and dark boundary, the instrument may have to be properly tilted with respect to the window or lamp. Increased contrast and sharpness of the boundary may be obtained by use of the vertical bold color fluorescent lamp.
- (3) Bring the scale seen in the eyepiece into best focus by rotation of the eyepiece. This setting need not be changed as long as the same individual continues to use the instrument.
- (4) Make the reading on the appropriate scale at the point where the dividing line between bright and dark fields crosses the scale. For HANES the lower specific gravity scale is the one to be read. Enter the reading under refractive index leaving the last field at the right blank as follows: 1. 0 1 7 .
- (5) Use a soft cloth or soft tissue moistened with water for wiping the prism. Dry the prism with a soft cloth or tissue. If the prism surface or cover plate is not well cleaned before the next sample is loaded, an erroneous or fuzzy reading may result. Do not immerse the eyepiece or the black focusing ring in water and do not use very hot water. Never use gritty cleaning compounds to clean the prism. NEVER EXPOSE THE INSTRUMENT TO TEMPERATURES ABOVE 150°F.

Zero setting: The zero setting of the TS Meter should need adjustment infrequently, if ever. In order to check adjustment make sure the temperature of the instrument is between 70° and 85°F and take a reading on distilled water. If the reading departs from zero by more than .05 percent (½ division) push a jeweler's screw driver through the cement seal, turn clockwise to increase the reading, counterclockwise to decrease the reading. Make sure that the final motion is clockwise. Seal the hole with caulking compound after the correct reading has been obtained.

NOTE: Caulking compound is supplied with the instrument.

Air Bubble: Temperature compensation is produced by optical action of a filled cavity arranged in the optical path. This cavity is hermetically sealed and cannot leak.

Thermal expansion of the liquid is accommodated by an air bubble which is kept out of the optical path by a bubble trap placed at the end of the cavity. In transit or under severe vibration the bubble may

escape the trap and appear in the visible portion of the refractometer prism. If this occurs the instrument should be held vertically, eyepiece down and shaken lightly. This will allow the bubble to pass into the trap where it will be help during all normal operations.

Chapter 11

ELECTROCARDIOGRAPHY AND SPIROMETRY

Equipment

The Marquette recording system consists of two remote patient transmitters (P.T.) and a central collection terminal. The P.T. located in the ECG room has the capability of entering a 20 digit identification code and will automatically transmit the I.D. codes and analog data signals.

The P.T. located in the spirometry room has the capability of entering a 20 digit I.D. but the sending of the codes and data is done by a sequence which allows the technician to interact with this P.T.

At the central terminal the system has the capability of generating a hard copy, analog tape, and a digital tape. The hard copy is a three channel pressurized ink system. The channel width is 50 mm and runs at a speed of 25 mm/sec. The recorder also imprints the 20 digit I.D. code at the top of each examinee graph.

The analog tape records by FM techniques three channels of analog data plus the 20 digit I.D. data and the control function codes. This feature allows a digital record to be generated from the analog record.

The three channels of analog data are multiplexed and sampled by an analog to digital converter which digitizes the signal in a 12 bit binary format per channel sample. The sampling is done at a rate of 500 samples per second per channel. Since channels are sampled in sequence the digital records of the three channels are interlaced and form one large buffer for each lead set. A lead set record consists of three channels of data lasting 5.088 seconds for classical ECG and 9.728 seconds for Frank ECG lead and spirometry.

The digital records are of three sizes. For the I.D. data the record is 24 bytes long written in EBCDIC. The classical leads and standard form a record of 15,264 bytes while the Frank ECG and spirometry form a record of 29,184 bytes. The digital data is written in a split binary format.

A complete ECG sequence would consist of an I.D. record, 5 classical records, one Frank record and one standard record. The spirometry consists of an I.D. record, and one spirometry data record.

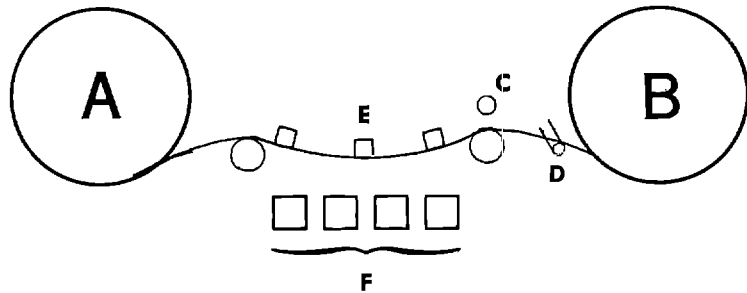
CENTRAL COLLECTION TERMINAL

ANALOG TAPE RECORDER
HARD COPY RECORDER
POWER & CONTROL
DIGITAL TAPE

1. Analog Tape Recorder

Used to backup digital tape recorder and to verify that data is being recorded.

a. Mount tape as shown in drawing.



b. Parts

A = Supply reel

B = Take up reel

C = Capstan

D = Tape tension arm

E = Heads

F = Manual control buttons (Stop, Forward, Rewind, Play)

c. Load tape

(1) Mount the tape.

(2) Reel a few turns onto takeup reel using the fast forward button and stop button. (Located in manual control button cluster.)

d. Comment

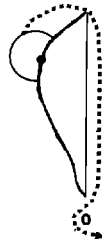
(1) In normal operations the manual control buttons are not used.

(2) When analog tape is full of data do not rewind tape off takeup reel. Remove takeup reel with tape and label reel with the tape/number, stand number, date, function, (i.e., analog), and technician number. Store reel in a box.

2. Hard copy recorder

Used to provide a hard copy of all the data that is being recorded.

a. Replacing Paper



Large margin is at top of paper. Use *paper drive switch* to advance the paper.

b. Switches—located on top right

(1) *Tape*—In normal use this switch should be in the “on” position. For our operation there is no reason to put the *tape* switch in the “off” or “standby” positions.

- (2) *Paper Drive*—"off" for normal running conditions. Use "on" position to advance paper.
 - (3) *Paper*—"on" for normal conditions, "off" when hard copy is not needed.
 - (4) *Tape Function*—"parallel" for normal use. "Playback" or "backup" positions are not used.
 - c. Button—*Power*; use to control the drive power to the paper recorded.
3. Power and control panel
- a. *Lights*—Numbered 1, 2, 3 to designate the line which is in service or use.
 - (1) One for Spirometry
 - (2) Two for ECG
 - (3) Three for telephone interface
 - b. *Analog Power*—Controls power to the analog recorded.
 - c. *Power Switch and Light*—Controls cabinet power. It should be "on" during the stand. It should be "off" when work is being done on the trailer power system or when the trailers are in transit.
 - d. Control Switches
 - (1) *Auto*—Pushed when real time data is to be recorded.
 - (2) *Tape Data*—Pushed when analog recorded is being used as data source, i.e., reviewing data or rerecording onto digital tape.
 - (3) *Hangup*—Pushed when working with digital recorder. This will not allow the system to be used.
 - (4) *Out-of-service*—In our system it works like *Hangup*.
 - (5) *Tele-Data*—Lights when system is receiving data. Pushed to lock system onto an incoming line. In most cases will not be used in our system.
 - (6) *Signal*—Lights when system sends commands to transmitters.
 - e. Digital tape switch and lights

Light is on when switch is in "run" position which indicates that data is being recorded onto digital tape. In "inhibit" position light will be out and data will not be recorded on digital tape.
4. Digital Tape—Records data for computer processing
- a. Loading Machine
 - (1) Mount tape on top reel and lock in place. Keep write ring in place.
 - (2) Push the *Hangup* button.
 - (3) Thread tape as shown on the drawing located on top right of face plate. Make sure there are at least three turns on the take-up reel.
 - (4) Push *Load*—Tape should move to silver BOT strip and "Ready" indicator light comes on. If tape doesn't move check step 2 above.
 - (5) Push *Auto* button and close the door.
 - (6) Make sure *digital tape* switch is in run position.
 - (7) Tape should be labeled: tape number, stand, location, technician, date and function, i.e., digital.
 - b. Unload Machine
 - (1) Push *Hangup*—Tape should rewind.
 - (2) If tape does not, push *File Gap* and then *Rewind*.
 - (3) If tape stops at BOT push *Rewind* to get tape completely back onto supply reel.

- (4) Remove tape and remove write ring from tape. Make sure label is on and place tape ring around tape reel.

5. Procedures preparatory to doing ECG's and Spiros

a. To start up

- (1) Turn "on" *paper power*—indicator light comes on.
- (2) Turn "on" *analog power*—capstan should turn.
- (3) Turn *digital tape* to "run", indicator light comes on.
- (4) Switches and buttons
 - (a) *Main power* "on"
 - (b) *Tape* "on"
 - (c) *Paper drive* "off"
 - (d) *Paper* "on"
 - (e) *Tape function* "parallel"
 - (f) *Analog power* "on"
 - (g) *Digital tape* "run"
 - (h) *Auto* "pushed"
- (5) Analog tape on machine
- (6) Digital tape mounted
- (7) Paper in hard copy device

b. To shutdown

- (1) Turn "off" *paper power*.
- (2) Turn "off" *analog power*.
- (3) Turn *digital tape* to "inhibit."

c. If Analog Tape is out and a recording is needed.

- (1) Turn *analog power* "off."
- (2) Proceed as usual.
- (3) Mark in log book that the analog machine is down.

d. If digital machine is down

- (1) Switch *digital tape* to "inhibit."
- (2) Turn on *analog tape*—tape should be mounted and labeled.

For ECG

- (3) Connect examinee as usual.
- (4) Enter SP data.
- (5) Push *call* on P.T.
- (6) On central cabinet push *tele-data*; audible tone should start.
- (7) At end of tone push *auto*.
- (8) Make two tracings of ECG. At this time the Analog tape should start then the paper drive. Both should stop at end of ECG.

For Spirometry

At this time there is no way to get an analog recording of the spiro data. Therefore,

- (9) Unplug the spiro P.T.
- (10) Use the auto position to drive Gould recorder.
- (11) Label the recordings as to:
 - (a) SP number
 - (b) Tech number
 - (c) Data and session

It is important to have a hard copy calibration done before each session so that the hand reduction of the data has a current calibration factor to work from. The calibration sheet should show date and session. The calibration sheet must be included with the spirometry records. The records should be ordered by session.

- e. If digital and analog recorders are both down or if auto function on central terminal is not working
 - (1) *Digital tape* in "inhibit."
 - (2) *Analog power* "Off."
 - (3) Attach leads to examinee.
 - (4) Enter SP data.
 - (5) Push *call* on P.T.
 - (6) Push *tele-data* on central terminal.
 - (7) When the ECG is finished push *hangup*.
 - (8) When channel 2 light goes out push *auto*.
 - (9) Mark in log book—"Digital and analog recorder down."
 - (10) Make two tracings of ECG.

- f. To generate a digital tape from an analog tape
 - (1) Mount and position analog tape.
 - (2) Mount and position digital tape.
 - (3) Switches and buttons
 - (a) *Main power* "on"
 - (b) *Tape* "on"
 - (c) *Paper* "on" (only to spot check to see if system is working, otherwise "Off")
 - (d) *Tape function* "Parallel"
 - (e) *Analog power* "On"
 - (f) *Digital tape* "Run"
 - (4) Push tape data
 - (5) System will run until you push *auto*. Push *auto* only during pause between recordings.

- g. To generate hard copy but not tape do all steps listed under f. except (f). Set *digital tape* switch to "inhibit".

- h. If power goes down while digital tape is on machine
 - (1) Turn *system power* "off" until power is stabilized.
 - (2) Turn *system power* "on".
 - (3) Push *Hangup*.
 - (4) While holding *ready* button in, push *load* button. Ready light should light.
 - (5) Push *file gap*.
 - (6) Push *Rewind*.
 - (7) If tape stops at BOT push *rewind* again.
 - (8) Check label on tape and mount a new tape (as described in section 4-a.).

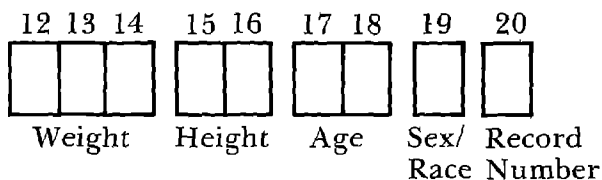
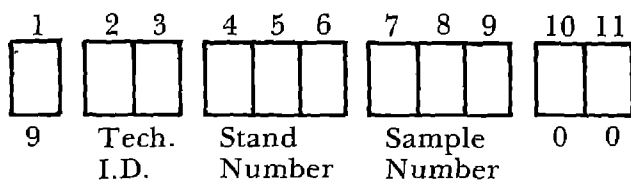
Electrocardiography

1. General

For the electrocardiogram analysis, information from the standard 12 leads plus Frank Scaler leads is recorded on magnetic tape. A computer program has been developed to analyze this information and print diagnostic messages along with the data.

2. Code Interpretation

Coded information to be recorded with the ECG lead format:



3. Codes

Technician Number:

01-29

Stand Number:

001-100

Sample Number:

400-799

999 used for calibration

Sample person weight:

001-998 weight to nearest pound

999 weight unknown or calibration

Sample person height:

01-98 height to nearest inch

99 height unknown or calibration

Sample person age:

25-74 age in years

99 age unknown or calibration

Sex/Race:

1) Caucasian male

2) Caucasian female

3) Negro male

4) Negro female

5) Other male

- 6) Other female
- 7) Race unknown male
- 8) Race unknown female
- 9) Neuter

4. Record Number 1-9

This switch will show the current number of ECG's attempted for an examinee. It will include attempts which were aborted and attempts which were completed. The technician should set this switch to "1" for the first record attempted on an examinee and he/she should increase the number by one for each subsequent record.

5. ECG Log Book

The purpose of this book is to keep a sequential record of the examinees processed and record the unusual occurrences. At the top of each right hand page, write the stand number, tape number, and ECG to clearly distinguish these pages from the spirometry entries.

Below this make columns headed, respectively, Sample Number, DATA, TECHNICIAN NUMBER.

The left hand page will be used for comments. These entries will consist of any unusual occurrences or usual routines, i.e., change tape or aborted ECG. It must be emphasized that the ECG and spiro log books must show the chronological sequence of data recorded. If a person is examined and then later reexamined the book must include an entry for each time the person is examined.

6. Procedure

Record the time on the control record. Ask the examinee to sit on the edge of the table.

a. Placement of the electrodes on the examinee

- (1) Sensitize the area by using a gauze pad with some electrode paste on it and briskly rub until the skin is reddened for all lead positions.
- (2) Place the (M) back electrode on the examinee first. This flat electrode should be attached by nonadhesive tape to the middle of the spine at the same level as V₆, I, and E electrodes. After this electrode is placed properly, ask the examinee to lie on his back on the table.
- (3) Place the limb electrodes over areas with the least muscle movement (approximately 2 to 3 inches above wrist and ankle joints over medial radius and medial tibia). Use the strap electrodes for the four limb leads.
- (4) Place the six chest leads (V₁-V₆) at the standard electrode positions (see section 3). Use the suction electrodes and electrode paste for placement of the chest electrodes. Make certain the electrode paste does not overlap between one location and another.
- (5) Place the H electrode to the right side of the neck using a suction electrode.
- (6) Place the E electrode at the middle of the sternum at the same level as V₆, I, and M electrodes. Use a suction electrode and electrode paste.
- (7) Place the I electrode on the right side of the chest at the same level as V₆, E, and M electrodes. Use a suction electrode and electrode paste.

- b. Enter the 20 digit examinee's identifying information in the following positions:

<i>Top Row</i>	<i>Bottom Row</i>	
1	9	
2 } 3 }	Technician number	12 } 13 } 14 } Weight to the nearest lb.
4 } 5 } 6 }	Stand Number	15 } 16 } Height to the nearest inch
7 } 8 } 9 }	Examinee Number	17 } 18 } Age
10	0	19 Sex/Race
11	0	20 Record number

- c. After all the electrodes are applied, the examinee's I.D. information is keyed in correctly, and the examinee is relaxed, push the call button.
- (1) The machine will automatically cycle through all 12 standard leads, the Frank Scaler leads, and the standard.
 - (2) Two hard copies and two digital tape records are required for each examinee.
 - (3) The lead format of the hard copy ECG will be as follows:

I	AVR	V ₁	V ₄	X	Standard
II	AVL	V ₂	V ₅	Y	Standard
III	AVF	V ₃	V ₆	Z	Standard

7. Recording

- a. The quality of the tracing should be checked as it is being recorded.
- b. If any of the below described artifacts are present, check the possible causes and repeat the ECG. The following criteria should be used to determine if a recorded ECG is acceptable:
 - (1) Noisy signals in a lead are interference causing the baseline to be thickened, obscuring or obliterating the P wave. This can be corrected by having the examinee relax completely and not touch any metal objects on or off the table. Also check that the electrode straps are not too tight.
 - (2) Wandering baseline occurs when the vertical difference between adjacent complexes is greater than 5 mm. If the baseline is wandering, reapply the electrodes frictioning the area well. Loose electrodes will cause high contact resistances that will result in a wandering baseline. Conversation and a physically uncomfortable examinee will create wandering baseline.
 - (3) Check the tracing for adequate pen performance.
 - (4) The length of each lead should be 5 seconds and 9.7 seconds for Frank Scaler leads.
 - (5) Negative pulse on lead I (inverted 2RS)

(6) Criteria for an adequate standard are listed below:

- (a) 10 mm in height \pm 1/2 mm
- (b) Baseline on 25 mm line \pm 5 mm
- (c) Four standard complexes present

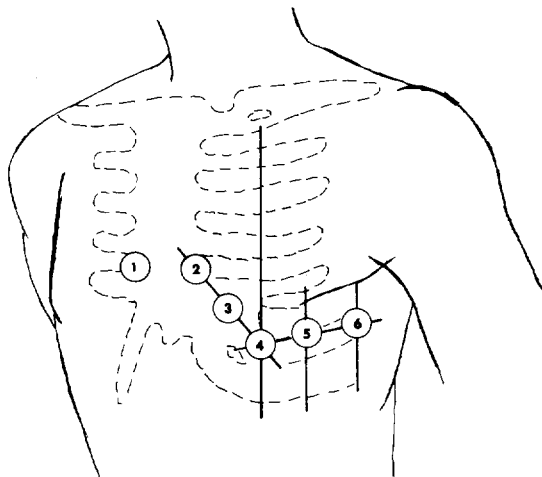
8. Lead positions

The basis of electrocardiography is the neuromuscular mechanism of the heart. The heart muscle contracts and the heart "beats" in response to a stimulus. The action of this stimulus sets up a tiny electric current which can be received and recorded by electrodes. Since electrical current in the heart flows from negative to positive, ECG electrodes are paired negative with positive to record the flow. Below is a listing of the negative and positive electrodes for each lead.

<i>Lead</i>	<i>Positive</i>	<i>Negative</i>
I	LA	RA
II	LL	RA
III	LL	LA
aVR	RA	LL and LA
aVL	LA	LA and RA
aVF	LL	LL and RA
V	Chest	LL and LA and RA
X	V ₄ and V ₆	I
Y	M and LL	H
Z	V ₆ and M	I and E and V ₄

The electrical potential of any extremity is the same anywhere from its point of attachment to the torso to its most distal end. Therefore, electrodes attached to wrists and ankles will give the same ECG pattern as those placed at the point of union of torso and extremity. The extremity electrodes should be placed over the area where muscle is at a minimum. This prevents picking up muscle potential artifacts. The electrodes should be placed on the inside area of arms and legs, approximately 2-3 inches above ankles and wrists. The electrodes may be moved around to obtain a better recording at the discretion of the technician doing the test. The electrodes should be cleaned weekly with an abrasive cleaner.

Standard Electrode Positions



The accompanying chart illustrates the most commonly used electrode positions for chest or precordial leads. The positions shown are located or determined as follows:

V₁ Fourth intercostal space, at right border of sternum.

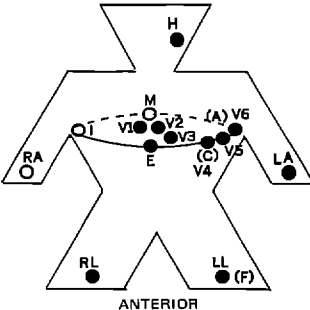
V₄ Fifth interspace, at left midclavicular line.

V₂ Same interspace, at left sternal border.

V₅ Same level as 4, in anterior axillary line.

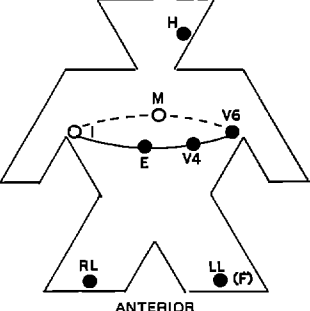
V₃ Midway between positions 2 and 4.

V₆ Same level as 4 and 5, in midaxillary line.



ECG/Frank VCG Electrode Placement

COLOR	ELECTRODE	PLACEMENT
Blue	H	On back or side of the neck, or on forehead.
Orange	E	Fifth interspace, at the front midline.
Violet	I	Same transverse level as E, at right mid-axillary line.
Yellow	M	Same transverse level as E, at back midline.
Red	LL,(F)	On the left leg.
Green	RL	On the right leg, both ECG and VCG.
Brown	V4,(C)	Same transverse level as E, fifth interspace at left mid-clavicular line.
Brown	V6(A)	Same transverse level as E (or V4) at left mid-axillary line.
Brown	V5	Same transverse level as V4, on anterior axillary line.
Brown	V3	Midway between V2 and V4.
Brown	V2	Fourth interspace, at left sternal margin.
Brown	V1	Fourth interspace, at right sternal margin.
Black	LA	On the left arm.
White	RA	On the right arm.



Frank VCG Electrode Placement

COLOR	ELECTRODE	PLACEMENT
Blue	H	On back of the neck or on forehead.
Orange	E	Fifth interspace, at the front midline.
Brown	V4	Same transverse level as E, fifth interspace at left mid-clavicular line.
Violet	I	Same transverse level as E, at right mid-axillary line.
Yellow	M	Same transverse level as E, at back midline.
Red	LL	On the left leg.
Brown	V6	Same transverse as E, at left mid-axillary line.
Green	RL	On the right leg.

9. ECG calibration

a. Frequency

The calibration should be done as a scheduled weekly calibration procedure. It should also be used as a diagnostic tool to help check the operation of the ECG lead set and hardware.

b. Procedure:

(1) Enter the following code at the ECG patient transmitter:

- 1 9
- 2-3 Technician number
- 4-5-6 Stand number
- 7—20 all 9's

- (2) Attach the ECG calibrator box and turn it on. Each electrode wire has a designated position to be connected to on the box.
- (3) After you have made sure the central terminal is ready to be used, push the call button on the ECG patient transmitter.
- (4) The graphs recorded on hard copy at the terminal should correspond in size and shape to the wave forms displayed on the top of the calibrator. If there is a discrepancy check the calibrator's battery first,

<i>Record</i>	<i>Type</i>	<i>I.D.</i>	<i>Signal</i>
1	ECG	1 9 2-3 Tech. No. 4-5-6 Stand 7-11 All 9's 12-0 13-1 20-8	ECG calibrator
2	ECG	Same as Above	Same as above
3	Spiro	1 1 2-3 Tech No. 4-5-6 Stand 7-11 All 9's 12-0 13-1 20-8	Operate position Pneumatic calibration
4	Spiro	Same as above	Same as above
5	Spiro	1 1 2-3 Tech No. 4-5-6 Stand 7-11 All 9's 12-0 13-1 20-8	Operate position
6	Spiro	Same as above	Same as above

then the lead set. If no waveform is recorded the problem is in the P.T. or the central terminal and it is time to ask for help.

Beginning of Stand Calibration

After the Marquette system has been connected and is assumed to be ready for operation, a set-up tape must be made. The following sequence of records should be recorded on the tape. The tape should then be labeled and sent to headquarters for verification.

Spirometry

1. Equipment

Custom designed equipment manufactured by Marquette Electronics Corporation is used along with the Ohio Model 840 spirometers to collect forced expiratory spiograms for HANES II. All of the data collected by this equipment are recorded on two kinds of magnetic tape, as well as on strip charts, for later computer analysis. The pieces of equipment are located in two separate rooms of the test caravans; the recording unit is in the ECG test room, and the spirometer and its support equipment are in a separate test area. The two stations are connected by internal telephone line to allow for data transmission.

Located in the spirometry test room are the Ohio spirometer, its pneumatic calibrator (a 2 liter plastic syringe), a storage oscilloscope, the Marquette transmission unit and the Gould strip chart (ink) recorder.

The spirometer face has a FUNCTION switch which should be in the OPERATE position except when electronic calibrations are being performed. It also has a knob labeled BTSP. This must *always* be set at 1.00, and should be checked before any operation, either spiogram or calibration, is performed. Four other knobs affect the baseline and amplification factor for flow and volume. The two labeled GAIN must *always* be set fully clockwise. This should be checked before any operation is performed. The two knobs labeled POSITION affect the baselines for the two signals being recorded, and during the setup procedure may be moved small amounts to line up the appropriate marking pens with convenient lines on the Gould strip-charts.

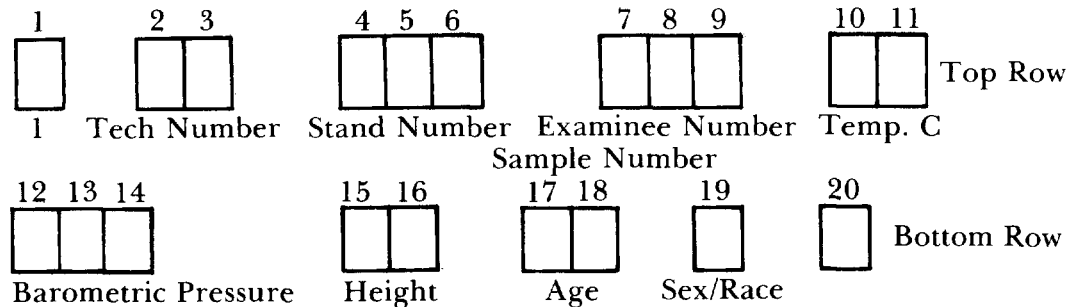
The Marquette control unit has a radially-operating switch with six positions. They are:

- OFF
- RESET—"locks out" the ECG station from the recording unit.
- STAND BY
- ID—The switch in this position causes the transmission to the recording unit of the data set into the 20 switches. The beginning of the transmission is indicated to the technician by an audible one second tone. Successful recording is indicated by a second, longer (about 2 second) tone following the first by about 4 to 6 seconds. If the record attempt was not successful, a still longer (about 4 second) "chopped" tone is given.
- AUTO—The switch in this position causes about 10 seconds of signals originating from the spirometer to be sent to the recording unit. The audible signals are the same as those for the ID position. This is the position used to record subject spiograms and spirometer calibrations.
- EX—Not used.

This switch then controls the recording of the data collected in the spirometry examination room, and two important aspects of its use must be noted. After the end of transmission signal is returned while the switch is in the ID position, the switch must be turned on to AUTO within 10 seconds. This requires that each technician learn to time his instructional presentation to the subject around this constraint.

The Marquette unit also has 20 digital switches which allow for the recording on magnetic tape of certain identification, demographic and environmental data. Each switch has 10 positions, numbered 0 through 9, each of which generates a unique electronic pulse (very similar to touch-tone telephone signals) which the computer recognizes as a code for that digit.

2. Code interpretation



<i>Switch Number</i>	<i>Data</i>
1	Always 1
2-3	Technician Number 01-29
4-6	Stand Number 001-100
7-9	Examinee Number 100-799
10-11	999—Used for calibration Temperature (degrees Celsius, rounded to nearest one degree)
12-14	Barometric Pressure (millimeters Hg., rounded to nearest mm.)
15-16	Height (in inches, rounded to nearest inch, where 99=height unknown)
17-18	Age (years, where 99=age unknown)
19	Sex/Race 1=Caucasian male 2=Caucasian female 3=Negro male 4=Negro female 5=Other male 6=Other female 7=Race unknown, male 8=Race unknown, female 9=Neuter 0=Examinee
20	1=Electronic calibration 2=Pneumatic calibration

3. Spirometry data book

On the top of each right hand page write the stand number, tape number, and spiro. Below this make three columns headed respectively: Sample Number (sticker), Date, Technician Number. Enter the appropriate information in these columns as the examinations are done.

On the top of each left hand page write "Comments." Record on this page, directly opposite such comments as:

- Miscoded info on ID, should be . . .
- Info not coded on ID, should be . . .
- Canc/PHY (exam cancelled per physician)
- Exam not done (or not completed) due to uncooperative examinee, etc.
- New tape mounted on Marquette

The Spiro data book is to be used as the unusual occurrence form for this section. Any information which the technician regards as pertinent to the exam should be noted.

4. Calibration procedures

A MINIMUM OF A 20-MINUTE WARMUP OF THE EQUIPMENT MUST PRECEDE THE REGULAR (DAILY) CALIBRATION. A FULL REGULAR (DAILY) CALIBRATION MUST BE DONE AT THE BEGINNING OF ANY TEST SESSION IN WHICH SPIROMETRY WILL BE PERFORMED. It is not necessary to calibrate the spirometry system if no spirometry examinations will be performed on that day; however, both electronic and pneumatic calibrations must be completed at the beginning of each day (and each session on days when split test sessions occur) during which spirometry examinations will be done.

a. Electronic calibration procedures

- (1) Check to be sure that the BTPS knob on the front of the Ohio spirometer is set at 1.00 (i.e., fully clockwise).
- (2) Check to be sure that the Gain knobs (both for flow and volume) on the front of the Ohio spirometer are set fully clockwise.
- (3) Enter the following data on the 20 switches on the Marquette box:
 - #1=1
 - #2-3=Technician Number
 - #4-19=9
 - #20=1
- (4) Turn the Marquette control switch to RESET. Pause 1 second.
- (5) Turn the switch to STAND BY. Pause 1 second.
- (6) Turn the switch to ID. A short "beep" will indicate that the data in the 20 ID switches are being recorded. Wait until the second "beep" (about 2 seconds long, about 4 to 6 seconds after the first) has completed. If this second beep does not occur, or if a "chopped" tone occurs, return to step 3 and attempt the calibration again. If a second attempt is not successful, refer the situation to the engineer.
- (7) Turn the switch to AUTO. About 1 second after the first, short beep is heard, over the next 9 seconds turn the Function switch on the front of the Ohio spirometer back and forth between "OL-.2L/S" and "6L-12L/S" three times. If this second beep does not occur, or if it is "chopped", proceed as in step 6.

- (8) Return the switch to OFF (*not* RESET or STAND BY).
- b. Pneumatic calibration procedure
- (1) Check to be sure that the BTPS knob is set to zero.
 - (2) Check to be sure that the Gain control knobs (both for flow and volume) are set fully clockwise.
 - (3) Enter the following data on the 20 switches on the Marquette box:
 - #1=1
 - #2-3=Technician Number
 - #4-19=9
 - #20=2
 - (4) Fill the 2 liter plastic calibration syringe with room air.
 - (5) Remove the spirometer hose.
 - (6) Turn the piston position control on the front of the Ohio to about 1.5 liters. (CAUTION: Failure to do this can cause serious damage to the spirometer.)
 - (7) With the syringe's plunger pulled all the way out, attach the full syringe to the front part of the spirometer gently (*do not* force), pushing it on as far as it will go.
 - (8) Turn the Marquette control switch to RESET. Pause 1 second.
 - (9) Turn the switch to STAND BY. Pause 1 second.
 - (10) Turn the switch to ID. Wait until the second "beep" has completed.
 - (11) Turn the switch to AUTO. About 1 second after the first, short "beep" is heard, push the plunger on the syringe all the way in. This should take about 3 seconds. *Do not* push the plunger hard enough to cause it to "bump" against the bottom of the syringe, but do make sure that it is all the way in.
 - (12) During the second "beep," return the switch to OFF (*not* RESET or STAND BY).
 - (13) Pull the syringe plunger all the way out. Be careful not to let the syringe fall off the spirometer port.
 - (14) Repeat steps 8 through 13 two more times.
 - (15) Remove the syringe from the spirometer port. Set the spirometer piston position control to 6 liters. Replace the syringe as in step 7.
 - (16) Repeat steps 8 through 13 two times.
 - (17) After completing four pneumatic calibrations, remove the syringe and store it. Replace the spirometer hose.

5. Test procedures

a. General

The volume and flow outputs of an electronic spirometer are recorded on two kinds of magnetic tape. A computer program has been developed that is capable of measuring the forced vital capacity, the forced expiratory volumes at 1, 2, and 3 seconds, the maximum expiratory flow rate, the maximum mid-expiratory flow rate, and various peak flow rates for the tape recorded signal.

The examinee, who must stand during the test, is instructed to inhale maximally from room air; then exhale with maximal force and speed into the spirometer. A nose clip, if needed, and a disposable mouthpiece are provided for the examinee. The important variables that affect the performance of the forced expiratory spirogram (FES) fall into three categories:

- Equipment Function
- Technician Skill
- Examinee Comprehension and Motivation

The section labeled "Calibration Procedure" is designed to help you control the first variable. The second variable refers to the technician's ability to establish initial rapport with the examinee, clearly administer the test instructions, provide the necessary stimulus and motivation for each examinee to perform maximally, and to judge the quality and reproducibility of the spirometry signals. Examinee comprehension and motivation are the end results of technician skill, i.e., the interaction between the technician and the examinee.

Should your best efforts not provide an acceptable test, indicate on the chart and in the Spiro data book that the exam is VOID; and record on the chart your comments concerning the reason for such poor recordings; i.e., language barrier, submaximal effort (SME), inhalation artifact (IH), or premature termination (PT).

b. Procedure

- (1) A MINIMUM OF A 20-MINUTE WARMUP OF THE EQUIPMENT MUST PRECEDE THE REGULAR (DAILY) CALIBRATION. A FULL REGULAR (DAILY) CALIBRATION MUST BE DONE AT THE BEGINNING OF ANY TEST SESSION IN WHICH SPIROMETRY WILL BE PERFORMED. It is not necessary to calibrate the spirometry system if no spirometry examinations will be performed on that day; however, both electronic and pneumatic calibrations must be completed at the beginning of each day (and each session on days when split test sessions occur) during which spirometry examinations will be done.
- (2) Check to be sure that BTPS knob on the spirometer face is set at 1.00.
- (3) Check to be sure that the two (flow and volume) GAIN knobs are set fully clockwise.
- (4) Do an electronic calibration. Follow the procedure outline under 1.a. *except* step 3. Set this examinee's individual identification and demographic data and the current environmental data into the switches instead of the nines indicated in step 1.a.(3). Be sure switch 20 is set to 1. Finish the electronic calibration.
- (5) Set switch 20 to 0 (examinee).
- (6) Instruct the examinee as follows:
 - (a) "Take in a great big *deep* breath of air as far as you can inhale." (Have the examinee inhale from room air.)
 - (b) "Hold all of the air in." (Have him hold his breath long enough to insert the cardboard mouthpiece into his mouth while you start the recording.)
 - (c) "Put the mouthpiece into your mouth and seal your lips tightly around it." (Demonstrate the right way.)
 - (d) "When I tell you to, blast your air into the tube as fast as you can." (The exhalation should be made with the lips tight around the mouthpiece with maximal force and speed. Do not have the examinee use the nose clip unless he exhales through his nose.)
 - (e) "Keep on blowing out that same breath of air, without stopping,

until your lungs feel completely empty.” (Have him blow out as hard and as fast as he can and keep blowing until he “empties” his lungs.)

- (7) Demonstrate to the examinee a deep inspiration, proper placement of the mouthpiece, and the blasting of air into the tube. Continue to blow for at least 4 seconds, making the demonstration as realistic as possible.
- (8) Have the examinee do the first trial; observe closely to insure that all instructions are being followed.
- (9) Using the Brush recorder, calculate the examinee’s approximate volume. Refer to the regression chart and find the forced vital capacity (FVC) cutoff points for the examinee.
- (10) If the examinee’s values fall below the cutoff points, give instructions.
- (11) Make sure that the following requirements are met:
 - (a) The onset of the spirogram should occur within 3 seconds after you turn the function switch to Auto.
 - (b) An optimal baseline must not be less than 1 second or more than 3 seconds in length. Past experience shows this to be one of the greatest problem areas. You must learn to time your presentation of the instructional information (step 6 above) with your use of the operating switch on the Marquette unit to achieve this baseline timing.
- (12) Proceed with trials 2, 3, 4 and 5. After each trial, using the oscilloscope, determine whether or not reproducibility is being achieved. See c. (1). Five trials must be done, but no more may be done without allowing the examinee to rest for 20 minutes.
- (13) If two of the trials are not within the allowable range for both volume and flow rate after five trials, stop testing and rest the examinee for 20 minutes, then retest.
- (14) Try your best to get the full cooperation of the examinee. Since there is a great deal of voluntary control over respiration, the success of lung-function tests depends on your getting the examinee to actively and fully participate.
- (15) Label and keep all tracings.

c. Evaluating examinee effort

- (1) Observations made during the five trials.

A clinically acceptable curve must be smooth and free of inhalation artifacts. The memory oscilloscope with its X-Y orientation is the most precise method of monitoring examinee effort. Flow is registered on the Y-axis (vertically each square equals two liters per second), and volume is registered on the X-axis (horizontally each square equals one liter). Both parameters have been calibrated so that both flow and volume readings are read directly from the face of the scope. Thus each expiratory effort results in a flow-volume loop. This is displayed on the oscilloscope and compared with subsequent efforts. Discrete changes in examinee effort and cooperation can be monitored by observing the shape of this loop and by peak flow deflection. Small variations of respiratory effort *cannot* successfully be monitored with a volume curve alone. Acceptable spirograms result in reproducible loops. Reproducibility is determined by comparing the loops side by

side. The oscilloscope is equipped with an "offset" knob to facilitate this. Don't attempt to use the Gould tracings for this purpose. After each time that the examinee has blown into the spirometer and you have watched the flow-volume loop on the screen, evaluate the examinee's effort. If the vertical and horizontal movement of the scribing point of the scope is low or reduced, look for the following conditions in your examinee:

- (a) The mouthpiece not being inserted into the mouth far enough or the lips placed in front of instead of around the mouthpiece.
 - (b) Collapsing of the mouthpiece by excessive mouth pressure.
 - (c) Tongue occluding the mouthpiece opening.
 - (d) Submaximal effort due to a lack of understanding of the procedure, reluctance to give a full effort, or improper instructions.
 - (e) Inability to comprehend instructions.
- (2) Observations made after the five trials.

The extent of the examinee's cooperation should be questioned if successive total volumes vary more than ± 5 percent for volumes greater than 3 liters and ± 10 percent for volumes less than 3 liters on the two trials with the largest FVCs.

Peak flows must be within ± 10 percent on the same two trials. This variability can be easily estimated on the Gould 280 tracings.

5 percent of 6 liters (30 lines)	is 1.5 lines
5 liters (25 lines)	is 1.25 lines
4 liters (20 lines)	is 1.00 lines
10 percent of 3 liters (15 lines)	is 1.50 lines
2 liters (10 lines)	is 1.00 lines
1 liter (5 lines)	is 0.50 lines

After a full set of five trials test to see if both of these criteria have been met. If they have, the examinee has produced a satisfactory and reproducible set of trials and may be dismissed.

If they are not met, rest the examinee at least 20 minutes then have him do five more trials. Evaluate this second set of five trials as before.

A third set of trials may be done after the mandatory 20 minute rest, but there is no point in going farther (to a fourth set) if reproducibility of effort is not achieved on these three attempts.

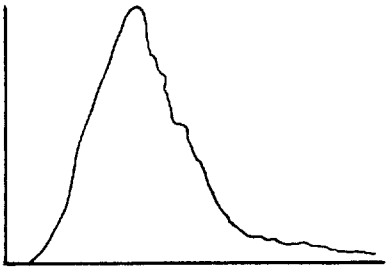
d. Spiro instructions for children 6 to 10 years old

The following spiro instructions are to be applied to the less behaviorally mature children. This will be most of the 6 and 7 year olds (except a few poised with mature behavior), about half of the 8 year olds, and the least mature of the 9 and 10 year olds.

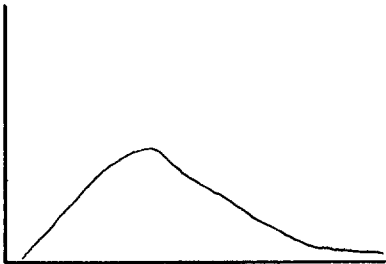
Take time; don't rush them. Don't talk at them. Use few words and mostly demonstrate by vivid, clear example.

Don't give them a lecture about the equipment or the overall purpose. Use the following example: "We want to see how your lungs work. We will measure how much air you can take in (demonstrate vividly and strenuously) and how much you can blow out—as hard and fast as you can." At this point ask if he can blow up a balloon well. It will give you a

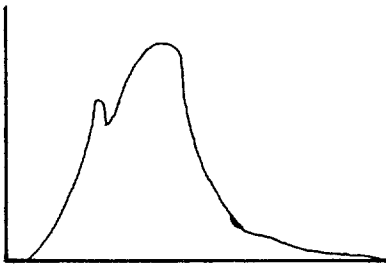
OSCILLOSCOPE EVALUATION USING THE FLOW-VOLUME LOOP



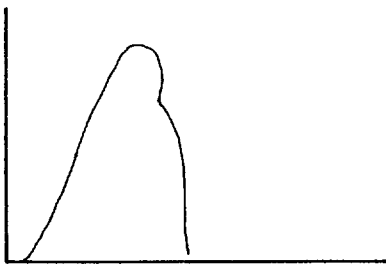
Typical flow loop



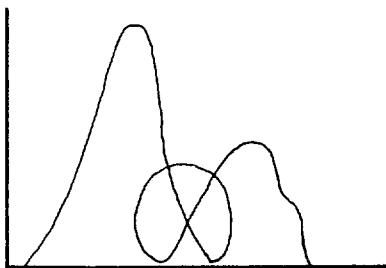
Sub-maximal effort (SME)



Hesitation in initial expiration effort—
inhalation artifact (IH)



Blowing stopped too soon or mouth-
piece removed before completed
expiration—premature termination
(PT)



Repeated efforts without removing
mouthpiece—inhalation artifact (IH)

good tip on how “ready” the child is to perform a good spirogram. “Let me show you.”

“Take in as much air as you possibly can. Like this.”

“Hold it all in until I tell you to blow.”

“Lips closed around the tube like this.”

“When I say ‘blow’, blow out all of your air as fast and hard as you can.

Keep blowing out hard until I tell you to stop.”

Go through each step of the procedure, while demonstrating, observing, and encouraging him to do each step *with you*.

Give the child one or two more practice trials in a relaxed way.

If still unsure of the child’s understanding and ability to perform, demonstrate all over again (repeat the above steps)—stressing anything he didn’t do perfectly (i.e., reemphasize by exaggerated demonstration rather than words on how to do it correctly, e.g., “take as much air in as you possibly can;” “hold all your air in until I tell you to blow”) NOTE: Accent the positive, don’t say, “you did it wrong.”

Then do a real set of 5 trials. If further instructions between trials are necessary keep them vivid, pertinent, and brief. If not satisfactory, make a decision. Either:

- (1) Have him come back later during the examination session, if there is hope for better trials.
- (2) If you really believe there is no hope for that day because the child is frightened, too confused, or clearly doesn’t understand after all this—mark “unsatisfactory trial” and let it go.

NOTE: Your encouraging attitude and the atmosphere of the testing situation which you create is probably more important to the response of the little ones, than formal instructions are.

6. Bellows leak check—beginning of stand

- a. Open the bellows to a position between 5 and 7 liters.
- b. Insert the stopper in the portal.
- c. Turn volume calibration dial (F/V converter) to “OPERATE.”
- d. Record values from Gould strip chart on calibration form.
- e. Turn off all equipment for 12 to 24 hours.
- f. Turn on all equipment on dry run day.
- g. Allow a minimum warmup period of 20 minutes.
- h. Record values from Gould strip chart on calibration form.
- i. A difference of 20 ml/12 hr or greater is significant.
- j. Repeat leak test (steps a through k).
- k. Report any significant findings to the supervisory technician.
- l. If the second test also showed a leak of 20 ml/12 hr or more:
 - (1) With rubber glove on remove the front plate of the spirometer.
 - (2) Rub a light, smooth coat of corn starch into the surface of the seal and the cylinder surface. Remove the excess dust.
 - (3) Rub a light film of Vaseline on “O” ring.
 - (4) Carefully reinstall the front plate.
- m. Repeat leak test and report result to the supervisory technician; contact the engineer if difference is 20 ml/12 hr or greater.

7. Sterilization Procedure

Soak the spirometer hose for at least 1 hour in cidex aqueous solution and then wash it at the end of each stand and after an examination has been performed on an examinee who has TB or any other active respiratory tract disease.

Remove the front panel of the spirometer and wash the cylinder bore, seal, and piston with cidex aqueous at the end of every third stand. See the spirometer manual for further details.

FVC Cutoffs
80 percent of predicted FVC

Ages 6-11.9	Height	Male	Female
	42.0-42.9	762	722
43.0-43.9	838	783	
44.0-44.9	913	845	
45.0-45.9	988	906	
46.0-46.9	1063	968	
47.0-47.9	1138	1030	
48.0-48.9	1214	1091	
49.0-49.9	1289	1153	
50.0-50.9	1364	1214	
51.0-51.9	1439	1276	
52.0-52.9	1514	1338	
53.0-53.9	1590	1399	
54.0-54.9	1665	1461	
55.0-55.9	1740	1522	
56.0-56.9	1815	1584	
57.0-57.9	1890	1646	
58.0-58.9	1966	1707	
59.0-59.9	2041	1769	

Reference: University of Utah, Department of Biophysics—1973.

FVC Cutoffs
80 percent of predicted FVC

Height	12 years		13 years		14 years		15 years		16 years		17 years		18 0-24 9 years	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
60.0-60.9	2138	1988	2277	2070	2416	2151	2555	2235	2694	2314	2634	2396	3112	2566
61.0-61.9	2269	2082	2408	2163	2547	2245	2686	2326	2866	2408	2965	2490	3207	2641
62.0-62.9	2400	2175	2539	2247	2678	2338	2816	2420	2966	2502	3096	2583	3302	2715
63.0-63.9	2531	2269	2670	2350	2810	2432	2949	2514	3086	2595	3227	2677	3396	2790
64.0-64.9	2662	2362	2802	2444	2941	2526	3080	2607	3219	2689	3356	2770	3493	2864
65.0-65.9	2794	2456	2933	2536	3072	2619	3211	2701	3350	2762	3490	2864	3568	2938
66.0-66.9	2925	2550	3064	2631	3203	2713	3342	2794	3482	2876	3621	2958	3663	3013
67.0-67.9	3056	2643	3195	2725	3334	2806	3473	2885	3613	2970	3752	3051	3778	3087
68.0-68.9	3187	2737	3326	2818	3466	2900	3605	2983	3744	3063	3883	3145	3874	3162
69.0-69.9	3318	2830	3458	2912	3597	2994	3736	3075	3875	3157	4014	3238	3969	3236
70.0-70.9	3450	2924	3589	3007	3728	3087	3867	3169	4006	3250	4146	3332	4064	3310
71.0-71.9	3581	3018	3720	3099	3859	3181	3996	3262	4136	3344	4277	3426	4159	3385
72.0-72.9	3712	3111	3851	3193	3990	3277	4130	3356	4269	3438	4408	3519	4254	3459
73.0-73.9	3843	3205	3982	3286	4122	3368	4261	3450	4406	3531	4539	3613	4350	3534
74.0-74.9	3974	3298	4114	3380	4253	3462	4392	3543	4531	3625	4670	3706	4445	3608
75.0-75.9	4106	3392	4245	3474	4384	3555	4523	3637	4662	3718	4802	3800	4540	3682
76.0-76.9	4237	3486	4376	3567	4515	3649	4654	3730	4794	3812	4933	3884	4635	3757
77.0-77.9	4368	3579	4507	3661	4646	3742	4786	3821	4925	3905	5064	3967	4730	3831

Reference: University of Utah, Department of Biophysics, 1973.

Chapter 12

ALLERGY TEST

Equipment

Sponge wipes

Needles, 25 gauge, $\frac{5}{8}$ "

Allergens

Alternaria

Bermuda grass

Cat

Dog

House dust

Mixed long and short ragweed

Oak

Perennial rye grass

Histamine base

Phosphate buffered saline (control)

General

The allergy test administered by the health technicians is designed so that constitutional reactions that would necessitate the use of emergency medical procedures will be kept to a minimum. The allergens most likely to cause constitutional reactions are cat, dog, and to a lesser extent ragweed.

Procedure

1. Before testing

Ask the examinee whether or not he:

- Has ever had even a small positive reaction to a skin test for cat, dog, or ragweed.
- Has a history of allergy to cat, dog, or ragweed.

Write in the examinee's age on the right side of box c, "Sex."

Questions 22–24 on the Medical History for ages 6 months to 11 years and questions 58–60 on the Medical History for ages 12–74 years pertain to the examinee's allergy history.

If there is no indication that the examinee is allergic to cats, dogs, or ragweed or that he is highly sensitive to certain other types of materials, then administer the tests according to the instructions in this chapter.

If the examinee has a history of allergy to cats, dogs, or ragweed, has had a positive reaction to any one of the three, or is known according to the Medical History to be a highly sensitive person, do the allergy test as usual with the following exception. DO NOT administer the cat, dog, or ragweed allergens.

After the 10-minute reading ask the physician to review the examinee's allergy history along with the results of the 10-minute reading for the allergens administered. The physician will decide whether to proceed with the cat, dog, and ragweed testing in total or in part based on either of the following:

- The history of allergy to cats, dogs, and ragweed and the overall sensitivity of the person based on the appropriate items in the medical history.
- The reactions at 10 minutes to the other allergens administered:
 - If less than three of the other allergens show positive reactions, (codes 12, 13, 14) then cat, dog, and ragweed allergens should be administered in the regular fashion in the other arm. (A HISTAMINE REACTION IS NOT TO BE COUNTED AS A POSITIVE).
 - If three or more of the other allergens show positive reactions (12, 13, 14) then cat and dog allergens will not be administered. Ragweed may be administered in the other arm, but with caution. If a wheal (the flat, edematous elevation of the skin) of at least 6 mm in diameter appears, wipe the site immediately and make a reading. Record the time the reading was made under "Minutes" if the reading was made before 10 minutes after the allergen was applied. Read again at 20 minutes even though the wheal area was wiped. If a wheal of at least 6 mm in diameter does not appear before 10 minutes after application, do the usual 10-minute and 20-minute readings.

2. Administration of the allergy test

- a. Sponge the inside of either forearm with alcohol and let the arm air-dry.
- b. Use a black marking pen to mark 10 dots, two rows of five each, for the skin pricks. Avoid the vascular areas near the elbows and wrists.
- c. Put a drop of allergen solution next to each dot until all ten solutions have been used. Use small drops of allergens so that they won't run.
- d. Prick the skin under the drops by lifting the skin lightly with a 25 gauge BD needle.
- e. Set the timer for the 10-minute reading as soon as the first prick is made.
- f. When the timer goes off at 10 minutes, immediately reset it for the 20-minute reading and then read the reactions and record the results of the readings for the allergens administered according to the instructions in the next section.
- g. 20 minutes after the first prick read the reactions and record the results for all the allergens administered.

3. Reading the reactions and recording the results

For all tests administered complete the Allergy Testing form, Deck No. 309, as follows:

a. First Reading

(1) Time

Normally the first reading is taken 10 minutes after first prick is made. However, in the case of an extreme reaction, safety precautions, the

examinee's needing to leave the exam center, or some other reason, measurements of reactions may have to be done at a time other than the standard time of 10 minutes after the prick. If there is a deviation from 10 minutes, record the time of the reading under "Minutes" and record the reason why across the bottom of the form.

(2) Recording results

- (a) For each allergen whose wheal at 10 minutes is 6 mm or more in diameter record the wheal's exact measurements under "Wheal Length" and "Wheal Width." Check under "Confluent" whether or not the reaction from the allergen has run into that of any other allergen. Record also the exact measurements of the flare or erythema (area of redness) surrounding the wheal under "Flare Length" and "Flare Width." Write in under "Test Results" the code that best describes the reaction from that allergen according to the code definitions given at the bottom of the Allergy Testing form. Blot the test areas after the 10-minute reading.
- (b) For each allergen whose wheal at 10 minutes is less than 6 mm in diameter, record whether the reaction is confluent or not, measure and record the wheal and flare length and width, and write in the code number which best describes the test results.
- (c) Erythema boundary — The distinguishing of the erythema boundary is easy in most cases. Wiping with an alcohol sponge will help in the determination.
In the case of a dark skinned person the boundary is harder to determine. A bright light will help with this problem. Either a 75 watt incandescent or fluorescent bulb can be used. Bright sunlight will help if a lamp is not available. In all cases, before reading wipe with an alcohol sponge.

b. Second Reading

(1) Time

Normally the second reading is taken 20 minutes after the first prick is made. However, in the case of extreme reaction, safety precautions, an examinee's needing to leave the exam center, or some other reason, measurements of reactions may have to be done at a time other than the standard time of 20 minutes after the prick. If there is a deviation from 20 minutes, record the time of the reading under "Minutes" and record the reason why across the bottom of the form.

(2) Recording results

Measure the length and width of each wheal and flare and record the measurements in the appropriate spaces. Also, record whether or not the reaction was confluent with another reaction. Write in the appropriate test result according to the codes at the bottom of the form. If there is no reaction for an allergen, leave every space blank except the space for "Test Results;" record "10" in that space.

c. After the second reading

- (1) Wipe the arm clean with alcohol.
- (2) Check on the form whether the test was satisfactory or unsatisfactory. If it was unsatisfactory, give reason why.

(3) Don't let the examinee leave the examination center before 30 minutes after the administration of the allergens.

d. Physician's report of findings

In transferring the results of the allergy test to the report of findings use the following translations to make the test result codes correspond to the codes from the "Notes on Tests and Procedures."

<i>Allergy form test result code</i>	<i>Report of findings code</i>
10, 20	0
11	1
12	2
13	3
14	4
15-18	5
19	6

Emergency Procedure

Generalized reactions to the skin tests are not expected. However, if one does occur it may be sudden and sometimes serious.

Do not wait for full development of an adverse reaction. If the examinee says he feels funny, faint, dizzy, or weak that is the signal to *immediately* notify the physician who will take appropriate action.

The recommended treatment is indicated below and has been excerpted from an article by Sheldon C. Siegel, M.D., as a contribution to "Current Pediatric Therapy."

"At the first sign of an impending anaphylactic reaction, the following drugs should be promptly administered and the described additional measures taken as indicated:

Epinephrine 1:1000, 0.3 to 0.5ml, should be administered either subcutaneously or intramuscularly. If no response is noted within 5 minutes, the dose may be repeated. In the event of severe shock with vascular collapse, 1 ml of 1:1000 epinephrine diluted in 10 ml of saline solution should be administered by slow intravenous injection.

"If the anaphylaxis has been caused by a therapeutic agent injected into an extremity, a tourniquet should be placed proximal to the site to delay absorption, and an additional 0.25 ml of epinephrine injected directly into the previous injection site.

"The administration of epinephrine should be followed immediately by an intramuscular or intravenous injection of an antihistaminic such as diphenhydramine (Benadryl). The dose for an older child should be comparable to that for an adult, 50 mg; for an infant or younger child, use 1 mg/kg, not exceeding 50 mg per dose or 150 mg per day.

"Oxygen administered promptly will minimize the development of hypoxia, which may in itself contribute to vascular collapse and cerebral edema. Vigilance must be kept at all times to make certain the patient has adequate ventilation. Excess secretions should be removed by suction. If the airway becomes completely obstructed by angioedema, intubation or tracheostomy may be necessary."

Antigen Care

The test antigens should always be refrigerated to maintain their stability. To assure stability throughout a stand the following should be followed:

1. Since 4 fresh vials of each antigen are provided at the beginning of each stand, discard all opened vials midway through the stand and replace with fresh vials which have been refrigerated since the beginning of the stand. At the end of each stand, discard all opened and unopened vials of antigen.
2. During an examination session antigen vials should be kept in special containers at a temperature of between 2° and 4°C.
3. After the last session of each day and after the first session of a split session day, antigens are to be replaced in the refrigerator. Again, the ideal temperature is 2° to 4°C.

Chapter 13

X-RAY

Restrictions

1. No examinee who is known to be pregnant is to have any X-rays taken. This restriction will be noted on the control record by the technician.
2. No female under the age of 50 shall have an X-ray of the lumbar spine taken.
3. The lead shield shall be used when taking all lumbar spine X-rays.

Radiation Badges

Every precaution recommended by the American College of Radiology and the radiation survey of the caravans by the Radiological Health Division of PHS is incorporated in our X-ray setup.

Radiation detection badges shall be worn by X-ray technicians during all operating sessions of the mobile examination center.

New badges will be provided every 3 months. When the new ones are received, the used film from the badges should be returned to headquarters for reading.

X-Ray Exposures

1. PA Chest

72 inch distance, Bucky, 110 KVP

<i>cm</i>	<i>MAS</i>	<i>MA</i>	<i>sec</i>
17-18	2.5	300	1/120
19-20	5.0	300	1/60
21-22	7.5	300	1/40
23-24	10.0	300	1/30
25-26	15.0	300	1/20
27-28	20.0	300	1/15
29-30	30.0	300	1/10

2. Cervical spine

72 inch distance, no grid, 300 MA, 1/10 second, 10 MAS

<i>cm</i>	<i>*KVP</i>	<i>cm</i>	<i>*KVP</i>
10	74	16	86
11	76	17	88
12	78	18	90
13	80	19	92
14	82	20	94
15	84		

* The KVP may vary among caravans ± 5 KVP

3. Lumbar spine

40 inch distance, table bucky, 100 MA, 1 second, 100 MAS

<i>cm</i>	<i>*KVP</i>	<i>cm</i>	<i>*KVP</i>
20-21	82	30-31	107
22-23	87	32-33	112
24-25	92	34-35	117
26-27	97	36-37	122
28-29	102		

* The KVP may vary among caravans ± 5 KVP

Procedures

1. Preliminary

- Record the time the examinee enters the X-ray room.
- Note the sample number that has been previously stamped on each record. Put this number in the lead number holder along with the date and an L (which designates left).
- Set X-ray control for the correct X-ray exposure.

2. PA chest

- Place a cassette in the upright cassette holder and put the lead number holder in the upper left corner. Use the bucky when indicated.
- Have the examinee raise both arms. With calipers measure the depth of the examinee's chest at the level of the sixth thoracic vertebra. Using the exposure chart, set the proper technique according to the chest measurement.
- Position the examinee with his anterior chest pressed against the cassette. Have him rest the back of his hands on top of his hips and roll his shoulders forward.
- Position the X-ray tube 72 inches from the film with the central beam at the midthoracic spine.
- Adjust the collimator on the X-ray tube so that only the chest area will be exposed.
- Ask the examinee to take in a deep, deep breath and hold it.
- Make the exposure on full inspiration while standing in the darkroom where you can observe both the meters on the X-ray machine and the examinee.

3. Lateral lumbar spine

- Place a 14 x 17 cassette lengthwise in the bucky tray with a 12:1 movable grid, and place the lead number holder on it with an R to mark the right side.
- Place the examinee in the lateral recumbent position. Flex the hips and knees for support.
- Align the long axis of the spine over the center line of the table (4 inches anterior to the posterior surface).
- Flex the bottom elbow and place the forearm under the pillow.
- Flex the top elbow and place the forearm above the head with the hand grasping the edge of the table.
- Rotate the body into a true lateral position.

- g. For thin people, place a rubber sponge under the rib cage to keep the spine straight.
 - h. Position the X-ray tube 40 inches from the film with the central ray 1½ inches above crest centered along the mid-axillary line at the level of the 3rd spinous process.
 - i. Center the bucky tray to the central ray.
 - j. Cone down to eliminate secondary radiation and increase detail.
 - k. Make the exposure on expiration from the darkroom while observing both the examinee and the machine dials.
4. Lateral cervical spine in flexion
- a. Place a 10 x 12 cassette lengthwise in the upright cassette holder. Put the lead number holder on the film. Don't use the bucky for this view.
 - b. Position the X-ray tube 72 inches from the film.
 - c. Place the examinee in a lateral position standing with the left shoulder against the upright cassette holder.
 - d. Place the top of the cassette 2 inches above the external auditory meatus.
 - e. Have the examinee bring his chin out and then down in maximum flexion position.
 - f. Direct the central ray perpendicular through the cervical spine to the center of the film.
 - g. While the examinee's back is straight and his shoulders are relaxed, place a 25 pound weight in each of his hands to hold the shoulders down.
 - h. Make the exposure from the darkroom while observing both the examinee and the machine dials.
5. Calibration
- a. Incoming Voltage

Before the X-ray machine is turned on, the transformer located in the CS-30 console should be adjusted to the incoming voltage. The procedure is outlined in the *CS-30 X-Ray Control* instruction book on page 2-13 and should be done by an X-ray repairman or a staff member acquainted with this technique.
 - b. Warmup

After the machine has been matched to the incoming line voltage and before each examination session, the tube should be warmed by taking three exposures at a technique which generates a low energy output: 50 KVP, 25 MAS, 1/20 sec. This warming procedure will help prolong the tube life.
 - c. Step wedge

On setup day and on any other day when you think the X-ray machine may not be operating properly, a calibration check must be made. The check should be similar to the one outlined in the book *CS-30 X-ray Control* on pages 2-16 and 2-29.

The theory behind the calibration procedure is that there are four factors which affect the photographic effect produced by the X-ray beam on the photographic film. They are target-to-film distance, milliamperage, time of exposure, and kilovoltage. In our procedure we will keep the target-to-film distance constant at 40 inches. We will be able to verify the timing accuracy by using the spin top on the step wedge and counting the

number of dots on the finished X-ray. We should be able to direct irregularities in the KV autotransformer or incoming voltage by comparing the shades of gray on a given step in each of the exposures taken under similar MAS conditions. This set of exposures can be compared with the standard film generated by CGR on this caravan's X-ray machine. Before a conclusion can be drawn from a comparison, the actual MAS at each exposure must be checked against the actual MAS used on the standard film. The MAS readings should compare within ± 2 MAS. If the MAS readings do agree and there is a shift in contrast, then the problem must be KVP. If the MAS don't agree to within ± 2 MAS then a conclusion cannot be made about the KVP and the console should be serviced.

The following procedure gives the KVP, MA, seconds, and dots expected for each of four exposures. Use the same film for the series of step wedge X-ray exposures. This will eliminate any irregularity between films. The multiexposure can be accomplished by covering all but a strip of the cassette with a lead sheet, making an exposure, and then covering successive strips for exposures at the different MA loadings.

- (1) Tube-to-film distance 40 inches table non-grid KVP set at 55.

<i>MA station</i>	<i>Time stations</i>	<i>MAS</i>	<i>Dots expected</i>
50	2/5	20	48
100	1/5	20	24
200	1/10	20	12
400	1/20	20	6

- (2) Compare the exposures for each MA station. The variation between any of the exposures should be within 1 density step. If this is not so, check your work and then inform the biomedical engineer. Mail the film to headquarters.
- (3) Place the back of the wedge, not the tip, against the stainless steel frame on the cassette and separate each of the four wedge placements by $\frac{1}{4}$ inch.
- (4) To use the top properly, spin it at a rate which is commensurate with the exposure speed. Use a slow speed for short exposures e.g., 1/120 sec. and a fast speed for long exposures, e.g., 1 sec.

Take the desired exposure while the top is spinning. Finally, count the number of dots on the developed view of the wedge and compare your total with value listed. You should keep in mind that at long exposures (e.g., 1 sec.) the dots will overlap and may not be distinct. If you find the number of dots differs from the desired value a problem does exist on the timing board and the console should be serviced.

Chapter 14

BODY MEASUREMENTS

Equipment

Anthropometer parts: 2 sets of four sections each, 4 sliding arms, 1 circular metal base
Body measurement table
Footstool
Sliding calipers
Skinfold calipers
Steel tape
Fiberglass tape
Special height scale
Polaroid land camera
Special light attachment for camera
Self-balancing weight scale
Set of weights for calibration of weight scale (one 25-lb weight and five 50-lb weights)
Children's measuring board

General

Two anthropometers are provided, one as a spare. Each anthropometer consists of a rod in four sections with two caliper arms. One of the arms is fixed to the top end of the instrument; the other slides. The lower two sections are used for sitting heights and will be mounted in the circular metal base. The top section is used for bitrochanteric breadth. The remaining section can be used when required for measuring sitting heights of large examinees. The sliding calipers used to measure elbow breadth may become too loose; if so, use candle wax to tighten them.

With these anthropometers there are three sources of error which must be checked daily. The chief technician should see that:

1. The anthropometer numbers read in the proper sequence and the movable arms slide freely without slipping;
2. When mounted in the base, the instrument stands vertically without support; and
3. The bottom end of the anthropometer is perfectly flush with the undersurface of the metal stand. (Do not handle anthropometers by the upper ends alone as this tends to wrench them from their bases.)

Measuring and Recording

The examiner takes each measurement and says it to the recorder. The recorder repeats the number, records it in the proper space, and says the name of the next measurement. The examiner should keep the measuring instrument set

until the recorder repeats the number. If the anthropometer becomes unset in any way before the measurement is read back, the measurement should be made again. On standing measurements the recorder will insure that the subject stands erect. For the standing height measurement the recorder should check the height photo to be sure of the accuracy of the technician's reading.

A recorder is important because he helps insure the accurate recording of the measurement while also helping the examiner position the examinee correctly. The recorder also assists the examiner by seeing that the steel tape is horizontal with proper tension when girths are measured. The recorder, having had the same training as the examiner, should recognize an error in measurement or in reading from the wrong scale. (The anthropometer has two scales—ascending and descending.) When he does see an error he should call it to the examiner's attention and have the mistake corrected.

All measurements are to be taken to the nearest tenth of a centimeter, except skinfolds which are to be taken to the nearest half of a millimeter. If the digit to the right of the last digit to be recorded appears to be exactly 5, the last digit to be recorded should be raised one unit if it is odd or stay unchanged if it is even. If a skinfold is too tight to be measured, write "too tight" in the recording space for that measurement (but, do try to get the subject to relax for the measurement).

The original examiner and recorder will complete an examination once it is started.

The measurements taken consist of various heights, breadths, girths, and skinfolds. All are to be taken on the *right side of the body* if possible. When any of the measurements cannot be taken on the right side because of casts, amputations, or any other reasons, these particular measurements should be made on the left side and the reasons noted on the recording page.

When the examinee's sample number ends in "3" or "6," four of the measurements are to be taken on the left side as well as the right side unless there is some reason it is impossible to take them on the left side. In this instance, again, the reason not taken should be noted on the body measurement page.

Procedure for Measuring Examinees 8 Years and Over

Record on the control record the examiner number and the time the procedure begins. Record on the body measurement form the examiner and recorder numbers.

Have the examinee stand with his feet together in the standard erect position for the following five measurements.

1. *Bitrochanteric breadth*.—With the top section of the anthropometer measure to the nearest 0.1 cm the maximum breadth of the body at the level of the greater femoral trochanters. *Compress the soft tissue over the trochanters as much as possible* by applying pressure on the caliper arms near where they touch the body (not where the arms are attached to the anthropometer). Take this measurement over the examinee's gown.
2. *Elbow breadth*.—Have the examinee extend his right arm forward until it is perpendicular to his body. Bend the arm so the angle at the elbow forms 90° with the fingers pointing up and the dorsal part of the wrist toward the examiner. With the sliding calipers along the axis of the upper arm, measure to the nearest 0.1 cm *the greatest breadth across the elbow joint*. This is

a bone to bone measurement across the epicondyles of the humerus and is usually taken at an oblique angle because the inner condyle is lower than the outer condyle. Be careful that the calipers do not slide off the epicondyle.

3. *Upper arm girth.*—With the examinee's right arm flexed 90° at the elbow, use the fiberglass tape to measure to the nearest 0.1 cm the distance from the outer edge of the acromial process to the olecranon process of the ulna. Mark the outer edge of the acromial process first, then place the tape on the mark and locate the midpoint between the acromial and olecranon processes. Mark this midpoint carefully. This is the level at which both the arm girth and triceps skinfold are measured.
4. *Triceps skinfold.*—Have the examinee relax his shoulder and let his arm hang freely at his side. *Mark a point on the right midtriceps in the same plane as the midhumeral point used for the upper arm girth and perpendicular to the olecranon process of the ulna.* Grasp the skin and subcutaneous tissue firmly with thumb and forefinger approximately 1 cm above this level and draw directly back from the body *making sure that no muscle tissue is included in the fold.* The crest of the fold should be parallel to the long axis of the arm. Apply the calipers at the level of the point marked above and measure the fold to the nearest ½ mm without releasing the fingers. Take a second measurement; if the two disagree, continue taking measurements until you get two that agree to within 1 mm.
5. *Subscapular skinfold.*—Have the examinee relax his shoulders and arms. Palpate the inferior angle of the scapula. Grasp a fold of skin and subcutaneous tissue directly above the angle firmly with the thumb and forefinger and draw straight back from the body *making sure that no muscle tissue is included in the fold. The fold should parallel natural cleavage lines of the skin* which are often lines about 45° from the horizontal extending medially upward. Apply the calipers about 1 cm below the thumb and forefinger and measure the fold to the nearest ½ mm without releasing the fingers. Take a second measurement; if the two disagree, continue taking measurements until two agree to within 1 mm.
6. *Sitting height.*—Have the examinee sit as far back on the measuring table as he can so that the backs of his knee joints (popliteal fossae) are at the front edge of the table. Have him sit *erectly* with his eyes straight ahead and the infraorbital meatal line parallel to the table top (i.e., eyes in horizontal plane looking straight ahead). *Check with the recorder on the examinee's position before making the measurement.* Then bring the caliper arm down firmly against the midline of the examinee's head. (Note: you might have to compress some hairstyles.) Take the measurement to the nearest 0.1 cm *with your eyes at the same level as the caliper arm.* Do not make the reading at an angle. *Shorter technicians should use the stool available in the measuring room as an aid.*
7. Ask the examinee whether he is right-handed or left-handed and record his answer by checking the appropriate box.
8. Weight
 - a. Examinees who weigh 250 pounds or less:
 - (1) Ask the examinee to stand still on the scale (in slippers).
 - (2) Wait until the scale pointer stops moving.

- (3) Insert the bottom of the body measurement page on the case record in the slot at the front of the scale's printer.
 - (4) Depress the bar on the front of the printer to record the weight on the record to the nearest quarter of a pound.
 - (5) Check to be sure that the recorded weight is legible.
 - (6) Record weight on the body measurement form in the space provided (Item 10) near the bottom of the form. Always record the weight in five digits, fill in the blank spaces with zeroes as appropriate, e.g., 98.5 should be entered as 098.50.
- b. Examinees who weigh more than 250 pounds:
- Since the scale printer will only print to 250 pounds, the following procedure must be followed if an examinee weighs more than 250 pounds:
- (1) If the examinee weighs more than 250 pounds, but no more than 350 pounds:
 - (a) Move the bottom weight on the notched bar on the front of the scale to 100 pounds (far right);
 - (b) Weigh the examinee and stamp his case record just as though he weighed less than 250 pounds;
 - (c) Add 100 pounds to the stamped weight total on the body measurement page; and then
 - (d) Record the total weight (stamped weight plus 100 pounds) in the proper space on the body measurement page.
 - (2) If the examinee weighs more than 350 pounds, but no more than 400 pounds:
 - (a) Move the bottom weight on the notched bar to 100 pounds;
 - (b) Move the top weight on the numbered bar to 50 pounds (far right);
 - (c) Weigh the examinee and stamp his case record just as though he weighed less than 250 pounds;
 - (d) Add 150 pounds to the stamped weight total on the body measurement page; and then
 - (e) Record the total weight (stamped weight plus 150 pounds) in the proper space on the body measurement page.
 - (3) If the examinee weighs more than 400 pounds ask him to estimate his weight.

9. Height

- a. Have the examinee stand erect with his back and heels against the upright bar of the height scale, ("Stand up tall" or "Stand up straight") with feet together and head in the Frankfort Horizontal Plane ("Look straight ahead"). Grasp the examinee under the mastoid processes and stretch him gently upward.
- b. Bring the horizontal bar down snugly to the examinee's head.
- c. Stick one of the sample number labels next to the tape on the upright bar so the number label can be read when the height scale is photographed.
- d. Photograph the height measurement and ask the examinee to step aside.
- e. Process the film and place the sample number label from the height scale

- on the photo. Do not cover up the scale or the photographed sample number.
- f. Record the standing height on the body measurement form as read from the photograph in the space provided (Item 11). This should be recorded in four digits to the nearest mm (0.1 of cm) from the metric scale. If there are less than four digits, fill in the blank spaces with zeroes as appropriate, e.g., 99.0 should be 099.0. When the measurement is exactly at the half-way point between 2 mm round up if the preceding whole number is odd and round down if even.

Procedure for Measuring Children Under 8 Years Old

1. *Bitrochanteric breadth*.—Use the same procedure as that for older examinees.
2. *Elbow breadth*.—With child standing or sitting, use the same procedure as that for older examinees.
3. *Upper arm girth*.—The arm must be fully extended and as relaxed as possible. Otherwise, use the same procedure as that for older examinees.
4. *Chest circumference*
 - a. *2 years old and over, standing*.—Using the steel tape, measure to the nearest 0.1 cm the chest circumference at the level of the nipple line at *midrespiration*, with the examinee *breathing normally* and with his arms relaxed at the sides. The tape should pass around the chest so that it is at right angles to the longitudinal axis of the body.
 - b. *3 years old and under, supine*.—Measure the child lying supine on the infant measuring board. Measure the circumference with a steel tape at nipple level, the tape being placed at right angles to the longitudinal axis of the body. The measurement is taken to the nearest 0.1 cm at *normal midrespiration*.
5. *Head circumference*.—The child can be either sitting or standing. Steady the child's head and measure its circumference to the nearest 0.1 cm by placing the steel tape firmly around the frontal bones (forehead) just above but not including the supra-orbital ridges, passing it around the head just above the ears on each side, and laying it over the maximum occipital prominence at the back of the head. The tape should be pulled *firmly* to compress the hair and underlying soft tissues.
6. *Triceps skinfold*.—With the child either standing or sitting (preferably standing) use the same procedure as that for older examinees.
7. *Subscapular skinfold*.—With the child either standing or sitting (preferably standing) use the same procedure as that for older examinees.
8. *Sitting height (2 years old and over)*.—Have the child sit erectly on the measuring table with his eyes directed straight ahead (the eyes should be in a horizontal plane looking straight ahead). The child should sit as far back on the table as he can so that the backs of his knee joints (popliteal fossae) are in contact with the front edge of the table. CHECK WITH THE RECORDER ON THE CHILD'S POSITION BEFORE MAKING THE

MEASUREMENT. Younger children need to be encouraged to sit straight, and you might have to give support to a younger child, i.e., straighten out his back by placing one hand (right) over the upper part of the chest and the other hand (left) over the lumbar area, and pushing gently. After checking the child's position with the recorder, bring the caliper arm *firmly* against the midline of the examinee's head. NOTE, you might have to compress some hairstyles. Take the measurement to the nearest 0.1 cm with your eyes at the same level as the caliper arm.

9. *Sitting height, recumbent (crown-rump length), children under 3 years.*—Measure on the infant measuring board with the child lying on his back with his knees bent to a right angle. One technician holds the child's head in the Frankfort plane (i.e., eyes straight ahead, in this case straight upward so that the plane they form is parallel to the movable footboard) and applies gentle traction to bring the head into contact with the fixed headboard. The second technician supports the child's legs under the flexed knees and brings the movable footboard to rest against the child's buttocks with *firm pressure*.
10. *Weight.*—Use the same procedure as that for older examinees.
11. *Standing height (2 years old and over).*—Use the same procedure as that for older examinees.
12. *Recumbent length (children under 3 years).*—Measure on the infant measuring board with the child lying supine. One technician holds the child's head in the Frankfort plane and applies gentle traction to bring the head into contact with the fixed headboard. The second technician holds the child's legs roughly midway between the ankles and knees, with the toes pointing directly upward. Then, while applying downward pressure to the legs (to prevent the knees from flexing), the technician brings the movable footboard to rest firmly against the child's heels. You may need extra help (third person) for restless infants under 2 years to make measurements as quickly as possible and maintain accuracy.

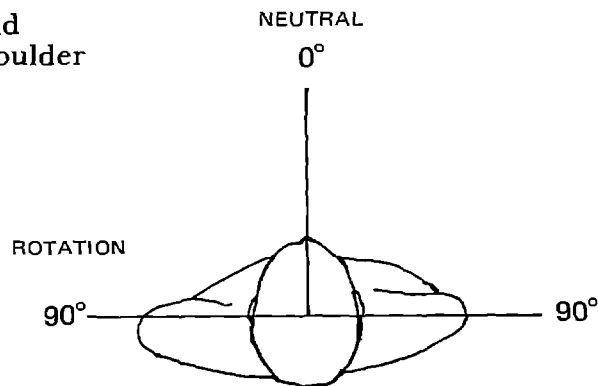
Measurement Procedure for Neck and Lower Back of Examinees 18 Years and Over

1. Cervical spine
 - a. Rotation

While the examinee is standing erect with feet together and head in the Frankfort plane, have him turn his head to each side as if looking over each shoulder. Using the protractor, measure to the nearest five degrees the amount of rotation to each side from the central or neutral position. Normally the cervical portion of the spine allows from 60 to 80 degrees of rotation.

ROTATION OF THE NECK

0° is straight ahead
90° is over the shoulder

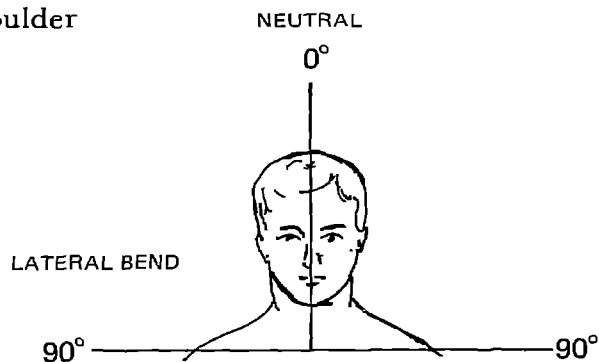


b. Lateral bending

Have the examinee stand with his back to the protractor on the wall. Ask him to try to touch each ear in turn to the shoulder below it without raising the shoulder girdle. Demonstrate what he is to do. Then measure to the nearest five degrees the amount of lateral bending to the right and to the left.

LATERAL MOTION OF THE NECK

0° is over the top of the head
90° is over the shoulder



c. Pain on cervical motion

Ask the examinee whether or not he feels any pain on either side during rotation or lateral bending. Write in the appropriate spaces the codes that indicate the amount of pain felt.

<i>Code</i>	<i>Amount of pain</i>
0	None
1	Doubtful
2	Minimal (mild discomfort)
3	Moderate (between 2 and 4)
4	Maximal (examinee cries out in pain, jumps)

2. Lumbar spine

a. Erect

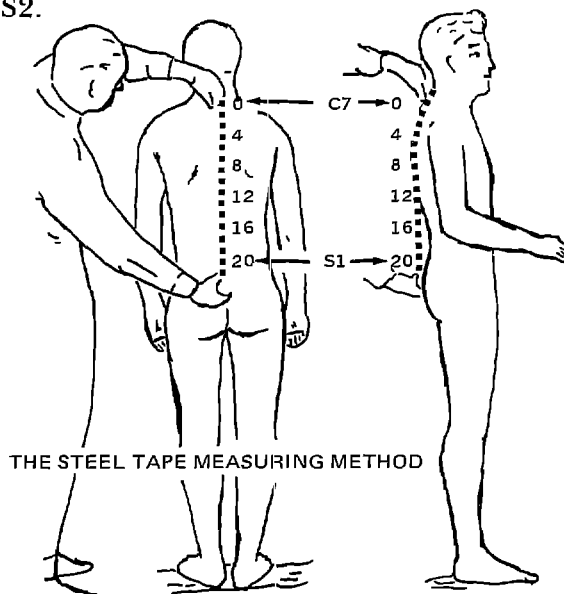
While the examinee is standing erect, use the steel tape to measure to the nearest tenth of a centimeter the distance from the vertebra prominens to the vertebral process of S1.

b. Flexed

Ask the examinee to bend forward as far as he can comfortably. Measure again to the nearest tenth of a centimeter the distance from the vertebra prominens to the vertebral process of S1. The average difference between the two measurements is about 10 centimeters.

MEASUREMENT OF SPINAL FLEXION

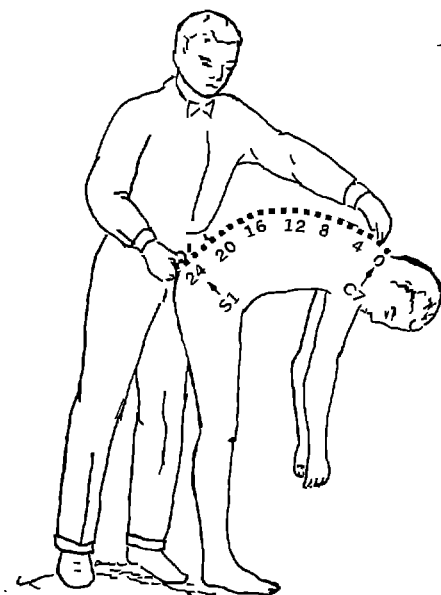
(The diagram is self-explanatory.) The seventh cervical vertebra is prominent (vertebra prominens) and is just under the collar. The posterior superior iliac spine is at the level of the spinous process of S2; S1 is easily palpable just above S2.



STANDING ERECT

BENDING FORWARD

Note the 4" in motion. (20" to 24")



MEASURING SPINAL FLEXION

Field Checks

1. *Calipers*.—Calipers must be checked before each stand and once a week during the stand against a metric tape. The skinfold caliper should be checked daily before use. To do this place the standards between the caliper arms and see that the reading on the scale corresponds to the length of the standard. If the calipers are not right, adjust them by pressing firmly on the arms. If they are *1 mm or more* out of calibration, use the other available calipers and return the ones out of calibration to headquarters.
2. *Height*
 - a. At the beginning and end of each stand, check to be sure that:
 - (1) The upright bar and tape measure have not been changed or damaged. Check the accuracy of the tape with the sitting height anthropometer. Set the sitting height anthropometer at about the middle of the height scale base. Turn the movable anthropometer's caliper arm upside down. Take the picture of the height measurement. Read the anthropometer measurement the same way as for sitting height and record the reading on the back of the photograph. Send the photograph to the Chief, Quality Control Section, headquarters. The photograph should include the stand number and location, date, number of the person who checked the scale, anthropometer reading, and whether it was the beginning or end of the stand. If the measurement does not agree with the sitting height anthropometer, adjust the sighting window until the measurement does agree with the sitting height anthropometer setting. Take a picture after the adjustment and send the photograph to headquarters.
 - (2) The horizontal bar is firmly attached to the upright section that slides on the upright bar.
 - (3) The camera and light are working to produce optimum photos. Any necessary repairs and adjustments should be made as soon as possible. This equipment is the only means we have for measuring height.
 - b. Check daily that the standing height measurer operates smoothly.
3. *Weight*.—At the beginning of each stand before the examinations begin and again at the end of the stand, the scale should be calibrated at zero and at intervals of 25 pounds all the way up to 250 pounds. If the scale is out of calibration by a constant amount at all calibration weights, correct the error with the adjustment knob on the left side of the scale. If the trailer is not level the scale will have to be zeroed. If adjusted to lower than 0.00 it will read E.EE; but when adjusted correctly it will read 0.00. After zeroing the scale properly, stamp zero on any ordinary sheet of 8 x 10½ paper. Then weigh the calibration weights in increments of 25 pounds, starting with 25 pounds and going up to 250 pounds and stamping each weight on the paper. Altogether, 11 recordings should be made on the paper. The paper with the recorded weights should also include the stand number and location, date, the number of the person doing the check procedure, and whether it was the beginning or end of the stand. Mail the recording immediately to the Chief, Quality Control Section, headquarters.

If the scale is out of calibration by $\frac{1}{2}$ pound or more at three stations, have it repaired.

The ribbon for printing the weight will need occasional replacement (approximately every 6 months). When the printing starts getting dim call a Toledo Scales dealer for replacement ribbon.

At the end of each stand, turn the scale lock to a vertical position for transit. The tech responsible for the body measurement station should weigh himself daily to roughly check the accuracy of the weight scales. If there is any reason to believe the scales are not accurate a complete recalibration should be done. The recording of the calibration should be sent to headquarters.

4. *Anthropometers*.—Check daily to see that the sitting height anthropometer is vertical on the table top and that the caliper arm is perpendicular to the bar and not bent. See that the arms of the bitrochanteric breadth anthropometer are perpendicular to the bar and not bent.
5. *Log Book*.—In a book that stays with the trailers write in the following headings:

Date, Technician Number, Measuring Device Number, 0 mm, 10 mm, 20 mm, 30 mm, 40 mm, 50 mm, Counter Reading, and Tape Measure Reading

Record daily in the log book the required identifying information under the appropriate headings. Then record the skinfold caliper calibration reading for each standard. Finally, move the foot board of the baby board as close as possible to the head board; record in the book the counter reading. Measure with the tape measure the distance between head and foot boards, and record that reading.

6. *Cleaning of equipment*.—At the beginning of each stand the anthropometer, calipers, and tape measures should be cleaned with vinegar.

Replicates

An intertechnician body measurement replicate is to be done every fourth session on the examinee who arrives first at the exam center. The sessions on which replicates are to be done are shown in the schedule sheet.

For the sessions during which a replicate is to be done, the coordinator should write the examinee's sample number in the appropriate space on the schedule sheet and should assign the original body measurements on that examinee to a technician according to the usual flow system rules. She should assign the replicate measurements in a *random* way to one of the other technicians and write that technician's number in the appropriate space on the schedule sheet.

Chapter 15

AUDIOMETRY AND SPEECH SCREENING EXAMINATION

Equipment

Soundproof room.

Audiometers: two (2) Beltone, Model 200-C

Language master: Bell and Howell, Model 1726

Tape recorder: Revox, Model 77A

Sound level meter: B&K, Model 2203

Artificial ear coupler: B&K, Model 4151

Condenser microphone: B&K, Model 4144 (1")

Octave band filter: B&K, Model 1613

Acoustic calibrator: B&K, Model 4230

Microphone power supply: B&K, Model 2810

Talk back microphone: B&K, Model 4125 (½")

Accessories: Microphone adaptor ring, 500 gram weight, prerecorded Language Master Cards, blank magnetic tapes

Forms: Daily check list, field calibration forms, environmental noise survey form.

Setup

The setup described in this section applies to that used in the examinations and daily checks. For calibration setups refer to the appropriate sections. Turn all equipment off when not in use.

1. Audiometer
 - a. Plug in power cord and press "on" switch to turn on power indicator light.
 - b. Place all switches and controls in "off" position.
 - c. Turn *speech input* control to "tape."
 - d. Turn *channel II gain* control fully counterclockwise.
 - e. Turn *I/U meter selector* switch to "channel I."
 - f. Turn *talk back* and *talk over* control fully counterclockwise.
2. Language Master
 - a. Insert plug with two leads into output jack of Language Master.
 - b. Insert phone plug labeled "tape input" into the female jack of a Y connector. Insert the two male plugs of the Y into the tape jack and external input channel II jack located in the rear of the audiometer.
 - c. Turn *volume control* fully clockwise.
3. Tape recorder
 - a. Plug in power cord and turn *power* switch to 7½" speed and small reel indicator. Check to see that the pilot light is on and that there are three cables connected to the rear panel of recorder.

- b. Turn *record function* selector to "aux."
 - c. Turn both *record level* controls fully clockwise.
 - d. Turn *channel selector* switch to "mono."
 - e. Turn second clear knob (from left) to "NAB" and leave the *balance control* in the center position (pointer straight up).
 - f. Depress *channels I and II preselector* buttons.
4. Sound level meter
- a. Insert plug labeled "B & K output" into output jack of sound level meter.
 - b. Screw plug adapter onto meter and insert plug labeled "Mic. Amp." into adapter.
 - c. Attach connector labeled "amp. input" into channel I output of microphone power supply.
 - d. Insert cable from 1/2" microphone into channel I input of microphone power supply.
 - e. Connect 1/2" microphone to cable.
 - f. Pull up black knob below indicating meter to turn the power on. Check to see that the power indicator light is flashing.
 - g. Turn the same black knob to "Batt." position. If meter pointer falls within section marked "battery," the batteries are satisfactory for use. Otherwise, replace batteries per instrument instruction manual.

Daily Field Checks - Audiometer

Turn power on and switch to manual mode. Turn *tone* switch to "on" position to turn on the tone indicator light.

1. To check tone quality:
 - a. Set hearing level dial at 40 dB.
 - b. Turn *channel I output* control alternatively to left and right phones.
 - c. Turn frequency dial successively from 500 Hz through 4000Hz while listening through each earphone in turn for purity of tones.
 - d. Check appropriate spaces on the form and note any abnormalities.
2. To check the hearing level control:
 - a. Set the Frequency dial on 2000 Hz.
 - b. Turn the hearing level dial slowly from 20 to 60 dB and back to zero while listening for scratches, abrupt changes in loudness of tone, or for other extraneous signals.
 - c. Check appropriate spaces on the form as each phone is checked and note any abnormal conditions in the "Remarks" section.
3. To check the wires leading to the earphones:
 - a. While wearing the earphones and with the 1000 Hz tone on at 40 dB, shake the wire to each earphone gently and listen for scratches, interruption of the tone, or any other abnormality.
 - b. If the tone is interrupted or changes loudness, tighten the set screws holding the earphone cord in the earphone. If this action does not correct the fault, replace the audiometer.
 - c. It may be necessary to replace an earphone cord from time to time. This can be done by loosening the set screws in the earphone, unplugging the

- old earphone cord, plugging in the new cord, and finally tightening up the set screws.
4. The attenuator and frequency dials may slip on the shaft. If this happens, report it under "Remarks" and replace the audiometer.
 5. Send any defective unit to EAR-CO for service. If neither audiometer works properly, contact Mr. Kenneth Stewart for instruction.

Equipment Care

The only care the Revox recorder and language master equipment needs on a regular basis is to keep the tape path clean. This is very important because the machine will perform its best only if all parts of the tape path are clean. A soft cotton or linen cloth is most suitable for cleaning. If necessary the cloth may be moistened with a little alcohol. Hard instruments must not be used for cleaning the tape path under any circumstances. The heads should be cleaned carefully. The capstan and pressure roller should be cleaned with a dry cloth. The recorder must never be oiled. At the beginning of the stand the Revox recorder and language master must be degaussed.

1. Procedure for Degaussing.
 - a. Remove all recorded material from room so as not to destroy or damage the recordings.
 - b. Hold the degausser 3 ft away from the head while energizing it.
 - c. Slowly move the degausser towards the heads. Move the tip around the head, capstan, and other metal parts in the tape path.
 - d. Slowly move the degausser away from the machine until it is 3 ft away. At this point, deenergize.
 - e. WARNING. Do not leave the degausser energized for more than 4 minutes. Otherwise it will overheat and self destruct.
 - f. The degausser doesn't need to touch the head to degauss it. It just has to be close to it.

Field Calibration

1. General
 - a. Field calibration of both audiometers will be performed at the start of each stand, weekly during the examination period, and at the end of each stand.
 - b. The field calibration report forms give the expected reading at each frequency and the tolerance limits allowed around that reading. The expected readings were determined for each set of field calibration equipment at EAR-CO's laboratory. If a microphone requires replacement, the calibration equipment is to go back to EAR-CO for a determination of new expected readings for the new microphone.
 - c. Reports on these field calibrations are to be made in duplicate. One copy is to be mailed that day to Miss Jean Roberts and the other to EAR-CO.
 - d. If the calibration shows a unit to exceed the specified limits, an independent calibration is to be made by another technician. If both technicians then agree that the audiometer is in calibration, the unit will

be considered satisfactory for use. If the difficulty cannot be resolved, the unit is to be sent to EAR-CO for service.

2. Pure Tone Calibration

a. To prepare the sound level meter for use:

- (1) Screw the artificial ear coupler onto the meter case.
- (2) Unscrew the top half of the coupler.
- (3) Screw the microphone cartridge (1" diameter) with protective grid onto the bottom half of the coupler.
- (4) Turn the black knob above the meter to position the number 90 opposite the marker on the meter case. Turn the clear knob to place the red circle over the number 90.
- (5) Set the function selector to A-Slow.
- (6) Remove the ½" adaptor from the acoustic calibrator and set the calibrator firmly over the microphone.
- (7) Press the tone actuator (on side of calibrator) once and release.
- (8) The sound level meter should read 94 dB on the A scale. If not, use a screw driver (supplied with meter) to turn the adjustment screw to produce the desired reading. (If the tone has disappeared, press actuator again to bring the tone back on.) The sound level meter is now in calibration.

b. To mount the earphone:

- (1) Remove the protective grid from the microphone cartridge and screw the adaptor ring onto the cartridge. Take great care not to touch the microphone diaphragm.
- (2) Screw the top of the coupler back on and remove the capillary pin contained therein.
- (3) Set the earphone to be tested over the cavity of the coupler, making sure that the earphone rests squarely on the coupler.
- (4) Place the 500 gram weight on top of the earphone and reinsert the capillary pin.

c. Calibration procedure:

- (1) Turn the black knob on the sound level meter until the number 70 on the dial is opposite the marker on the meter case and keep the red circle over 70.
- (2) Set the audiometer to a frequency of 500 Hz and 70 dB hearing level.
- (3) Turn the tone switch to "on."
- (4) Select the earphone under test.
- (5) Record the sound level meter reading (A-scale) on the report form.

Example: The meter reading is determined as follows:

Red Circle over	70
Meter needle at	<u>6.5</u>
Meter reading is	76.5 dB

Since the expected reading at this frequency is 76.8 dB with a tolerance of ± 4 dB, the audiometer is within calibration at this frequency.

- (6) Continue testing at the other three frequencies indicated in the

report form. In each case the report form provides the appropriate settings for the sound level meter.

(7) To test the other earphone:

Remove the weight and lift the earphone already tested off the coupler. Remove the capillary pin. Place the other phone and weight back on and reinsert capillary pin. Repeat steps (2) through (6).

3. Masking noise calibration

- a. Set up the field calibration equipment as before.
- b. Set function selector on the B & K meter to "C-Slow" position.
- c. Turn the audiometer *channel II* tone switch to "on" to bring tone indicator light on. Turn the *channel I* tone switch "off."
- d. Turn the *Freq. and Input* dial to "N. B. Noise" and *channel I* frequency selector to 500 Hz.
- e. Set the masking level knob at 60 dB as indicated on the form.
- f. Select the earphone under test.
- g. Set the black knob and red circle on the sound level meter at 80 and obtain the reading.

Example: The actual masking signal level at the selected range of frequencies is determined as follows:

Red circle over	80
Meter needle at	<u>2.4</u>

Masking signal level is 82.4 dB

Since the expected reading is 81.7 dB with a tolerance of ± 4 dB, the level of the masking noise is within the specifications in this frequency range.

- h. Repeat the procedure with the channel I frequency selector at other frequencies and other attenuator settings indicated on the form.

Environmental Noise Survey

A noise survey is to be done during the setup day before the start of each stand of examination. One copy of the completed form should be sent immediately to Miss Roberts and one to EAR-CO. Adhere to the following procedures.

1. Screw the 1" microphone (with protective grid in place) directly onto the connector on the B and K sound level meter.
2. Check the battery condition and calibration per previous instructions.
3. Set the selector knob to "Ext. Filt. Slow" position.
4. Set *weighting* switch on the octave filter set to "off."
5. Close both doors to the audiometer room.
6. Turn off all hearing test equipment.
7. Set the black knob to 70.
8. Rotate the *frequency* knob to 31.5
9. Adjust the red circle knob to obtain a meter reading which is somewhat above 0 dB on the meter scale. Read the red circle number and add to it the meter reading.

Example:

Red circle on	60 db
Meter reading	<u>4 db</u>
Environmental noise level	64 db at 31.5 Hz

10. Record the reading on the appropriate form.
NOTE: The meter reading will fluctuate considerably. Try to estimate an average reading after having observed the meter for a moment.
11. Turn the *frequency* knob to 63.
12. Turn the red circle knob to obtain a meter reading as in instruction 9.
13. Proceed through each octave band 125 Hz . . . 8,000 Hz.
14. Under "Comments" explain circumstances, if possible, where the environmental noise levels exceed ANSI allowable levels.

Audiometric Testing Procedures

1. General

At the beginning of each examination session turn on the audiometer at least 10 minutes before performing the daily field check. At the completion of testing, perform a second field check. Both doors to the audiometric room should be closed while testing.

a. Recording

Use the left side of form first when the sample number is even and the right side first when the sample number is odd. Enter the beginning time, audiometer number, and technician number on control record. Indicate which ear will be tested first by circling right ear or left ear on the form. This will check for any bias.

b. Audiometric testing

Perform air condition tests for both ears in the sequence indicated on the recording form. If any part of the test cannot be completed, enter "X" in the appropriate space and indicate the reason under "Condition Affecting Test Results." If other than physical conditions of the examinee have affected any of the audiometric results, explain in the space provided at the right of this section. If any thresholds of 30 dB or greater are obtained, be sure to question the examinee about physical conditions which might contribute to the results and check the appropriate box or boxes under "Condition Affecting Test Results." For a 15 to 19 year old with a 40 dB or greater threshold at 4000 Hz in one or both ears, ask if he has listened to a large amount of amplified music. Please note under number 8 "Other." If the examinee does not respond to 100 dB at any test frequency, record "100+" in the appropriate space.

c. Instructions to examinee

Detailed instructions should be given the examinee to stress the following points: • Once the earphones are placed by the technician, they must not be touched by the examinee. The technician should ask if they are comfortable and readjust if necessary. • Tell the examinee that he will hear tones that are high and low and will become softer and softer until he will have difficulty hearing them. When he hears the tones, he should depress the response button and release it when the tone is no longer heard. Remind him to concentrate very hard when the tones are soft. • Eyeglasses, earrings, chewing gum, wigs, and hair ornaments should be removed if they interfere with proper placement of the headset.

(1) Example of verbal instructions for 7 to 19 year olds.

- (a) We are going to see how well you hear some tones from these earphones.
 - (b) You will hear short tones that are both high and low. They will become softer and softer.
 - (c) Each time you hear a tone, please press this button (technician demonstrates with response button) and when you no longer hear the tone let the button up.
 - (d) Listen carefully when the tone starts to get softer but even if you think you hear it, press the button and I will be able to tell if you hear it.
 - (e) First you will hear the tones in your right/left ear (point) and then in your other ear.
 - (f) If the tone seems to be in this ear (point to nontest ear), please tell me.
 - (g) Remember to press the button when you hear a tone and let it up when you no longer hear it.
 - (h) Do you have any questions? (If so, clarify as necessary.)
- (2) Example of verbal instructions for 4 to 6 year olds.
- (a) (Bring the child into position to face the audiometer. With a 50 dB 1000 Hz tone in one phone, hold it to the child's ear.) We are going to see how well you can hear some tones from these earphones. Listen to this one.
 - (b) Every time I play a tone, the red light goes on. Do you see it? (Demonstrate)
 - (c) If you listen carefully and hear the tone, you can turn it off by pressing this button and making the white light go on. (Indicate by depressing response button.)
 - (d) (Hand the response button to the examinee and present tone, encouraging the child to press the response button. When he does, release the stimulus tone. Repeat the sequence at least once or until you feel that the child understands his task. Reinforce the child's performance with a positive comment.) Good. Now we will play this game while you sit in that chair. (Indicate the chair and hand the child the response button.)
 - (e) (Place the headset on child.) First you will hear the tones in this ear (indicate right or left) and then you will hear them in your other ear.
 - (f) Are you ready?
- (3) Examples of verbal instructions when masking of the better ear is required (when the difference between hearing levels of the two ears is 40 dB or greater at any frequency).
- (a) Now you will hear the tone in your right/left ear (point).
 - (b) At the same time you will hear a noise, like wind, in your other ear (point).
 - (c) The noise is to keep you from hearing the tone in that ear so don't pay any attention to it.
 - (d) I want you to listen for the tones in your right/left ear (point) and press the button whenever you hear them.
 - (e) Do you understand? (If not, clarify as necessary.)

d. Conduction of air conduction hearing test

- (1) Take the examinee into the test room and seat him opposite the examiner but facing away so that he cannot see the examiner's movements or the equipment being operated.
- (2) Close the test room doors.
- (3) Ask the examinee if he has any problems which might affect his hearing—colds, earache, etc. Record these under "Condition Affecting Test Results."
- (4) Repeat the instructions briefly.
- (5) Make sure the ears are not obstructed with cotton before placing the earphones.
- (6) Place the earphones on the examinee and make sure the earphone opening is over the ear canal and that it has a good seal against the examinee's ear. The red earphone is placed on the right ear; blue on the left. Hair should be pushed away from ears before the headset is placed.
- (7) Make sure that the audiometer is ready for the test by checking that it is set in the following manner:

Air Conduction Setup

<i>Channel I</i>	<i>Machine dials</i>	<i>Correct Setting</i>
	Channel I monitor	Off unless using
	Channel I output	Right/left
	ON/OFF toggle switch	ON
	AUTO/manual toggle switch	Manual
	Frequency	1000 Hz.
	Decibels	20 dB

Masking Setup

<i>Channel II</i>	<i>Machine dials</i>	<i>Correct setting</i>
	Channel II output	Off*
	Channel II monitor	Off unless using
	ON/OFF toggle switch	Off*
	AUTO/manual	Manual
	Frequency and Input	N.B. Noise
	Decibels	60 dB

* When masking is required, channel II output should be right/left and the on/off toggle switch is "ON."

NOTE: Dials SISI and Speech-Input have nothing to do with either Air Conduction or Masking testing.

- (8) The 1000 Hz tone is introduced to the first ear to be tested at a level of 20 dB for about 1 second. This should be well within the range of audibility for most examinees and will serve as listening practice.

If the tone is not heard at 20 dB, increase the level in 10 dB steps until he responds to it.

- (9) When the examinee responds, set the intensity dial 10 dB below the previous stimulus intensity (10 dB) and present the tone for 1 or 2 seconds.
 - (10) The procedure for decreasing the level of the tone in 10 dB steps with at least one presentation per level should be continued until no response is obtained.
 - (11) Then increase the intensity dial 5 dB and present a stimulus.
 - (12) If a response is obtained at this level, the intensity is reduced by 10 dB. If no response is obtained, increase the intensity 5 dB. Always descend 10 dB and count the number of responses at the lowest level while ascending in intensity in 5 dB steps.
 - (13) The threshold recorded is the lowest dial reading at which 50 percent or more of the responses are obtained to ascending presentations—that is, 2 out of 3 or 3 out of 5 trials. Below this level, less than 50 percent response is obtained and above this level, 100 percent response is approached.
 - (14) Enter the proper two-digit entry on the test form. Test the remaining frequencies in the order indicated on the form.
 - (15) Repeat the procedure presenting each successive frequency in the order listed on the examination form to the test ear and then shift to the other ear as indicated on the test form until the pure tone air conduction test has been completed for all frequencies in both ears.
- e. Masking procedure—(when the difference in thresholds between the two ears is 40 dB or greater at the same frequency.)
At any frequency, when the threshold of one ear is poorer than the other ear by 40 dB or more, you must retest the poorer ear using a masking noise in the better ear. When this is necessary, use a masking level of 60 dB no matter what the difference in thresholds is between the two ears. Record these results in the appropriate spaces on the audiometry form.
- f. Procedure necessary for threshold accuracy
- (1) Avoid rhythmic presentation of signals to the examinee. The examinee may respond to the rhythm rather than to the sound. This is especially true of younger persons.
 - (2) Avoid a long, drawn-out search for a threshold which tends to lessen the interest and cooperation of the person being tested and to produce fatigue. If necessary, shift to another frequency and test, then return to the problem frequency later. Note at the bottom of the form any change in the order of the test on the test form.
 - (3) Avoid giving visual or auditory cues when the tone is presented; for example looking at the person each time a tone is presented, making a click with the interrupter switch, or clicking in the intensity dial.
 - (4) Double check the dial reading.
 - (5) Check whether the interrupter switch was at “off” position.
 - (6) Avoid activity which will distract the examinee.
 - (7) Check the response of the examinee occasionally by leaving the tone off for several seconds and then presenting the tone to see if he is responding consistently.
 - (8) Avoid presentation of the test tone for longer than 3 seconds. This may lead to a false response.

- (9) Count only the ascending responses in determining the threshold.
- (10) Avoid being influenced by the threshold obtained for the first cycle tone when obtaining the threshold for the second presentation of this tone.
- (11) Make sure all forms are complete. Record the time the test is finished and the technician number on the control record. When the test is not done or incomplete, record the reason.

Field Calibration of Masking Generator

Date _____

Audiometer No. _____

Location _____

Masking Generator Calibration

Masking generator center frequency	Masking level knob	Setting for		Expected reading "C" slow	Tolerance dB	Actual reading left phone
		Black knob	Red knob			
500	60	80	80	81.7	±3	_____
1000	70	80	80	88.7	±3	_____
2000	70	90	90	94.9	±3	_____
4000	70	80	80	82.0	±3	_____

Note: Each field calibrator (C, D, and E) has the same expected readings for these masking generator signals.

Technician

ENVIRONMENTAL NOISE SURVEY (HANES)

Date _____

Location _____

Band center frequency (Hz)	ANSI Max. allowable sound pressure level (dB) for no masking at audio zero	Band level dB/0.0002u bar	
		Air conditioning OFF	Air conditioning ON
31.5	(35)	_____	_____
63	(35)	_____	_____
125	35	_____	_____
250	35	_____	_____
500	35	_____	_____
1000	35	_____	_____
2000	42	_____	_____
4000	52	_____	_____
8000	62	_____	_____

Comments: _____

Technician

Field Calibration of Earphones
For audiometer No. ___ Caravan ___

_____ Date

_____ Location

"C" Calibrator

Audiometer 70 dB at frequency	Setting for		Expected reading "A" slow	ANSI intensity tolerance	Actual reading	
	Black knob	Red circle			Right	Left
500	70	70	79.4	±3 dB		
1000	70	70	76.8	±3 dB		
2000	80	80	80.7	±3 dB		
4000	80	80	85.9	±3 dB		

"D" Calibrator

Audiometer 70 dB at frequency	Setting for		Expected reading "A" slow	ANSI intensity tolerance	Actual reading	
	Black knob	Red circle			Right	Left
500	70	70	79.4	±3 dB		
1000	70	70	76.8	±3 dB		
2000	80	80	80.7	±3 dB		
4000	80	80	85.9	±3 dB		

"E" Calibrator

Audiometer 70 dB at frequency	Setting for		Expected reading "A" slow	ANSI intensity tolerance	Actual reading	
	Black knob	Red circle			Right	Left
500	70	70	79.4	±3 dB		
1000	70	70	76.8	±3 dB		
2000	80	80	80.7	±3 dB		
4000	80	80	85.9	±3 dB		

"F" Masking Generator Calibration

Masking generator Center frequency	Masking level knob	Setting for		Expected reading "C" slow	Tolerance dB	Actual reading	
		Black knob	Red knob			Right Phone	Left Phone
500	60	80	80	81.7	±3		
1000	70	80	80	88.7	±3		
2000	70	90	90	94.9	±3		
4000	70	80	80	82.0	±3		

Note. Each field calibrator (C, D, and E) has the same expected readings for these masking generator signals.

_____ Technician

Speech Screening Examination

1. General

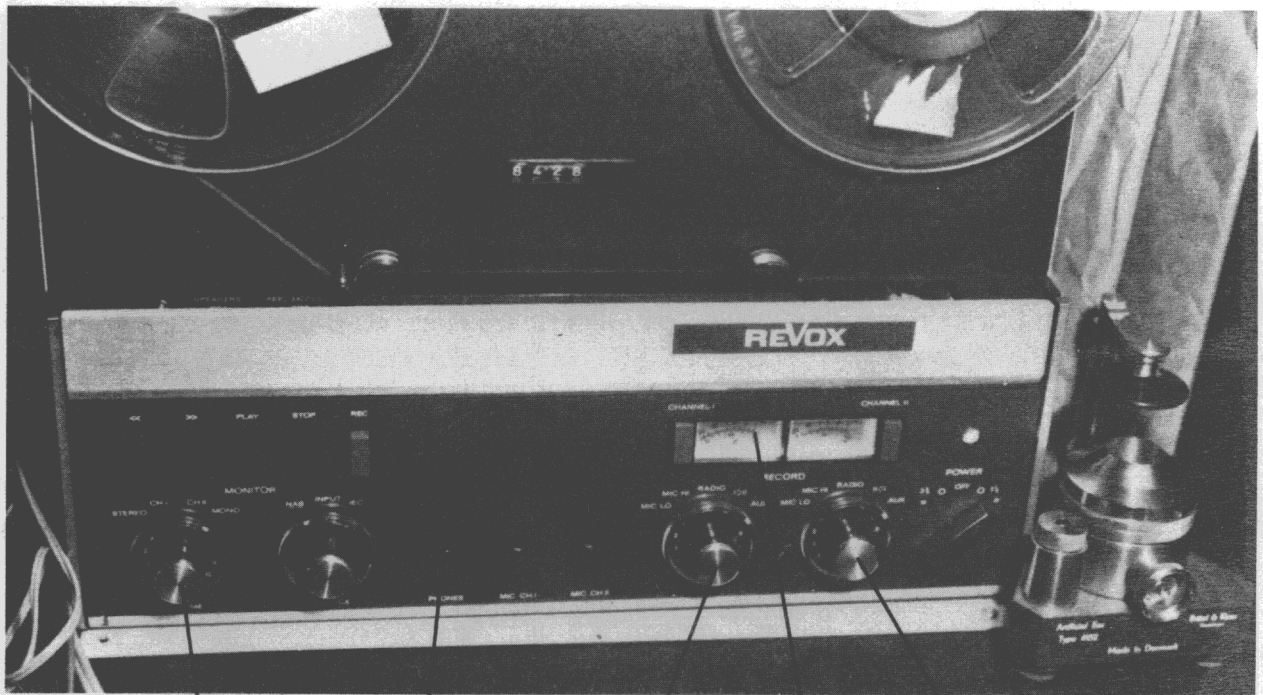
Administer the speech examination after completing the audiometry examination. Remove the headphones until the examinee is ready to listen to the 15 sentences.

a. Instructions for daily checks of the speech equipment.

- (1) Attach the 1 KHz (1000 Hz) calibrator to ½" microphone.
- (2) Turn on the B & K meter, amplifier, and Revox recorder.
- (3) Adjust the B&K meter to read 110 + 10 on the linear scale when the 1 KHz calibration source is activated.
- (4) Activate the 1 KHz calibration; adjust Revox's channel I VU meter to read 75 percent. (On the right side of the Revox under the record section, turn the first solid knob on the right until the channel I VU meter reads 75 percent.) See the diagram of the Revox recorder.
- (5) Set the second solid knob on the Revox under the record section to the seven mark. (See diagram of Revox recorder).
- (6) Turn the Beltone's channel I selector switch to Speech and turn its channel II selector switch to "Ext. input."
- (7) Pass a 1000 Hz card through the language master. Set the Revox recorder channel I VU meter to read 95 percent by adjusting the language master volume control.
- (8) Pass a 1000 Hz card through the language master and adjust the channel I gain on the Beltone so the Beltone VU meter reads zero. (The gain and VU meter channel select knobs are located under the VU meter.)
- (9) Pass a 1000 Hz card through the language master and adjust the channel II gain on the Beltone so the Beltone VU meter reads zero.
- (10) Pass all 15 cards through the language master and listen to each sentence for clarity of the words before starting the testing each day.
 - (a) Examine the magnetic tape at the bottom of the speech card for bubbles, tape pulling away from the card, and scratches on the surface of the tape. Repair the card whenever possible.
 - (b) Each caravan must have two complete sets of speech cards. One set will be in use and the second set will be stored for backup.
 - (c) When a card becomes damaged, replace the set with the backup set. Report to the biomedical engineer that a new set of cards is needed and send back the damaged set only after the new set has been received in the field.

b. Equipment setup before presenting the speech examination

- (1) Mounting and unmounting a tape
 - (a) Mount the tape on the recorder as shown on the diagram in the audio room.
 - (b) When a tape is completely used, rewind it onto the original.
 - (c) Record only seven exams on a 1200-foot tape.
 - (d) Record only 12 exams on an 1800-foot tape.
- (2) Adjust the ½" mike 8" to 12" in front of the examinee. The microphone is oriented so the examinee's breath stream is across the diaphragm. Engage the examinee in conversation while adjusting the B&K needle to



Monitor Volume
adjust

Second Solid Knob
from right

First Solid Knob
from right

channel 1 VU meter

monitor phone jack

read 4; record the B&K black dial and red circle readings on the examinee's speech form.

- (3) Turn the Beltone's channel I selector switch to "Speech" and turn the channel II selector switch to "Ext input." The speech stimulus should be presented bilaterally to the examinee at a level which is 40 dB above the air-conduction threshold. The threshold is obtained from the first test at 1 KHz (1000) in the good ear. The stimulus should not be less than +40 dB or greater than +80 dB.

Example: If the examinee's right ear threshold for the first 1KHz stimulus is +30 dB and the left ear threshold for the same stimulus is +10 dB, the examinee should be stimulated for speech at the 50 dB level.

AC threshold at first 1 KHz in good ear	Bilateral speech stimulus level
+0dB and below	+40dB
+5dB to +10dB	+50dB
+15dB to +20dB	+60dB
+25dB to +30dB	+70dB
+35dB or above	+80dB

- (4) Attach the monitor phone to the Revox (jack on front of the audiometer at the far left side. See diagram of Revox recorder.)
 - (5) Start the tape.
 - (a) Push in and hold the record button.
 - (b) Push in the play button.
 - (6) Record the following information on tape:
 - (a) Sample number
 - (b) Age by year and month (e.g., 5 years, 2 months)
 - (c) Technician number
 - (7) Stop the recorder.
- c. Instructions to the examinee
- (1) It is important that the technician give the following instructions, word by word to the examinee. "We're going to play a talking game. You say just what I say. Let's practice."
 - (a) "Hello", examinee says "Hello"
 - (b) "I'm fine, thank you," examinee says "I'm fine, thank you".
 - (c) "Is it raining?", examinee says "Is it raining?".
 - (2) If the examinee repeats each sentence appropriately, say "Good, now a lady is going to talk to you through the headphones. You say just what she says. I can't hear her so you must listen very carefully and say exactly what she is saying."
 - (3) Place the headphone on properly and check the position of the ½" mike.
 - (4) Start the recorder.
 - (5) Feed sentence card 1 through the language master as diagrammed on the front of the machine. If the examinee repeats the sentence, continue with cards 2 through 15.
 - (6) Listen on the monitor phone for stimulus and reply.
 - (7) After the examinee has attempted four sentences, acknowledge by a smile or nod that the examinee is doing fine, even if errors are made.
 - (8) After card 15, repeat the sample number and technician number.
 - (a) Remove the headphones.
 - (b) Stop the recorder and rewind the tape approximately 15 revolutions to check the examinee's responses to sentences 14 and 15.
 - (c) Let the examinee hear his/her voice through the monitor phone.
 - (d) If sentences 14 and 15 are recorded properly and the volume is audible, you are finished. If the sentences do not meet the quality control criteria, repeat the examination.
 - (e) Say, "Fine, you were a good talker."

d. Exceptions to the general procedures

- (1) If the examinee says “me, too” to “I’m fine, thank you” or answers the question “Is it raining?” say “Whoops, I caught you. Remember to say exactly what I say” and repeat the sentences. If he continues to answer the question, try “Now you ask me.” Get the question repeated before proceeding with the 15 sentences, if possible.
- (2) If within the 15 speech sentences the examinee does not respond to a particular sentence, offer it a second time, saying “Listen again.” If the examinee still does not attempt it, say “Try this next one” and present the next sentence. Give all of the sentences in sequence. Give only one second chance per sentence in the sequence of 15. If, however, the examinee is silent on selected sentences, try each once more after sentence 15.
- (3) If the examinee stops responding halfway through the sentences, go back and give the three practice sentences again. Then continue with the sentence where the examinee had stopped responding.
- (4) If you can’t get the examinee to respond at all, let the examinee observe another older child (or an adult) perform the examination.
- (5) If (4) doesn’t work engage the examinee in nonverbal imitation and lead him into verbal imitation. Example: Technician to child—“You do what I do.” Technician claps hands together at once; child should respond. (If not, take his/her hands and clap them together.) Technician taps top of head; child imitates. Technician touches nose with index finger; child imitates. Technician says “ah;” child imitates. Technician says “Hi;” child imitates. Technician says “Let’s keep talking;” and if child imitates this utterance, go right into practice items.
- (6) If the examinee seems to have the idea of imitation but stops imitating when sentences are presented through the earphones, as a last resort, present them live. Say each sentence in a natural fashion and then nod at the examinee to indicate it’s his turn to respond.
- (7) If the examinee still will not respond, perform some other examination and then bring the child back to the audiometry room and try again. If the examinee still will not respond, note 7 on “Conditions affecting the test” and explain.

Speech Screening Examination Sentences

The speech screening sentences printed on the examination form, HRA-12-4, are incorrect. The correct sentences are listed below.

1. Robert found a shiny penny.
2. He wants to wash himself.
3. Someone burned a hole in the rug.
4. Why didn’t they tell another story?
5. She put the cover on the jar very tightly.
6. There’s no reason for fighting with him.
7. Is Ralph playing a different game?
8. After Jack fixed my bike I rode around a lot.
9. My aunt who fell can’t walk.
10. Let him go to the store because we need some milk.

11. Where will they sing for the children?
12. If you eat too much candy, you'll be sick.
13. We thought the baby could say thank you.
14. Joe must have bought three oranges.
15. It's not for me but I would like to look at it.

Chapter 16

QUESTIONNAIRES

General

The Health History Supplement and Behavior Questionnaire are usually administered by a health technician or temporary employee at the time the allergy testing is done.

Health History Supplement (Ages 12—74 Years)

1. Procedure

The interviewer should check to see that the identifying information has been filled in completely and accurately (examinee name, sample number, sex and age). The sex and age determine in many instances whether a question or series of questions is to be asked. The interviewer's name and number are needed and used for quality control purposes. Read the instructions at the top of the form to the examinee. Check the appropriate interviewer item box based on the verified sex and/or age. Then ask each question as it is written and check the appropriate box. If the examinee doesn't understand a question, reread the question in order to obtain the best possible answer for each of the answer categories. It is important that the skip patterns be followed.

2. Guidelines for Specific Items

a. Questions 1f, 11c., and f.

You are trying to get from the respondent what the doctor said a problem was. You should probe for clear and concise answers which can be coded easily if this is not what you get as a first answer.

b. Question 1j. (code 126), 2h. (code 152), 11b. and e. (codes 278 and 294), and 21a. (code 380):

These questions are asking for specifics that don't fit the answer categories. These answers should be clear and concise and the appropriate answer box should be marked.

c. Question 2c.

The information needed here is the month and year of the attack not the number of months and years that have lapsed since the last attack.

d. Questions 4r. and 27c. and e.

Age is the required information not the number of years since the disc or urinary problem.

e. Questions 6b. and c.

You only need to ask 6b for those items in 6a for which the response was "yes," and 6c for those items for which the answer was "yes" in 6b.

f. Questions 9b., c., d., e

Try hard to get the examinee to give an estimated number of days. Don't accept "don't know" unless absolutely necessary.

- g. Questions 13b. and c., questions 14c and d; questions 15c and d
Ask questions 13c, 14d., and 15d. for those joints for which you get a "yes" answer in 13b., 14c., and 15c., respectively.
- h. Question 16b.
You need the length of time the examinee worked at a particular job in months if he worked less than a year or in years if he worked more than 11 months.
- i. Questions 22c., e. and f.
Try to get the approximate number of cigarettes per day from the examinee if he doesn't know exactly.
- j. Question 22d.
The information desired here is the number of years since he smoked fairly regularly not the age he was when he stopped smoking regularly.
- k. Questions 22g, 27c., and e.
Here the age of the person at the time of the event is the correct information.
- l. Question 30c.
You are trying to determine how long the person has had this disability or handicap in months or years, but not both.
- m. Questions 31a. and c.
Age in years is the desired answer for both these questions. Frequently the respondent answers in years ago. If this happens convert the answers to age in years.
- n. Question 33c.
Count stillbirths and abortions as miscarriages.

Behavior Questionnaire (Ages 25—74)

1. Procedure

Fill in the sample number, age, and sex of the examinee at the top of the questionnaire. The form is to be self-administered by the examinee. Instruct the examinee to check the appropriate response to each of the questions; tell him that if he makes an error to circle the incorrect response and check the correct one. Instruct the examinee that if some questions do not seem to apply to his life situation to request further instructions or clarifications.

2. Guidelines for specific items

a. Question 11

The answer categories for this question were printed incorrectly. They should have been printed as follows:

- 1 Tell the next interrupter in a firm way *not to interrupt you?*
- 2 Tell the next interrupter in a quiet way *not to interrupt you?*
- 3 Lock *or close* your door?
- 4 Move to a quiet place?

If the examinee asks for clarification of the answer categories, read him the correct list of answers.

b. Question 12

Category 5 "never" should read "*never let them win.*" If the examinee feels the question does not apply have him write "not applicable" or "N.A." to the right of the response categories.

c. Questions 13, 14, and 15

Have the examinee write "not applicable" or "N.A." to the right of the response categories if he feels the question does not apply to his life situation.

d. Question 16

Have the examinee write "not applicable" or "N.A." to the right of the response categories if he does not have deadlines.

e. Question 17

Have the examinee write "not applicable" or "N.A." to the right of the response categories if he is not working.

f. Question 18

Have the examinee write "not applicable" or "N.A." if he has not been employed regularly.

REPRINTED 1980
September 1976