THE HEALTH INSURANCE STUDY
SCREENING EXAMINATION
PROCEDURES MANUAL

PREPARED UNDER A GRANT FROM THE U.S. DEPARTMENT
OF HEALTH, EDUCATION, AND WELFARE

LISA HAHN SMITH, GEORGE A. GOLDBERG,
ROBERT H. BROOK, LAURA TOSI,
RAE W. ARCHIBALD

R-2101-HEW
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Rand
SANTA MONICA, CA 90406
PREFACE

The Health Insurance Study (HIS), funded by a grant from the U.S. Department of Health, Education, and Welfare, is a social experiment investigating the effects of different health care financing arrangements (differing coinsurance rates and deductibles, and fee-for-service practice versus prepaid group practice) on the use of medical services, individual health status, satisfaction with care, and quality of care. Approximately 2750 families (8000 people) are enrolled in the experiment. Seventy percent of the families will participate in the experiment for three years; the remaining thirty percent will participate for five years. Participants were selected from six sites: Dayton, Ohio; Seattle, Washington; Fitchburg, Massachusetts; Franklin County, Massachusetts; Charleston, South Carolina; and Georgetown County, South Carolina.

The health status of HIS participants was assessed at the time of enrollment, annually during the enrollment period, and on exit from the study. Measures used to assess the physical, mental, and social health of individuals are discussed in the Rand report series titled Conceptualization and Measurement of Health for Adults in the Health Insurance Study--Dayton (R-1987-HEW).

Data on physiologic health—the condition of each organ system (e.g., cardiovascular, respiratory) of the body—are acquired by the Health Insurance Study in the Medical History Questionnaire and the medical screening examination at the time of enrollment from a random sample of participants, and at the time of exit from all participants. Measurement of physiologic health will be discussed in a forthcoming report on conceptualization and measurement of physiologic health in the Health Insurance Study.

Because the major reason for the medical screening examination was to measure the level of functioning at the organ (as opposed to organism) level, the utility of such measures to the HIS is outlined briefly below. The forthcoming report will contain additional information, including the actual data collected on the level of organ functioning at the time of enrollment.
The purposes of organ-specific measures of health status are:

1. To help evaluate the effect of an insurance plan on health status
   - By measuring various conditions that are amenable to intervention by the medical care system (e.g., blood pressure, visual abnormalities)
   - By confirming objectively the existence of conditions reported by the participant that are amenable to intervention by the medical care system (e.g., chronic lung disease, acne)

2. To help evaluate the effect of an insurance plan on the quality of care by providing information about the outcome of care for specified diseases
   - By determining whether therapeutic intervention was initiated where appropriate (e.g., high blood pressure, dental decay), whether observation was performed where indicated (e.g., old tuberculosis on x-ray), and whether further investigations were performed where needed (e.g., abnormal result on the Denver Developmental Screening Test in Children)
   - By determining objectively whether those disease processes that can be controlled were under control at the time of exit from the HIS (e.g., blood pressure normal, fluid removed from the middle ear)

3. To help evaluate the effect of an insurance plan on alteration of risk factors and health habits that may lead to better future health status
   - By determining whether abnormal risk factors were observed closely (e.g., presence of premature ventricular contractions on electrocardiogram), investigated suitably (e.g., abnormal glucose level), or treated appropriately (e.g., cigarette smoking with decreased pulmonary function receiving educational intervention, high blood pressure receiving drug intervention)
4. To help evaluate the effect of an health insurance plan on use of services during participation in the HIS
   - By screening for the existence of conditions expected to be associated with increased use in the future (e.g., alcoholism, previous heart attack)
   - By screening for the presence of abnormalities amenable to surgical intervention (e.g., enlarged tonsils).

This technical report describes the procedures used at all the enrollment examinations and the first Dayton exit screening examination. Overall HIS research objectives are discussed in Joseph Newhouse, The Health Insurance Study: A Summary, The Rand Corporation, R-965-1-OEO, March 1974.
ACKNOWLEDGMENTS

The authors would like to acknowledge Dr. Thomas M. Vogt of the University of California at Los Angeles for his review of a preliminary draft of this report. The authors would also like to acknowledge Dr. Vladimir W. Spolsky of the University of California at Los Angeles for his many contributions to the dental section of this report.

A word of special thanks is due Allyson Davies-Avery for her editorial contributions.

In addition, the authors would like to thank Ruthlouise Acar and Joseph Freitas for their superb work in translating numerous drafts of the procedures and tables into the final copy.
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I. INTRODUCTION

The subject of this report is the Health Insurance Study (HIS) medical screening examination, a method used to collect data on body organ systems. The screening examination was administered to HIS participants, along with the HIS Medical History Questionnaire (MHQ), at enrollment in and exit from the study. During enrollment, all participants were asked to complete medical history questionnaires; a stratified random sample was asked to take the screening examination. The enrollment screening examination was limited to this group to measure the effect of the screening examination on subsequent use of services. At exit from the study, all participants will be asked to complete both the MHQ and the screening examination.

Participants were given both verbal and written information about the screening examination when appointments were assigned at the time of enrollment. (A copy of the examination brochure is included in Appendix A.) This information gave instructions that participants 14 years of age or older should fast two hours prior to screening, and that all lenses for vision, hearing aids, and medications used by any member of the family should be brought to the screening center.

The screening center consisted of seven testing stations and reception and waiting areas. The screening examination was carried out by trained paramedical personnel (except the dental examination, which was generally performed by a dentist) who gathered data by administering the various tests described in this report. Participants were required to remain at the screening center for about two hours, which allowed them to complete both the screening examination and the MHQ.

This report, in describing the procedures followed during the screening examination, serves two purposes: (1) to document the decisions made in the Health Insurance Study regarding the tools and techniques used to conduct each of the tests; and (2) to give people (such as health administrators) who may want to replicate all or part of this screening examination some idea of the rationale behind the measurement decisions made when the screening examination was designed.
The next two sections of this report discuss criteria for screening test selection and administrative and operational details of the HLS screening examination. The final section, the major portion of this report, contains technical descriptions of screening examination test procedures. Six appendixes contain additional documentation.
II. DESIGN OF THE HIS MEDICAL SCREENING EXAMINATION

The data collected during the medical screening examination are used as a measure of physiologic health; they indicate whether certain body organ systems are functioning at a level expected for the individual. Multiphasic screening was selected as the method for collecting data on physiologic health because it allows testing methods to be standardized. It uses nonphysician personnel who administer, in a carefully specified manner, a series of tests.

The usual purpose of multiphasic screening is to detect evidence of disease in people who are asymptomatic, that is, people who exhibit no apparent symptoms of the diseases being sought. Furthermore, this type of screening is generally performed with the assumption that follow-up testing will be used to confirm (or discount) positive results. Given this assumption, the typical screening program can use tests that are not highly specific, that is, tests that have a substantial number of false positive results, because further testing will identify the false positives. Because the general purpose of screening is detection, high sensitivity is the primary consideration, i.e., when the test is given to a person who does have the disease, the result should be positive (Feinstein, 1975).

The purpose of the Health Insurance Study medical screening examination differs from that of screening programs in general; its primary purpose is to assess physiologic health on the basis of data that would not be recollected or supplemented with further testing. For that reason, both specificity and sensitivity were considered when tests were selected for the screening examination.

This section of the report discusses what was involved in the selection and exclusion of screening tests. To facilitate the discussion, Table 1 summarizes the diseases or conditions to be identified by the screening examination, the technique used in the examination, the population screened for each test, and the NHQ questions that pertain to each disease or condition.
## Table 1
### Physiologic Health Diseases/Conditions: An Outline of Their Measurement Strategy

| Disease Condition | Screening Test | Population to Screen | Notes: Measure Questionnaire
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<tr>
<td>Acne</td>
<td>Partial Skin Photograph</td>
<td>All persons &gt; 31 years of age who either claim to have acne, or appear to have acne</td>
<td>Trouble with pimples? Doctor said he had acne? Doctor prescribed medicine? Doctor prescribed light therapy? Doctor prescribed facial mask? Doctor prescribed special diet? Doctor prescribed popping pimples? Doctor prescribed medications? Currently using acne? Currently using over-the-counter medications? Currently using special soap? Currently taking acne medications?</td>
</tr>
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<td>Alcoholism and Liver Disease</td>
<td>Blood Alcohol Level: Total Billirubin: ALT/AST</td>
<td>All persons &gt; 16 years of age</td>
<td>Ever had at least one drink? During last 12 months, how many? How often did you drink? Quantity Index (total quantity of alcohol consumed in a typical drinking day) Quantity-freqency index (average quantity of alcohol consumed in one day) Doctor said cirrhosis of the liver? Doctor said you were diagnosed with alcoholism? Doctor believed you had alcoholism? Doctor ever said you are a problem drinker? Do you currently have any of these to cut down on: Alcoholism, Anorexia, Chemical dependency, Sexual dysfunction, Marital problems, Psychosis, Psychiatric? Been in accident due to drinking?</td>
</tr>
<tr>
<td>Anemia</td>
<td>Hematocrit Hemoglobin Mean Corpuscular Volume</td>
<td>All persons &lt; 6 months of age</td>
<td>Doctor said you currently have anemia and you are under treatment? Ever sick or weak as a child? Currently taking treatment for anemia? Last time you saw a doctor for anemia?</td>
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<tr>
<td>Cardiovascular Disease</td>
<td>1. Electrocardiogram</td>
<td>All persons &gt; 35 years of age (except persons who are age 45 years or over) and persons &lt; 35 years of age answering positively to questions regarding the presence of heart or lung disease, or if blood pressure reading is &gt; 140/90, or if there is a history of hypertension</td>
<td>1. Have you had pain, discomfort, weakness, or pressure in your chest in past 12 months? Ever chest pain when walking, running, or bending? Ever chest pain when walking or running? Ever chest pain when walking at ordinary pace or on level ground? Ever chest pain when climbing stairs? Ever chest pain when sitting? Ever chest pain when eating? Ever chest pain when walking? Location of chest pain: Above middle chest, middle chest, or below chest, right chest, left chest, somewhere else? Has a doctor ever said you had a heart attack? Is chest pain described as shortness of breath, fatigue? Have you ever complained of shortness of breath, fatigue? Shortness of breath, numer of times? Ask doctor after using x-ray? Do you have any of the following symptoms: Shortness of breath, coughing, wheezing, chest pain?</td>
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| Abnormal Child Growth and Development | 1) a. Head Circumference  
b. Length  
c. Height  
d. Weight  
2) Develop Developmental Screening Examination | 1) a. Children ≤ 2 years of age  
b. Children ≤ 2 years of age  
c. Children ≤ 2 years of age  
d. ≥ 3 months up to < 5 years  
2) ≤ 3 months up to < 3 years | 1) What weight at birth?  
How tall now?  
What weight now?  
2) Born prematurely?  
Age first rolled over?  
Age first sat up?  
Age first walked?  
Age spoke first word?  
Parent satisfied with child's development? |
| Dental Disorders | 1) a. Decay-and-Missing-Filled Index  
b. Cross Decay Index  
c. Simplified Oral Hygiene Index  
2) Periodontal Index | 1) a. All persons 3 years or older  
b. All persons 3 years or older  
c. All persons 3 years or older  
2) Persons 10 years or older | Have any natural teeth?  
Dentist said you have gum problems?  
Dentist said gum problems cause early tooth loss?  
Dental Health staff (questions asked verbally during screening examination) |
| Diabetes | 2-hour Post-load Glucose<sup>b</sup> | All persons ≥ 4 years of age except diabetics taking insulin or oral agents<sup>b</sup> | Think you have diabetes or prediabetes?  
Doctor of nurse say had diabetes or prediabetes?  
Take insulin?  
Take medicine for diabetes by mouth?  
Has a doctor or nurse told you to check urine for sugar? |
| Drug Usage | Urine Drug Screen | All persons ≥ 14 years of age | Doctor prescribed sleeping pills?  
Currently using sleeping pills?  
Doctor prescribed tranquilizers, sedatives?  
Currently using tranquilizers, sedatives? |
| Glaucoma | Tonometry | All persons ≥ 40 years of age | In the past 5 years, have you had your eyes checked for glaucoma?  
Doctor said have glaucoma?  
Last time saw a doctor for glaucoma?  
Doctor prescribed medicine for glaucoma?  
Currently taking eye drops for glaucoma?  
Currently taking pills for glaucoma? |
| Syphilis and Gonorrhea | None | —— | Syphilis  
Dentist ever said have syphilis?  
Drug prescribed or injections for syphilis?  
Gonorrhea, clap, VD  
Had gonorrhea, clap, VD in past year? |
| Hay Fever | None | —— | Ever had hay fever?  
Last time you saw a doctor for hay fever?  
Get shots to help prevent hay fever?  
Doctor prescribed any medicine to help prevent symptoms of hay fever?  
Actually take medicine for hay fever? |
| Hearing Disorders | 1) Pure Tone Threshold Audiology  
2) Tympanometry | 1) All persons ≥ 4 years of age  
2) All persons ≥ 4 years of age except those who have had ear surgery in the past 5 months | Describe hearing in the left ear.  
Describe hearing in the right ear.  
Do you wear a hearing aid?  
Trouble hearing without a hearing aid? |

<sup>a</sup>Persons ≥ 12 years of age or older on exit screening examination.
<sup>b</sup>No glucose load administered on exit screening examination: usual glucose level measured instead.
<sup>c</sup>All persons ≥ 14 years of age on exit screening examination.
<sup>d</sup>Tympanometry on ages 4 through 13 on exit screening examination.
Table 1—Continued

<table>
<thead>
<tr>
<th>Disease Condition</th>
<th>Screening Test</th>
<th>Population screened</th>
<th>Medical History Questions/Examination Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemorrhoids</td>
<td>None</td>
<td>Yes</td>
<td>Had hemorrhoids in the past? Have you seen a doctor for hemorrhoids? Doctor prescribed pelvic suppositories for hemorrhoids? Doctor prescribed potassium for hemorrhoids? Takes rectal suppositories for hemorrhoids? Uses sitz baths for hemorrhoids?</td>
</tr>
<tr>
<td>Hemiz</td>
<td>None</td>
<td>Yes</td>
<td>Had hemiz in past 12 months? Ever had operation for hemiz? Last time saw doctor for hemiz? Scheduled for operation for hemiz?</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Systolic Blood Pressure—repeat S.P. if first reading ≥ 140/90 Scheduling S.P. if screening on antihypertensive medications</td>
<td>All persons 14 years of age</td>
<td>Ever told by doctor had high blood pressure? Ever told blood pressure high more than once? Doctor prescribed medication for high blood pressure? Currently taking medication for high blood pressure? Blood pressure currently high or normal?</td>
</tr>
<tr>
<td>Joint Problems (Osteoarthritis, Rheumatoid Arthritis)</td>
<td>1) Gait/Posture 2) Grip Strength 3) Joint Size 4) Rheumatoid Factor 5) Hand/Wrist X-ray</td>
<td>2) Persons ≥ 14 years of age claiming to have pain or swelling in their joints 3) Persons ≥ 14 years of age claiming to have pain in hands and/or wrists</td>
<td>Pain, aching, swelling, stiffness in joints? Pain, aching on most days for one month? Swelling and pain for one month when touched? Stiffness for one month on getting up in morning? Stiffness lasting for at least 15 minutes on getting up? Doctor said rheumatism, arthritis? Last time saw doctor? Arthritis taken for joint problems? Can you perform activities of daily living (ADLs)? Number of aspirin taken for joint problems?</td>
</tr>
<tr>
<td>Gout</td>
<td>Urine Acid</td>
<td>All persons ≥ 14 years of age</td>
<td>Doctor said gout? Currently taking medication for gout, high uric acid?</td>
</tr>
<tr>
<td>Kidney Disease</td>
<td>1) Blood/creatinine 2) Albumin Blood and Protein 3) Microscopic Vitaminuria 4) Urine Culture</td>
<td>2) Females ≥ 14 years 3) Females ≥ 14 years 4) Females ≥ 14 years</td>
<td>Doctor ever had kidney disease? Ever had kidney, bladder, urine infection? Frequency of infection? Currently have kidney, bladder, urine infection? Currently taking medication? Last time saw doctor for kidney, bladder, urine infection?</td>
</tr>
<tr>
<td>Lead Poisoning</td>
<td>Blood Lead Level</td>
<td>Persons 1 to 5 years of age</td>
<td>None</td>
</tr>
<tr>
<td>Missing Limbs</td>
<td>Observation for missing limbs (wrist only)</td>
<td>All persons</td>
<td>Do you have any missing limbs?</td>
</tr>
<tr>
<td>Obesity</td>
<td>Height, Weight, Computation of Body Mass Index</td>
<td>All persons ≥ 7 years of age</td>
<td>Overnight, based on respondent’s report. On diet? Follow diet? Special measures to lose weight?</td>
</tr>
</tbody>
</table>

*No hand-writer x-ray on exit screening examination.

*Females ≥ 4 years old (no males) on exit screening examination.

*Observation in Eastern questions in WHO for other sites.
### Table 1—Continued

| Disease Category | Screening Test | Population Screened | Medical History Questionnaire
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis</td>
<td>Chest X-ray</td>
<td>All persons ≥ 25 years of age (except pregnant women), and person answering positively to tuberculosis questions</td>
<td>Doctor ever said had tuberculosis? Ever take prescribed medicine for TB? Last time you saw doctor for TB?</td>
</tr>
<tr>
<td>Smoking</td>
<td>None</td>
<td>----</td>
<td>Do you smoke cigarettes or pipe? Do you smoke cigarettes? How many years smoking? How much smoking? Doctor ever said to stop or cut down smoking? Have you ever smoked cigarette regularly? How many years? How many packs smoked daily?</td>
</tr>
<tr>
<td>Physical Diseases</td>
<td>1) Serum Thyroid (T&lt;sub&gt;4&lt;/sub&gt;) 2) T&lt;sub&gt;3&lt;/sub&gt; Uptake T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>1) All persons ≥ 14 years of age 2) Pregnant women, women taking birth control pills, and persons taking thyroid medications</td>
<td>Doctor ever said had goiter or thyroid trouble? Doctor prescribed medicine for thyroid trouble? Doctor prescribed surgery for thyroid trouble? Doctor prescribed radiation for thyroid trouble? Current: taking medication for thyroid trouble? Last time you saw a Doctor for thyroid or goiter?</td>
</tr>
<tr>
<td>Tumoral Diseases</td>
<td>Tumor Examination</td>
<td>Persons ≤ 19 years of age</td>
<td>Had tonsils removed?</td>
</tr>
<tr>
<td>Ulcer, Stomach Pain</td>
<td>Serum Peptic Enzyme&lt;sup&gt;1&lt;/sup&gt; Blood Type&lt;sup&gt;1&lt;/sup&gt; Hb&lt;sub&gt;A&lt;/sub&gt; for Decreased Status&lt;sup&gt;1&lt;/sup&gt; Frex Peptic Enzyme&lt;sup&gt;2&lt;/sup&gt;</td>
<td>All persons ≥ 14 years of age</td>
<td>Trouble with stomach pains, echo? Had pain three days in one week? How much after eating or attacks after? Believed by taking milk or food? Doctor said ulcer in stomach or duodenum? Ulcer confirmed? Currently taking medication at least once a day?</td>
</tr>
</tbody>
</table>

<sup>1</sup>in cooperation with Centers for Disease Control and Evaluation (CDC), UCLA, Los Angeles, California.
<table>
<thead>
<tr>
<th>Disease Condition</th>
<th>Screening Test</th>
<th>Population Served</th>
<th>Medical History Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicose veins</td>
<td>Varicose Vein Examination</td>
<td>All women &gt; 30 years of age, and men &gt; 50 who report having or having had varicose veins</td>
<td>Ever had surgery for varicose veins? Varicose veins in last year? Avoid wearing stockings in last year? Doctor said keep feet up during day? Doctor said wear support stockings? Currently wear support stockings? Doctor recommend surgery for varicose veins?</td>
</tr>
</tbody>
</table>
| Visual Disorders   | Patient Vision
  - Eye Vision
  - Pinhole Acuity
  - Correction
  - Mobility
  - Binocular Stereoscopic Test | All enrollees > 1 year of age | Ever had overnight tested by doctor? Last time eyes tested? Eye test needed for work, school, camp, insurance? Doctor prescribed glasses or contact lenses? Problem with seeing near? Wear glasses or contact lenses? Wear them for reading or close work? Without glasses, can you read newspapers? Problem with seeing far? Wear glasses or contact lenses? Wear them for seeing at a distance? Without glasses, can you recognize a friend across the street? |
| Stereopia          | Serum antibody | Enrollees 1 to 10 years of age | Received certain shots or immunizations? |

1 With and without glasses.
2 No mobility on unit screening examination.
3 Unit screening examination only.
SELECTION OF HIS TESTS

The selection of HIS screening examination tests was based on considerations of validity, sensitivity, specificity, standardization, reliability, logistics of performance, acceptability to participants, acceptability to the medical community, and cost.

Validity

For HIS screening examination tests, validity is defined as the ability of a test to indicate accurately the presence of a disease or condition. Three aspects of validity were considered: sensitivity, specificity, and predictive ability. Sensitivity is the ability of a test to detect the presence of disease when it is in fact present; specificity is the ability of a test to indicate the absence of the disease when in fact the person is disease-free; and predictive ability indicates either the percentage of people with a positive test who have the disease or the percentage of people with a negative test who do not have the disease. Consider the following matrix:

<table>
<thead>
<tr>
<th>Test Result</th>
<th>Confirmed Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>a</td>
</tr>
<tr>
<td>Negative</td>
<td>c</td>
</tr>
</tbody>
</table>

where a, b, c, and d represent the distribution of a tested population. Sensitivity equals \( a/(a + c) \) and specificity equals \( d/(b + d) \). Predictive ability equals \( a/(a + b) \) and \( d/(c + d) \). In interpreting the result of a test, the investigator somewhat arbitrarily decides when a test result will be labeled normal or abnormal. This decision simultaneously affects both the sensitivity and specificity of the test, because moving the cutoff point makes one of them better and one worse (e.g., more sensitive but less specific).

These considerations are important in the selection of tests for the screening examination, as well as in the interpretation of test results. Data on the sensitivity, specificity, and predictive ability of the screening tests used in the HIS, and the impact of these
considerations on HIS screening results, will be discussed in a forthcoming report.

Standardization

Standardization is the performance of screening tests in exactly the same manner each time the test is administered, to minimize technician variability. Standardization is more closely achieved when technicians are well-trained, the tests are simple, and instructions for the examinee are easily understood. The use of well-calibrated instruments rather than technicians to make a measurement may increase standardization. In the HIS, if instruments met these requirements, they were used to reduce technician input. For example, an automatic sphygmomanometer was used to measure blood pressure, rather than an unautomated standard mercury manometer interpreted by a technician.

Reliability

Test-retest reliability is the degree of congruence of test results obtained from the same examinee when the same measurement is performed twice separated by some length of time. Results will not be perfectly congruent for many variables such as blood pressure due to biologic variability. Test-retest reliability gives an indication of how well the test procedure is standardized. During HIS screening examinations, test-retest measurements were taken for blood pressure, spirometry, height and weight, decayed-missing-filled simplified index, oral hygiene index, periodontal index, audiometry, visual acuity, motility, tonometry, tonsil size, grip strength, 50-foot walk, joint size, and varicose vein severity. Some (e.g., height and weight) were repeated immediately for all people screened. Each person had at least one of the other tests repeated approximately one hour after its first administration. The test to be repeated was selected after all initial tests were completed; thus, the technician performing the initial tests did not know which would be repeated. Tests for repetition were selected by a nonbiased system that yielded a predetermined number of repeat tests for each examination. The result of the initial test was not available to the technician who performed the repeat, and the repeat test result was coded on a separate piece of paper.
A second type of reliability measured by the HIS concerns those tests requiring clinical interpretation, such as an x-ray. When such judgments were required, screening tests were selected that produced a "hard copy" of results that could be interpreted independently by several readers, yielding a measure of interobserver reliability. Hard-copy output from the HIS included acne skin photographs, blood pressure graphs (at some sites), chest x-rays, electrocardiograms, and hand/wrist x-rays.

In addition, the HIS collected data to determine the reliability of laboratory results. Duplicate blood samples were drawn on 5 to 10 percent of screening participants and shipped to the laboratory in different batches to evaluate the congruence between results.

**Logistics of Performance**

Each screening test had to be performable within available bounds of space and within a length of time which permitted a smooth flow of examinees and a reasonable overall time period for the examination. A test could not require a large number of technicians to carry it out, nor could it demand a level or type of technical training not available at all HIS sites.

**Acceptability to Participants**

To maximize participant cooperation with the HIS screening examination, no potentially embarrassing or painful tests were selected. For this reason, no rectal examination, screening for syphilis or gonorrhea, or Pap test was included in the examination.

**Acceptability to the Medical Community**

Screening tests were selected that would be familiar to physicians receiving the test results. Tests were scored and results were recorded in such a way as to be readily understandable. If there was some reason to doubt physician familiarity with a test, an explanation of the testing procedure was enclosed with the results. For example, because tympanometry is not routinely performed on adults, physicians were sent a short explanation of the tympanometry test and its interpretation.
Cost

Given the above criteria, tests and instruments were sought that would give the most accurate measure of physiologic health within the constraints of the project budget.

EXCLUDED TESTS

A number of tests were considered for, but not included in, the HIS screening examination. Although the rationale for saying "no" to each test is set forth in this section on a test-by-test basis, there were certain recurrent reasons for exclusion:

1. Expected low yield of abnormalities from the test.
2. Information provided equally as well or better by a test already included in the examination.
3. Logistic difficulty in carrying out the test within the constraints of the screening examination (e.g., test required too long a period of testing or too much time to perform).
4. Social sensitivity of the test, which might present a stressful situation to HIS participants being screened.
5. Questionable correlation of the test with the disease condition it was intended to detect.
6. Lack of sensitivity or specificity of a test.
7. Difficulties in interpreting a positive test result because of the limited auxiliary information available in a screening situation.
8. Uncertain clinical significance of a positive finding.
9. Inability to guarantee acceptable standardization of the measurement (a problem for tests requiring a technician's observation).

For many tests, more than one of the above reasons contributed to the decision not to include the test in the screening examination.
Excluded tests were:

1. **Remaining Blood Tests from Standard SMA-12 Battery.** Albumin, total protein, and alkaline phosphatase are commonly included in the SMA-12 battery to assess liver function, but were not included in the HIS screening examination. To detect alcoholism and alcoholic liver disease, blood alcohol determination (together with SGOT and bilirubin) was considered sufficient. Calcium and phosphorus are also commonly included in the SMA-12 battery, but we had no interest in possibly discovering a rare case of hyperparathyroidism or sarcoidosis or metastatic disease that might exist. If the calcium were low, as it may be in chronic renal failure, undoubtedly the BUN, which is measured in the screening examination, would have been abnormal.

2. **Triglyceride Blood Test.** Serum triglyceride level is positively correlated with certain types of cardiovascular diseases. Twelve to 14 hours of fasting must precede drawing a blood sample to obtain a valid triglyceride level. For this reason, the test was not included in the screening examination. The examination and MHQ did provide data on blood pressure, cholesterol, smoking, and blood sugar, all of which are additional risk factors for cardiovascular disease (Harrison, p. 1230).

3. **Serological Test for Syphilis.** Serological testing for syphilis (e.g., VDRL) poses a number of problems. It was deleted primarily because of difficulties in interpreting positive test results: the test can remain positive (sometimes permanently) even after appropriate and successful treatment of syphilis. False positive tests also occur in those who have never had a venereal disease. Thus, for either reason, an individual may be free of venereal disease and possess health status unaffected by venereal disease yet have a positive serological test for syphilis. Given the low number of new cases of syphilis in the general population compared with the number of false positives and the number of properly treated former true positives who are still positives, the current false positives are likely to outnumber the current true positives. Second, requirements for reporting positive tests to health officials might well have caused certain individuals to refuse to participate in the Study. This was a risk we were not willing to take.
4. **Test for Asymptomatic Gonorrhea in Women.** A number of studies in populations with varying demographic characteristics have shown a noteworthy incidence of cervical cultures positive for gonorrhea (*Morbidity and Mortality Weekly Report*). This test was not included for several reasons. Obtaining cervical cultures takes a proportionally inordinate amount of time in a screening examination, given the need for undressing and positioning. Such a "personal" test might well have caused a number of women to refuse to participate in the Study. Finally, routine culturing for gonorrhea in an asymptomatic woman, although perhaps well-advised in some populations, is not yet considered standard practice; judging quality of care using this criterion might be inappropriate.

5. **Cytological Examination of a Cervical (Pap) Smear.** The Pap smear to detect cancer of the uterine cervix in women is considered standard practice. Nevertheless, it was omitted because obtaining a Pap smear takes a considerable amount of time in a screening examination, given the need for undressing and positioning, and such a "personal" test might well have caused a number of women to refuse to participate in the Study. In addition, information from the claim forms filed by physicians providing care to HIS participants will provide data on which women receive a Pap smear, frequency of Pap smears, and incidence of invasive carcinoma of the cervix.

6. **Testing for Immunization.** Antibody testing—screening for previous inoculations or vaccinations—was excluded from the enrollment screening examination because conclusions could not have been drawn from knowing which immunizations had been carried out before enrollment in the HIS. Testing for immunization was included in the exit screening examination. We will pay special attention to those children who were "born into" the Health Insurance Study, or have lived a large proportion of their life during the Study, to learn whether immunization varies with generosity of health insurance. Claim forms do not provide reliable information on the incidence of immunization, because immunizations could be received in situations where a claim form might not be completed, such as in a public health clinic or at a place of employment.
7. **Test for Sickle Cell Disease or Trait.** Sickle cell disease is rare in the general population. There is no effective treatment for the disease (other than during crisis periods). In addition, any participant with sickle cell disease would be anemic and would be thus identified. Although sickle cell trait has higher prevalence, and possible implications for family planning, the condition rarely causes illness or has any clinical significance for the affected individual (Harrison, p. 1618). Furthermore, although tests given during the screening examination did vary on the basis of age and sex, we did not wish to vary tests on the basis of race. In the United States, sickle cell disease and trait are confined almost exclusively to blacks (Negro race).

8. **Test of Urine for Ketones or Bilirubin.** A number of urine "dipsticks" include tests for ketones and bilirubin. These were not included in the Health Insurance Study's data base. The presence of ketones indicates, in the overwhelming majority of instances, nothing more than that the examinee has not eaten for quite a while. Bilirubin was measured in serum, the preferred way to ascertain its level.

9. **Microurinalysis in Males.** Screening males for urinary tract disease by the level of BUN in the blood and by dipstick testing of the urine for protein and blood was considered sufficient without the addition of microurinalysis, which requires additional cost and additional preparation and transportation of urine specimens. Microurinalysis was done for females to ascertain the level of contamination by vaginal contents (as measured by the number of epithelial cells present) of special urine samples that were obtained for bacteriological culture. No such contamination is possible in males, and urine cultures were not obtained in males because of the low prevalence of male urinary tract infections.

10. **Test for Blood in the Feces.** Fecal matter (stool) can be tested to indicate the presence or absence of blood. Blood in the stool implies bleeding at some point along the gastrointestinal tract, whether from ulcer, drug irritation, hemorrhoids, growth (benign or malignant), or some other cause. Although rectal examination is one
means of obtaining a sample of stool to be checked for blood, an individual (by following careful instructions) can also obtain a proper sample without "professional" help. Stool samples, whether supplied by the individual alone or through a rectal examination, were not obtained because such a "personal" test might have caused individuals to refuse to participate in the Study. Information from participants' claim forms will enable us to know which participants had their stools checked for the presence of blood during their participation in the HIS.

11. **Skinfold Thickness.** Skinfold thickness has been included in a number of multiphasic screening examinations to determine the presence or absence of obesity. The Health Insurance Study measured height and weight to calculate a relative weight and body mass index, but did not include skinfold thickness and other measurements of body fatness for several reasons. First, body mass index, which can be computed from height and weight alone, is an accepted measure of obesity (Keys et al.), and in a general population the number of people whose muscularity will cause them to be inappropriately classified as obese is low. Second, the Health Insurance Study was not seeking information regarding nutritional status per se. Third, skinfold and similar measurements, at least until the present, have been confined to screening examinations—they find little application in clinical medical practice.

12. **Blood Pressure in Children.** Although the measurement of blood pressure in children may become the norm in the future, it was not so when the enrollment screening examination was designed. Perhaps more important, the clinical significance of childhood hypertension is not yet clear, because a large percentage of children who have more than one elevated blood pressure reading will show spontaneous reversion to normal blood pressure levels in ensuing months (Aschinberg et al.).

13. **Stress (Exercise or Fitness) Testing.** A stress test, taking the form of either a step test or treadmill test, was considered for inclusion primarily to measure the fitness (as demonstrated by tolerance for exercise) of Study participants who did not have symptoms of
heart disease. Aside from the questionable merit of considering fitness as a variable that depends on generosity of health insurance coverage, the exercise test had to be rejected on the grounds of expense. Legal counsel recommended that a physician be present on a full-time basis if exercise testing were to be carried out, not necessarily to administer the test, but to be there in case of complications.

14. **Lateral Chest X-ray.** A posteroanterior chest x-ray was taken on enrollment and exit (with exclusion of certain participants such as pregnant women). For research purposes, we were particularly interested in indications of presence (or absence) of selected conditions, such as tuberculosis, heart disease, and chronic lung disease. Screening for these conditions can be carried out satisfactorily with a single posteroanterior film of the chest; additional information to be gained from a lateral film would be small (Sagel et al.), and there would be added problems of space, time, expense, and x-ray exposure of normal people.

15. **Maxillo-facial Dental X-ray.** A maxillo-facial dental x-ray provides a film of the entire dentition, and can be used to identify many types of pathology, including some cavities, fillings, gingival pockets, bone cysts, and other abnormalities. For our research purposes, however, we were interested in obtaining valid information about two selected types of dental disease: caries and periodontal disease. Measures of these conditions were obtained in other ways, and a dental x-ray was, in our opinion, not worth the additional cost of taking and interpreting film, or the risk of additional radiation.

16. **Pitting Edema.** Edema—swelling of parts of the body because of excess fluid—may accompany congestive heart failure. When caused by heart failure, the edema is characteristically pitting: when pressed, the skin indents and the mark remains for a period of time. Unfortunately, symptomatic (as well as asymptomatic) congestive heart failure may not produce pitting edema, and pitting edema is often present in the absence of congestive heart failure (Harrison, pp. 176-182, 1119-1120). Because of this lack of sensitivity and specificity, the low frequency of pitting edema, and the difficulty
of training a technician to estimate the amount of edema present, pitting edema was not included in the screening examination.

17. **Missing Limbs.** We were interested in knowing about missing limbs or portions of limbs because a functional handicap may ensue. This information was obtained on the MHQ.

18. **Hernia.** Examination for hernia would have provided us with a known population of Study participants with hernia. We could then have observed how many of them underwent an operation for this condition during the HIS. A training program to teach a technician to determine, within acceptable limits of error, if a hernia was present or absent probably could be designed. Unfortunately, we were unable to arrange an acceptable training program, and the test was excluded.

19. **Hemorrhoids.** Examination for hemorrhoids would have provided us with a known population of Study participants with hemorrhoids. We could then have observed how many of them underwent an operation for this condition. A logistic difficulty was that, in our opinion, a male was required to examine a male for hemorrhoids, and a female was required to examine a female; this requirement would therefore have raised the question of interobserver reliability. More important, the likely psychological sensitivity and high rate of refusal to an examination for hemorrhoids rendered the undertaking unacceptable.

20. **Breast Examination.** Although a breast examination in women, by a trained technician, was considered for inclusion as a cancer screening device, it was excluded because of the problems inherent in training to detect a mass in a reliable manner, and in inferring the possible seriousness of any finding on the basis of a single breast examination. In addition, the expected low yield (Kisch and Keeler, p. 6; Thier) from screening by palpation in our relatively young population reduced the expected benefit of performing breast examinations.

**DIFFERENCES BETWEEN THE ENROLLMENT AND EXIT SCREENING EXAMINATIONS**

The Health Insurance Study exit screening examination, by design, is not an exact replica of the enrollment screening examination. Changes were made in the tests included in the examination (because of new data in the literature, or analysis of enrollment data, or
revised aims of certain tests), in the personnel performing some tests, in the population tested for particular diseases, and in the screening subcontractor and laboratories used.

Changes in method and machinery are documented in the technical sections of this report (see Sec. IV). Other differences between enrollment and exit screening examinations are discussed below.

First, a number of differences in test content or population screened exist between the enrollment and exit screening examinations. The rationale for each change is given below.

1. **Periodontal Index.** The age group for the Periodontal Index examination was changed from 14+ years to 12+ years. Because the National Health Examination Survey selects 12 to 17 years as one of its age groups, this change was made to increase comparability of results between the two studies.

2. **Blood Sugar.** A random blood sugar test was substituted for the two-hour post-glucose-load blood sugar test obtained at enrollment. The glucose load was administered at enrollment, when case-finding was the primary consideration. At exit, we were interested more in control of hyperglycemia (high blood sugar) than in case-finding, so a random blood sugar test was more helpful. The blood sugar was still drawn two hours after the start of the screening examination, to reduce the chance that a supposedly "random" blood sugar was a post-glucose challenge in disguise (which might be the case if the examinee had ingested caloric food or drink immediately before the screening examination).

3. **Tympanometry.** At exit, tympanometry was performed on children aged 4 to 13 only. Adults received tympanometry at the enrollment examination to gather data on the prevalence of abnormal findings in adult populations. The most common clinical use of tympanometry is to detect fluid in the middle ear, a condition that is rare in adults.

4. **Hearing Aid Evaluation.** At exit only, hearing aid users were evaluated at local speech and hearing centers to measure the usefulness and effectiveness of hearing aids obtained during their enrollment in the Health Insurance Study.
5. **Hand/Wrist X-ray.** The hand/wrist x-ray was included at enrollment as an aid in diagnosis of rheumatoid arthritis; however, the test was so rarely positive that its use at exit was not justified.

6. **Urinalysis.** The sulfosalicylic acid test for confirmation of the presence of urinary protein (when dipstick urinary protein had been positive) was deleted at exit because enrollment screening confirmed the accuracy of the dipstick protein test.

7. **Immunization Status Evaluation.** Determination of the presence of immunization-induced serum antibody was added to the exit screening examination. Immunization incidence during the years of the Health Insurance Study might have differed depending on the generosity of the health insurance plan. An unknown number of immunizations, however, might have occurred in settings where documentation of the immunization did not reach the Health Insurance Study (such as public health clinics). Determination of the presence of antibody at exit helped obviate this problem.

8. **Chronic Condition Evaluation.** Determination of the absence or presence of selected chronic conditions (and, if present, an evaluation of the adequacy of current management) on the basis of physician interview and examination of selected enrollees was added to the exit screening examination. This evaluation provided a validity check on data from other Health Insurance Study sources, such as claim forms and the Medical History Questionnaire. A local physician evaluated certain HIS participants who, on the basis of a review of all claim forms they had submitted to the Health Insurance Study, were considered to be under active treatment for one of a number of selected chronic conditions. The physician provided additional data that can be obtained only by direct interview and examination techniques. The physician had no information concerning the examinee's particular health insurance plan, amount of use of health services, or type of health services used.

9. **Psychiatric Evaluation.** Determination of the presence or absence of selected psychiatric conditions on the basis of a psychiatrist's personal interview of selected enrollees may be added to the exit screening examination in one site. This evaluation would
provide additional information, if required, on the validity of data on mental health obtained in the MHQ. Specifically, information from the psychiatrist's evaluation could be used to define levels of abnormality for the mental health scales, and to identify the cutting point for defining severe psychiatric impairment.

Second, at the time of enrollment, laboratory analyses were performed by a laboratory located at each site. Local laboratories, selected according to criteria described in Sec. III, were favored because practitioners receiving results from a locally known laboratory would be more likely to trust and take account of the results; measurement of the effects of providing practitioners with these results would thereby be more valid. Local laboratories were also preferred because specimens could be more easily transported to the site of analysis. At the time of exit, both of the stated advantages of local laboratories were weighted against the need for laboratory determinations that were comparable from site to site and that conformed to the same measurement standards. A single laboratory was therefore selected to perform all laboratory determinations for the exit screening examination, although operational problems may result in a return to the local laboratories.

Third, although only 60 percent of the participants received the enrollment screening examination (so the effect of the screening examination on use of services could be measured), all participants take the exit screening examination.

Finally, enrollment screening examinations were carried out by American Health Profiles of Nashville, Tennessee; exit screening examinations are performed by Health Testing Institute of Boca Raton, Florida. This change represented a decision to switch from a manual to an automated testing system.

When the exit screening examination was designed, we decided to reexamine the state of the art of medicine screening examinations. A systematic survey was conducted to determine if viable, high-quality organizations other than the subcontractor used for enrollment examinations were interested in conducting HIS examinations, and if new
screening methods had been developed since the design of the HIS enrollment examination. In particular, we were interested in methodologies that increase test standardization and reliability. As a result of this search, we selected a new subcontractor who offered an automated testing system at a price competitive with manual screening operations.

Automated health testing uses computer technology to collect, record, and process test data. The advantages of such a system are several. First, the instrumentation for acquisition of data is connected to the computer, thereby transmitting results directly into the database and eliminating manual recording errors; when instruments rather than technicians perform the tests, variance from interpretation is eliminated. Second, the computer can monitor intermediate steps in a procedure to make sure that the technician performs them adequately. If a procedure is not properly performed, the computer can feed this information back to the technician and indicate that the test should be repeated. An example of this type of feedback is in the monitoring of placement of ECG leads. The computer can also monitor results to determine if they are within reasonable limits. If the results fall outside these limits, the computer can indicate that the test should be repeated as a check on the reading. Finally, the computer can check for completeness of the data before the examinee leaves the screening site. The HIS exit screening examination includes a check of each participant's data file for missing, incomplete, or invalid test results. If data are missing, the participant is requested to return to the appropriate test station; if all tests are complete, the participant may leave the screening center.

Although the automated screening method should increase standardization and reliability of the HIS screening examination, not all data collection problems are eliminated. Patient understanding and cooperation are important factors in obtaining the most accurate and reproducible results. These factors are influenced by the technician's ability to make the patient feel at ease and to give clear instructions. Also, technician interaction with the equipment will influence results even with automated systems. In audiometry, for example, if earphones
are poorly placed or if the patient does not understand how to respond to the tones, results will not be accurate. A rigorous quality control program to ensure collection of the most accurate data possible is still necessary. Quality control, as well as other aspects of HIS screening operations, is discussed in the following section.
III. ADMINISTRATION AND OPERATION OF THE HIS SCREENING EXAMINATIONS

OVERVIEW

Enrollment screening examinations began at the first HIS site, Dayton, in October 1974 and ended at the last HIS site, Charleston, in January 1977. During this period, 60 percent of the participants enrolled in the Health Insurance Study (N=5101) received screening examinations (see Table 2).

Table 2

HEALTH INSURANCE STUDY ENROLLMENT SCREENING EXAMINATIONS

<table>
<thead>
<tr>
<th>Sites and Dates</th>
<th>Number of Persons Screened</th>
<th>Number of Persons Enrolled</th>
<th>Percent of Enrolled Persons Screened</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dayton</td>
<td>911</td>
<td>1772</td>
<td>51</td>
</tr>
<tr>
<td>October 14, 1974, through December 21, 1974</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seattle</td>
<td>1550</td>
<td>3112</td>
<td>50</td>
</tr>
<tr>
<td>December 1, 1975, through May 28, 1976</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitchburg/Franklin</td>
<td>1245</td>
<td>1615</td>
<td>77</td>
</tr>
<tr>
<td>June 19, 1976, through September 25, 1976</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charleston/Georgetown</td>
<td>1395</td>
<td>2048</td>
<td>68</td>
</tr>
<tr>
<td>October 25, 1976, through January 19, 1977(^a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5101</strong></td>
<td><strong>8547</strong></td>
<td>60</td>
</tr>
</tbody>
</table>

\(^a\)Includes persons enrolled in a special preenrollment sample who will be offered enrollment beginning in September 1978.

Each screening examination center was designed to handle twenty-five to thirty people per day on average; however, because screening appointments depended on the progress of enrollment of families into the experiment, the number of daily screens varied from five to forty.
As enrollment proceeded in each site, the number of individuals scheduled each day for examinations generally increased.

Nonresponse was not a problem and therefore will not be discussed in detail; less than 5 percent of the participants designated to receive the examination were not screened. This high response rate is probably explained by the fact that enrollment screening examinations were not ends in themselves, but rather were a requirement for participation in the Health Insurance Study. In addition, families were paid up to $50 to take the examination, and transportation was provided if needed.

Examinations were scheduled at ten-minute intervals within an eight-hour daily schedule. A one-hour break in appointments was scheduled each day. The demand for weekend appointments made Saturdays and Sundays the most heavily scheduled days. Serial flow of participants through the examination center allowed flexibility in scheduling and maximum privacy by placing all tests that required undressing in one test station staffed by one technician.

Participants were instructed that the screening examination would take approximately two hours. The planned time for completion of all adult screening tests (except venipuncture, which was performed exactly two hours after the administration of the glucose load) was one hour and twenty minutes, which allowed forty minutes for completion of the MHQ. Pediatric tests generally required forty-five minutes. Although most participants completed the entire screening process in two hours, some, because of difficulty in completing the questionnaire, remained at the screening examination center from three to five hours. Participants who had problems filling out the questionnaire were offered interviewer assistance.

The enrollment screening centers were staffed by four medical assistants, three technicians, a dentist, and the registered nurse supervisor. Each center was divided into stations and, with the exception of the dentist and his assistant, there was one tester per station. Each tester (medical assistant or technician) was responsible for maintenance and calibration of all equipment at the station. The supervisor was responsible for managing the screening center and
monitoring the flow of participants through the screening process. The supervisor was also responsible for handling emergency situations and arranging for transfer of any persons requiring physician treatment to the emergency room of a local hospital. Fortunately, it was never necessary to carry out the latter task during his screening.

Exit screening examinations began in Dayton in October 1977 and will end in Charleston in January 1982. All participants are required to take the exit examination. Exit examinations are scheduled six days per week, with twenty-five appointments per day. Since exit examinations do not depend on other field activities, each screening day can be filled with appointments.

The exit screening centers are staffed by four registered nurses, an x-ray technician, a dentist, a dental recorder, a medical assistant, and the site supervisor. The time for completion of all screening tests is the same as during enrollment examinations. Since the completion of the medical history is a time-consuming task, participants are allowed to complete this questionnaire at home before arriving at the screening center.

Enrollment screening examinations were conducted by American Health Profiles, Incorporated; exit screening examinations are conducted by Health Testing Institute, Inc.* In addition to designing the screening examination, Rand made major operational decisions and monitored the screening examinations. The major roles of key personnel at both Rand and the screening subcontractors are shown in Fig. 1.

PLANNING OF SCREENING FIELD OPERATIONS

Multiphasic screening organizations usually administer screening tests to provide a series of test results to a physician for his or her

*Both enrollment and exit screening subcontractors were selected from organizations responding to requests for proposals issued by Rand prior to enrollment and exit screening. Proposals were evaluated by a team of physicians, administrators, and researchers. Selection of the subcontractor was based on organizational capability, effectiveness of the proposed work plan, and estimated cost.
Fig. 1 — Key operational roles of Rand and subcontractor for HIS screening examinations.
use in providing care to a patient. As stated earlier, testing is performed with the assumption that the physician will repeat any test with an abnormal result to confirm the abnormality before proceeding with further investigation or treatment. In addition, many screening organizations operate on a low-cost, high-volume basis using methods that, although adequate, may not produce the most reliable or valid results. This mode of operation thus raises problems for a research project that must rely on screening test results for evidence of the presence or absence of disease or as a measure of the health status of a population. Because of the different needs of research screening and usual multiphasic screening, it was necessary to stress research standards of operation to the subcontractors and to monitor closely the quality of the data collected.

When Rand issued its initial competitive request for proposals to locate a screening subcontractor, it was clear that some organizations were more research-oriented than were others. Operational competence, however, was the primary requirement. Thus, although we might like to have chosen the most research-oriented organization responding to our request, this aim proved not to be feasible.

In planning for screening operations, the HIS recognized and addressed the following issues.

1. Training of Personnel. Technicians who had the necessary background were given special training when appropriate. For example, technicians were sent to a special training course in Denver to learn how to perform the Denver Developmental Screening Test, and a technician made hospital rounds with a vascular surgeon to learn how to evaluate varicose veins. Furthermore, periodic retraining and checking of performance for standard as well as special tests were deemed essential.

2. Reliability of Testing Equipment. All screening organizations are aware of the importance of maintaining their equipment. Some take more care than others in making their original selections of equipment, some follow routine maintenance and calibration procedures more rigorously than others, and some have instituted additional checking procedures (e.g., biological checks). The HIS devoted a great deal
of attention to selecting equipment, to ascertaining that the sub-
contractor performed all routine maintenance and calibration proce-
dures, and to ensuring that additional checks were performed routinely
for certain equipment. The subcontractor was required to maintain logs
that contained both the dates of the calibration checks and their
results.

3. Standardization of Test Procedures. Technicians may vary
their test procedure from week to week, from day to day, or from
participant to participant. To reduce variation in results attributable
to variation in test procedure, training and continuing supervision by
the HIS and the subcontractor emphasized the need to use an absolutely
and continuously standard procedure for each test.

4. Reliability of Measurement. The concept of checking for re-
liability of measurement may be new to a number of multiphasic screen-
ing organizations. Checking may be by immediate retesting (e.g., two
measurements of weight in a row, separated only by stepping off the
scale and readjustment of the scale to zero before stepping on the
scale again) or delayed retesting (e.g., two examinations for the
Periodontal Index, with the examinations separated by one hour or
longer). Reliability of the laboratories was checked by sending them
split samples with different identification marks.

5. Explanation for Unusual Data. When certain data were out of
the usual range (e.g., a menstruating woman might produce a urine
specimen contaminated with red blood cells) or were missing (e.g., a
retarded participant refused to have blood drawn), it was necessary
to know exactly why the data were unusual or absent. Screening or-
ganizations may need assistance in developing the necessary explanatory
mechanism. For purposes of the HIS examination, "completion codes"
were developed to explain the status of each test result. These codes
can be found in Appendix B.

6. Data Editing. Before the participant left the screening
center, personnel checked to make certain that all needed tests had
been performed (unless justification for not performing the tests was
given) and that no test results were grossly outside of expected
ranges. In the case of the HIS screening examination, the decision
to perform (or not perform) several of the tests was based on age and sex, or on results of previous tests. Therefore, the need for editing to make certain that all needed tests had been performed was particularly acute. In addition, data that were recorded on precolumned forms (as was the case with the HIS) had to be edited to ensure that they were completed and recorded in the correct fields. Data editing needs were an important consideration in the decision to change to a computerized data collection system for exit screening (see below).

7. **Quality of Cooperating Laboratory.** Selection of a laboratory to analyze collected samples depends on both quality and price. For a research project, high quality weighs more heavily and low price is somewhat less important than would be the case with nonresearch screening. In selecting a cooperating laboratory, therefore, the needs and wishes of the research organization were clearly communicated to the screening organization.

8. **Confidentiality.** The Health Insurance Study is actively concerned with ensuring that data that might be used to identify HIS participants be held in confidence. Assurances of confidentiality have been made to all participants, and the screening subcontractor was required to provide for such confidentiality. A manual outlining the principles and practices of data safeguarding was developed by the HIS and each subcontractor.

9. **Quality Control.** In addition to specifying exact screening procedures, the HIS implemented a quality control program. Quality control—the monitoring of test procedures and field activities to maintain a high level of on-line performance at each screening examination center—was performed by both the subcontractor’s supervisory staff and HIS personnel. Screening organizations usually have some type of quality control program; however, additional requirements dictated by research needs were imposed. Quality control measures include (1) reviewing calibration logs to ensure that calibration checks were regularly performed, (2) observing staff performance of screening tests to check for standardization of testing procedures, (3) on-site editing of data recording forms to check for test omissions and recording errors, (4) monitoring environmental factors, such as
lighting that may affect standardization of vision testing, (5) monitoring staff attitude and approach to participants that could affect participants' cooperation, (6) monitoring appointment scheduling and patient flow to avoid poor test performance caused by time pressure, and (7) reviewing confidentiality procedures.

Quality control checks were performed daily by the screening examination center supervisor and during site visits by the HIS physician and screening examination administrator two or three times per site. In addition, daily telephone communication concerning field activities took place between the subcontractor and the administrator.

SCREENING EXAMINATION FIELD OPERATIONS

Site Setup and Preparation

Eight weeks before screening examinations began at each site, suitable space was rented and renovation plans drawn up for the HIS screening examination center. Criteria established for the selection of a facility included: (1) easy access to public transportation, (2) reasonable freedom from noise and excessive vibration, (3) parking accommodations for at least ten cars, (4) an open area within a few feet of the building large enough to park an 8 ft by 26 ft mobile van, (5) power, water, and sewerage connections, (6) at least two bathrooms, and (7) adequate space for examining rooms, office space, and waiting areas.

Screening centers consisted of seven examining rooms, a supervised playroom for children, a room for completing questionnaires, and a waiting/reception area. Renovation of facilities often involved dividing existing space into these areas. The arrangement of screening rooms and the flow of examinees through the center were standardized whenever possible; however, each building placed some constraints on design. In all sites the guiding factors in design were that (1) all examining rooms provide privacy, (2) the playroom be large enough for at least six children to play comfortably, (3) a separate room that can seat at least ten adults be provided for completing questionnaires,
(4) all examining rooms be large enough to contain the necessary equipment and allow the technician to work efficiently, and (5) corridors outside the examining rooms be wide enough for chairs for participants who may need to wait. There were no constraints on the order in which the screening tests were to be performed, except that the first procedures during the enrollment examination were always weight and height measurement and having the participant drink a calculated load of glucose, so that drawing blood two hours later (the final procedure) could be carried out without undue waiting.

Analysis of blood and urine specimens collected at the enrollment examination center was performed by a local laboratory at each site. The HIS selected the laboratory using the following criteria:

1. Continuing participation by the laboratory in a "proficiency testing" (quality control) program run by a nationally recognized organization.
2. Willingness of the laboratory to allow the HIS to perform split sample quality checks and to monitor the laboratory's internal and external quality control system.
4. Certification by Medicare.
5. Willingness of the laboratory to receive (or pick up, as appropriate) specimens from the HIS screening examination center.
6. Willingness of the laboratory to designate a liaison person who would be easily accessible to representatives of the subcontractor and the HIS.
7. Sufficient size and degree of automation to permit reasonable turnaround time on analysis of specimens.
8. Reasonable costs and competitive pricing.

Laboratories performing blood and urine analysis from HIS enrollment screening examinations were Zipf Laboratories of Centerville, Ohio; Swedish Hospital Laboratories of Seattle, Washington; Damon Laboratories of Needham Heights, Massachusetts; and Pathology Associates of
Charleston, South Carolina. Analysis for the first exit examination was performed by Metpath Laboratory of Hackensack, New Jersey.

After a laboratory was selected and the screening center location was approved, arrangements were made for printing laboratory and examination data collection forms (see Appendix C), as well as information brochures for participants giving instructions for preparation for the examination and directions to the center (see Appendix A).

The sole purpose of the HIS screening examinations was to collect data on participants' physiologic health status; the examination centers were not equipped to provide medical care. Staff members were prepared, however, to handle emergencies that might arise during screening. A registered nurse was designated to take primary on-site responsibility in the event of an emergency, and a formal list of steps to be followed in an emergency was provided. In addition, a local physician, retained by the screening subcontractor before screening began, was on call during hours of center operation for emergency treatment. Advance arrangements were also made with a local hospital emergency room to accept anyone sent for treatment from the screening center.

After agreement on job descriptions and training procedures, staff members were hired and trained to administer the specific tests. With the exception of the child supervisor, the dental recorder, and the dental examiner, all screening personnel were members of a team that moved from site to site and performed the same tests at all sites. Refresher training was provided prior to screening at a new site.

Screening examination appointments were the responsibility of National Opinion Research Center (NORC), the survey subcontractor. The screening staff had to establish an effective communication system with NORC so that "no-shows" could be rescheduled for screening, and so that transportation to the screening center could be arranged for families requesting it. Arrangements were made in advance with taxi companies to provide transportation and submit a monthly invoice for services rendered.

One week before screening began, all advance arrangements were reviewed and modifications were made where necessary. Mock screening was performed to check the calibration of instruments and training of
personnel. Two days before screening, NORC interviewers were screened, a process that served to increase their understanding of screening examination procedures and to prepare the screening examination staff for managing a full appointment schedule. Mock screening was also useful to the HIS physician because it provided an opportunity to observe testing techniques and to train technicians further if necessary.

**Description of the Screening Examination**

Screening procedures and scheduling of examinations were generally the same at all sites. Screening examinations were conducted five or six days per week—Tuesday through Friday from 1:00 to 8:00 p.m., Saturday from 9:00 a.m. to 4:00 p.m., and at some sites, Sunday from 12:00 to 7:00 p.m.

Appointments were scheduled at ten-minute intervals; whenever feasible, family members were given appointments together, and the required number of ten-minute intervals blocked off. Adult participants (14 years of age and older) were required to remain at the screening center for two hours, which included time for the actual screening examination and for completion of the Medical History Questionnaire Form B (Form A was completed before the examination). The average time required for pediatric (3 through 13 years of age) examinations and infant (< 2 years of age) examinations was 45 minutes.

Below is a brief description, listed in usual order of occurrence, of each procedure of the HIS screening examination. A complete description of each procedure as well as the average time for administration of each test can be found in Sec. IV (pages indicated in parentheses).

**Identification Data.** The name, address, sex, and birth date of the participant were verified and corrections made where necessary.

**Authorization for Release of Findings.** Each participant was requested to supply the name of a personal physician to whom screening results could be sent. If a participant did not have a personal physician, (s)he was requested to select the name of a physician from a list supplied by the local medical society and kept at the examination center.
Signing of Release for Examination of Minors. A parent or guardian was requested to sign a release form for the examination of a minor. The parent also signed the authorization for release of the minor's screening results to the named physician.

Medication Sheets. All adult participants were asked what medications they were currently taking, dosage instructions, what disease or condition the medication was prescribed for, and what the medication was supposed to do for their condition. Responses to the above question were recorded verbatim by the receptionist. Information about medications taken by children was asked of a parent (generally the mother).

Medical Abstract Sheet. The participant was asked to answer a short list of medical history questions. This sheet was not intended to be a complete medical history, because all participants fill out the detailed MHQ. Rather, the medical abstract revealed indications and contraindications for various screening examination tests. Children's medical abstract sheets were filled out by the mother.

Height, Weight. Participants were weighed and measured while wearing light clothing and no shoes (pp. 229ff.).

Urine Collection. The participant received verbal and written instructions for the collection of a clean-catch urine specimen. The specimen was collected at any time during the examination. Urine samples from women were cultured within 10 minutes of collection, using the Isocult culture tube. Preservative tablets were placed in the remaining urine, and samples were shipped to the laboratory for additional analysis (pp. 218ff.).

Glucose Load. A glucose load, based on each adult participant's height and weight, was administered at the beginning of the enrollment screening examination except to those taking insulin or an oral anti-diabetic drug (pp. 133ff.). No glucose load was administered at exit screening.

Blood Pressure. A single sitting blood pressure measurement was taken on all adult participants. If the systolic reading was >140 or the diastolic reading was >90, the measurement was repeated after at least 10 minutes of rest. A standing blood pressure measurement
was taken on participants currently using antihypertensive medications (pp. 174ff.).

Audiometry. Air conduction threshold hearing was tested at four frequencies using a pure-tone audiometer. Participants with a specified degree of air conduction loss were tested for bone conduction (pp. 149ff.).

Chest X-ray. All participants 25 years of age or older and other adult participants answering "yes" to heart disease or lung disease questions on the medical abstract sheet received a single film chest x-ray. No x-rays were taken on pregnant women (pp. 69ff.).

Hand/Wrist X-ray. During enrollment screening, hand/wrist x-rays were taken on adult participants who said they had experienced pain, aching, or swelling in the hands and/or wrists (pp. 203ff.). No hand/wrist films were taken at exit screening.

Electrocardiogram. A twelve-lead electrocardiogram was taken on males 30 years of age or older, females 35 years of age or older, and all other adult participants answering "yes" to the heart disease or high blood pressure questions on the medical abstract (pp. 80ff.).

Pulmonary Function. All adults were tested for vital capacity (FVC) and forced expiratory volume in 1 second (FEV1). The tests were conducted using an electronic spirometer (pp. 235ff.).

Tympanometry. At enrollment, all participants 4 years of age and older were tested for compliance of the eardrum under conditions of varying air pressure. At exit, participants aged 4 to 13 were so tested (pp. 164ff.).

Varicose Veins Examination. All women 20 years of age and older and any men who claimed to have varicosities were examined for presence and severity of varicose veins (pp. 254ff.).

Joint Problem Tests. Adult participants who said they had experienced nontraumatic pain, aching, or swelling of the joints were tested for grip strength, time to complete a fifty-foot walk, and joint size (pp. 191ff.).

Acne Photograph. Two facial photographs were taken of all adult participants claiming to have acne (pp. 54ff.).
Vision Testing. Visual acuity of participants 3 years of age and older was tested with and without glasses, using a Snellen (or similar) chart. Motility or stereopsis was also tested (pp. 259ff.).

Tonometry. Participants 40 years of age and older were tested using a noncontact applanation tonometer (pp. 142ff.).

Dental Examination. All participants 3 years of age and older were examined using standardized indexes for (1) whether the tooth was decayed, missing, or filled, (2) periodontal disease, and (3) oral hygiene (pp. 105ff.).

Tonsil Examination. Tonsils of participants under 20 years of age were examined and scored for size (pp. 246ff.).

Denver Developmental Screening Test. Children 3 months through 4 years of age were given a standardized developmental test that included evaluation of personal-social skills, fine motor-adaptive skills, language skills, and gross motor skills (pp. 90ff.).

Venipuncture. During enrollment screening, venous blood specimens were drawn from adult participants exactly two hours after ingestion of glucose load. Blood specimens were obtained from children and infants when convenient (see description for each blood test). During exit screening, blood specimens were drawn from all participants when convenient.

Data Editing and Processing

Figure 2 presents a document flow chart. At the end of each screening day, all recording forms were batched and sent to the document processing center at the subcontractor's home office. Each daily shipment contained the forms on which results were recorded, repeat-test sheets, x-rays, electrocardiograms, the appointment sheet for that day, and a master tracking sheet listing all documents contained in the shipment.

As each shipment of screening examination documents was received at the document processing center, recording forms were stamped with date of receipt, recording form envelopes were counted, the total number of persons screened was matched against the appointment sheet, and the participants' identification numbers were verified against the appointment sheets.
Fig. 2 — Flow of HIS screening examination documents
An edit was performed to check completeness of data, legibility of recorded results, completeness of names and addresses of participants and their physicians, whether all necessary forms had been signed, and whether all documents listed on the master tracking sheet were included.

All electrocardiograms, x-rays, and acne skin photographs were sent to board-certified physician consultants for interpretation. Each box or envelope of materials to be interpreted was marked to indicate date of screening, number of documents enclosed, and date documents were sent to the interpreting physician, and was labeled "CONFIDENTIAL MATERIAL." Materials were delivered, or mailed, to the appropriate physician's office by a courier who picked up materials that had been interpreted. When the courier returned materials to the document processing center, the number of documents and the identifiers were checked for agreement with the tracking form.

Physicians' interpretations were then transcribed onto the recording form using specified codes (see Appendix D). ECG codes used were the standard codes used by each subcontractor. The x-ray coding system developed by the HIS required the radiologist to determine presence or absence of findings of particular interest for the research team. Acne was coded as "present," "absent," or "questionable" according to the description in Pillsbury, Shelly, and Kligman. Similar but not identical codes are used for scoring exit screening examination findings.

All test results were reviewed by the screening subcontractor's staff physician according to specifications established by the HIS (see Appendix E). For enrollment screening results, the physician then designated one of the following types of notification letter to be sent to the participant and the participant's physician: (1) Normal—all test results fell within normal ranges, (2) Normal except dental—all medical test results fell within normal ranges, gross decay was noted on at least one tooth, (3) Slightly abnormal—at least one medical test result fell outside normal ranges, but no test fell into the alert range, (4) Slightly abnormal with dental abnormality—same as slightly abnormal with gross decay noted on at least one tooth,
(5) Abnormal—at least one medical test result fell into the alert range, and (6) Abnormal with dental abnormality—same as abnormal with gross decay noted on at least one tooth.

The types of letter sent for notification of exit screening examination results include: (1) Participant—notification that results have been sent to the specified physician, (2) Participant with dental abnormality—notification that results have been sent to the specified physician and gross decay was noted on at least one tooth, and (3) Physician—results of the screening tests and notification that the participant requested that the results be sent.

If a test result fell significantly outside of normal ranges, indicating that the participant's health might be in immediate danger (e.g., a systolic blood pressure greater than 250 mm Hg), telephone calls were made to both the participant and the participant's physician, and follow-up letters sent. This procedure was followed during both enrollment and exit screening examinations.

All notification letters were sent by certified mail. The participant received a letter, and the designated physician received both a letter and a copy of all test results. No results were sent to dentists unless the participant so requested. Results were sent out within two weeks of the date of screening.

During enrollment screening, a final edit, primarily to check completeness of documents, was performed before screening data were keypunched. If a test that should have been performed had not been performed, the data were recorded as missing because of an error.

Data were shipped to Rand along with a shipping list containing the number of each type of document enclosed. Upon receipt of documents at Rand, a verification of shipment contents was sent to the subcontractor. Rand received data that contained numerical identifiers, not names. Original data collection forms and machine readable files remain with the subcontractor or are specially stored at Rand with strict access controls.

**DISCUSSION OF SCREENING EXAMINATION PROBLEMS**

Any research project with a major field component is bound to
experience a number of operational problems. The Health Insurance
Study screening examinations, taking place at a number of field loca-
tions, were not immune. Based on what happened during our field
operations, and on how we responded to various difficulties, we
present a variety of general issues to be considered.

Problems Concerning Field Personnel

Problems with field personnel may be expected to arise during
screening operations.

1. Minor adjustments in the testing protocol may be made by
field personnel who are attempting to be "practical" or "intelligent"
rather than sloppy.

For example, the noseplugs that we originally specified to be
worn during the performance of spirometry (lung function testing) were
left off for occasional patients, sometimes for entire days of appoint-
ments, because a technician had noted that the noseplugs were bother-
some to some participants, or were inconvenient to use, or sometimes
fell off during use. This small change, while "reasonable," might
have interfered with research results. In fact, we ascertained that
using noseplugs did not affect results in forced-expiration spirometry,
and their use was subsequently discontinued.

On another occasion, we discovered that the technician who mea-
sured blood pressure was taking additional readings (not called for
in the testing protocol), not because she felt that the first reading
was inaccurate, but because she thought that later readings would be
more "representative." Because all readings were recorded, no harm
was done by this deviation from the protocol, and we were able to
select the initial reading for analysis, as planned. (The protocol
did call for a subsequent blood pressure measurement, under specified
and controlled conditions, if the initial reading was elevated above
specified levels.) This deviation, like all the others, was discussed
with the technician so that it would not recur, and so the technician
would gain increased understanding of the importance for research of
adhering to the specified testing protocol.
Another subtle change in testing occurred when a technician found one or more questions "peculiar" to ask, and decided to rephrase them to all—or to only some—participants. For example, questions concerning the use of pipe cleaners and interdental stimulators for oral hygiene were omitted by a technician when confronted by participants who did not appear to be "the type" likely to use such implements. Once discovered, the omission was discussed and the problem rectified.

Yet another example of change in research protocol was a deviation from protocol for "humane" reasons. Our protocol called for each participant being screened to undergo one repeat test, determined by a randomly generated table of repeat tests. One of the repeat test assignments was to obtain additional blood at the time of venipuncture so that duplicate samples could be prepared. When a "duplicate blood sample" was the repeat test assigned to a child, one technician skipped that test and assigned the following repeat test to the child (saving the duplicate blood sample for the next adult), to spare the child having an additional amount of blood drawn. The need to follow exactly the table of repeat tests was stressed, and the problem did not recur. Because the purpose of obtaining duplicate blood samples was to maintain quality control on the laboratory performing determinations on the blood samples, this deviation did not affect the quality of HIS data.

2. Technicians may slip when it comes to maintenance of relatively minor quality control. For example, we noted occasions when technicians performed various checks of their machines yet failed to record the checks in their logbooks. Similarly, when the participant was performing the grip strength test, the technician occasionally failed to tell the participant to relax the grip when the pressure reached 250 mm Hg (such deviation does not change the test results but the grip should be relaxed after reaching 250 mm Hg to prevent possible loss of mercury from the column if the pressure exceeds 300 mm Hg). Sterile urine samples were not always refrigerated immediately upon delivery to the drop-off location within the screening center. We believe that in all the instances reported here, careful explanation resulted in improved compliance with the protocol.
3. Relationships among screening personnel strongly influence screening operations. A high degree of professionalism is required from the on-site supervisor, who must be close enough to the technicians to maintain their morale and loyalty, yet be able to exercise authority when it is required. Ample living quarters, attention to the need for scheduling breaks for eating, a place near the screening center at which prepared food can be obtained easily, and provision of an off-duty relaxation room at the screening site all assist in improving morale. The more often the screening site must be moved, the greater the stresses caused by the exigencies of travel, and personnel turnover can be a considerable problem. Because technicians spend a great deal of time with each other, both on the job and during leisure hours, attention must be paid, by research workers as well as the subcontractor, to the compatibility of personnel.

Other Field Problems

Additional problems that researchers and administrators must concern themselves with are listed below.*

1. Problems can arise from misunderstandings with community organizations, and it is therefore wise to make extensive contact with local medical and dental societies and other community agencies prior to screening. This does not mean that approval or endorsement is required, but that establishing lines of communication is worthwhile. Such links may solve some problems. For example, agreement can be reached on what to do if a participant has no physician, yet the researcher wants to send screening results to a physician. A local emergency facility can stand prepared to accept, as necessary, any screening participant who is sent there with a possible emergency condition.

Through good communication, other problems may be avoided. For example, if state law appears to say that a dental hygienist may gather dental indices without continuous, on-site supervision by a

dentist, it is important to know if the local dental society interprets the law in the same way. When some physicians receive unrequested results from a screening examination and telephone the local medical society to complain or seek further information, it is of immeasurable help if the society understands the purpose of the research and can explain why the physician has received the results.

Problems may arise from poor communication with local media. All inquiries from the press should be handled by one person who is prepared to give lucid information about the research study to reporters and other media representatives.

2. Screening examinations designed to gather research data are subject to legal and ethical responsibility for following up test results. In addition to sending a copy of all results to the participant's own physician, an explicit plan must exist for immediate follow-up of certain test results, whether obtained at the screening site or later from the laboratory or physician interpretation, that have been defined as representing possible danger to the participant.

3. To avoid a situation in which tests are not performed because of temporary short staffing, all screening personnel must have multiple capabilities. In the case of the HIS, backup was made available for all specialized testing, such as hearing and the Denver Developmental Screening Test, by sending more than one technician through training programs.

4. Data collection problems do not start when the participant enters the screening center, nor do they end when the participant leaves the examination. Provision of identification labels, scheduling and rescheduling of families, and arranging for transportation are but some of the "pre-collection" necessities. After data collection, the researcher must provide ranges and specifications for data editing and processing.

5. At the risk of stating the obvious, the unexpected does occur and must be met with due regard for research goals. For example, at one site, a basement in which supplies were stored was unexpectedly flooded; at another, a technician required several hours of emergency dental care, and the flow of participants had to be instantly altered pending the technician's return. Field operations must be flexible.
IV. TESTING PROCEDURES

This section of the Screening Examination Procedures Manual contains technical descriptions of the test procedures for both enrollment and exit examinations, arranged by disease condition. If a test was used to screen for more than one disease condition, as in the case of the chest x-ray, the procedure is described only once and referenced in other disease chapters.

Each table within disease chapters contains technical information for a single test procedure. Tables contain the test name, description of the test, time required to administer the test, the population screened, the equipment used, personnel administering the test, training of personnel, test procedures, recording form, a description of quality control, reliability measurement procedures, and comments.

Unless otherwise noted, the test procedures were the same for all screening examinations, and the same medical assistant, medical technician, or registered nurse performed a given test throughout screening at one site. The only other person administering a given test was the on-site supervisor, a registered nurse, who was trained in all test procedures for backup purposes. If the medical assistant, technician, or nurse administering a test did not continue testing at the next site, the new tester received the identical training given the departing one.

In general, exit examination test procedures are conducted by registered nurses, whereas enrollment examination test procedures were conducted by medical assistants and technicians. This trend toward using nurses does not reflect a need for more highly trained personnel to generate quality test results, but reflects a general policy of the subcontractor conducting exit examinations to hire more highly trained personnel.

For the purposes of this report, a medical assistant is defined as an individual with training from a six-month certified medical assistant school; a medical technician is a licensed technician/technologist trained in the stated field of medical expertise; and
a registered nurse is an individual with an R.N. degree and current licensure in the state where screening was conducted. The training section of each table is a description of the instructions designed specifically for Health Insurance Study screening examination personnel, beyond the basic certification training.

Other personnel mentioned in this document are the American Health Profiles Coordinator, an R.N., responsible for the overall quality of enrollment screening examinations, the Health Testing Institute field officer who is responsible for overall quality of exit examinations, the site supervisor who was responsible for day-to-day quality of the screening examinations, the HIS physician (referred to as the physician) who conducted many of the training sessions and who monitored the screening procedures, and the HIS screening administrator who was responsible for monitoring the operations of the screening examination centers.

The description of test procedures is brief and whenever possible the instruction manual for the equipment used is referenced. All of the equipment manuals are stored in the Health Insurance Study archives. The recording form section presents the appropriate excerpt from the Confidential Recording Form from entry screening examinations.

Quality control refers to the monitoring of test procedures and the methods used to improve the on-line performance at the screening site.

Reliability measurements are procedures which allow for the determination of certain properties of the collected data without actually modifying the data collection process. The reliability measurements were computed after the data collection process was completed in order to make statistical inferences concerning the nature of the data.
DESCRIPTIONS OF TESTING PROCEDURES
## ACNE

### Test:
Facial Skin Photograph

A skin photograph was selected as the method for acne screening so that a dermatologist was not required to be on-site. Also, the photograph, a hard copy, can be re-interpreted at a later date, thereby avoiding any maturation effect in the dermatologist's interpretation of both entry and exit acne photographs.

### Description of test:
Two facial photographs were taken: one forehead photograph, one cheek photograph.

### Time required:
2 minutes

### Population screened:
Persons 14 years of age or older answering "Yes" to the question "Do you think you have acne (pimples on the face)?" or the question "Has a doctor recently said that you had acne?".

Acne skin photographs were also given to any examinee 14 years of age or older with visible acne, as judged by the medical assistant.

### Equipment:
Polaroid CU-5 Close-up Land Camera, 3" lens, 2x frame, 25" view finder, CU-5 AC Power Pack, Polaroid Polacolor 2, Type 108 color film, stopwatch.

### Standardization & maintenance of equipment:
Camera malfunctions were repaired at Polaroid Corporation Repair Stations.

Daily maintenance included the inspection of the steel rollers before loading each new film. If the rollers appeared dirty, they were cleaned with a damp cloth. The lens was cleaned daily.
Acne—Facial Skin Photograph (continued)

Personnel administering test:

Enrollment Examinations
Medical assistant

Two medical assistants were trained in the use of the CU-5 camera. One medical assistant took the photographs during Dayton screening, and the other medical assistant took the photographs during screening in subsequent sites.

Exit Examinations
X-ray technician

Training of personnel administering test:

Enrollment Examinations

Instructions were given to the medical assistant in identification of examinees who should receive acne photographs, choice of the most affected area of the face, use and maintenance of the camera, and methods for obtaining the best photographs.

Training in both identification of examinees with acne and choice of the most affected areas was conducted prior to screening by the Coordinator of the subcontractor. Visible acne was loosely defined as pimples and/or blackheads on the face which were visible from a distance of three feet. The medical assistant was instructed that, when in doubt, a photograph should be taken. The area most affected was defined as the area of the face with acne of the severest grade. A dermatology textbook (Pillsbury, Kligman, 1956) along with a series of photographs was used for teaching acne grading.

Instructions on the proper use and maintenance of the camera were given by a representative of the Polaroid Corporation. Training lasted one full day and included instructions for camera assembly, the connection of the cord to power supply unit and to camera, use of controls on the power pack, proper loading of the film, development of the film, maintenance of the camera, and "trouble-shooting." The majority of the training consisted of practice sessions in using the camera. Training materials used included the Polaroid CU-5 Instruction Manual (see Appendix F, Item 1).
Acne—Facial Skin Photograph (continued)

Instruction in methods for obtaining the best photographs was given by a board-certified staff dermatologist from Massachusetts General Hospital; instruction was not given in person, but through correspondence with the subcontractor's Coordinator after the dermatologist had reviewed a set of acne photographs taken during the first two weeks of screening in Dayton. Subsequently, the following instructions were given for improving the quality of the photographs.

1. Use 1/60 second exposure at f4.5. In order to diagnose acne, the pores and location of the papules need to be clearly visible. The f4.5 position will increase the depth of the pores, and thereby improve clarity.
2. The film should be developed for only 50 seconds rather than 60 seconds as suggested by Polaroid.
3. The light should be increased for any dark-skinned examinees.
4. The light should be decreased for light-skinned examinees and for more reflective surfaces such as the forehead. The lighten/darken control (L/D control) is located on the front of the power pack.

Exit Examinations

One x-ray technician and one registered nurse were trained in identification of examinees who should receive acne photographs, choice of the most affected area of the face, and use and maintenance of the CD-5 camera.

Training in both identification of examinees with acne and choice of the most affected areas was conducted prior to screening by a dermatologist. Training consisted of 16 hours of instruction at the office of the dermatologist, using actual patients. A dermatology textbook along with a series of photographs was used for teaching acne grading (Pillsbury, Shelley, Kligman, 1956).

Visible acne was loosely defined as pimples and/or blackheads on the face which were visible from a distance of three feet. The area most affected was defined as the area of the face with acne of the severest grade. If no specific area of the face was more affected than any other area, photographs were taken of the left cheek and of the center forehead, or alternate photographs as specified by Rand.
Instructions on the proper use and maintenance of the camera were given by a representative of the Polaroid Corporation. Training lasted one full day and included instructions for camera assembly, the connection of the power cord, use of the power pack, proper loading of the film, development of the film, maintenance of the camera, shutter speed and f stop settings, and "trouble-shooting." Additional practice sessions in using the camera were held several days prior to actual testing in Dayton.

The Polaroid representative suggested the following: (1) use 1/60 second exposure at f4.5; (2) light should be increased for dark-skinned examinees; (3) light should be decreased for light-skinned examinees; and (4) film should be developed for 50 seconds.

Procedure:

Two facial photographs were taken on examinees eligible to receive the test. The medical assistant was permitted to use his/her judgment in choosing the areas most affected with acne. In cases where no specific area was most affected, it was arbitrarily decided that the medical assistant would photograph the left cheek and the center of the forehead.

For the cheek photograph, the medial frame of the camera was placed just lateral to the edge of the mouth, and the superior frame was placed just inferior to the cheekbone, with slight adjustments made to achieve a flat surface. For the forehead photograph, the frame was centered on the forehead, with the inferior frame edge placed just superior to the eyebrows.

After the photographs were developed, the medical assistant mounted them on the facial photograph mounting form (Fig. 1) and marked the facial location appropriate for each photograph.

Interpretation of photographs:

The acne skin photographs were interpreted by a dermatologist to determine the presence or absence of acne. Initially, all photographs were interpreted (as described in Pillsbury, 1956) by one dermatologist, with the second dermatologist interpreting 100 percent of the same photographs for measurement of score reliability.
Acne--Facial Skin Photograph (continued)

At the time of exit screening examinations the acne photographs will be repeated. All photographs will be evaluated and scored by two dermatologists. In order to avoid any maturation effect, the photographs taken during entry screening will be reevaluated along with photographs from exit screening examinations. For examinees with both entry and exit acne photographs, the two sets of photographs will not be labeled as "before" or "after" photographs. Instead, the photographs will be arbitrarily labeled "A" and "B"; the dermatologists will determine whether "A" is better or worse than "B" and if so, by how much. The scoring system will differ from that used for entry screening photographs; all photographs will be scored according to the Witzkowski and Simons acne grading system.
Cheek
1. Left
2. Right

Forehead
1. Center
2. Left
3. Right

Place photo here

Physician's Interpretation: Acne 1. Present 2. Absent

Photographer's Signature

M.D.

Age

Identification No.

Fig. 1—Acne skin photograph mounting form
Acne--Facial Skin Photograph (continued)

Recording Form:

1. The medical assistant circled whether or not the examinee claimed a history of acne.
2. The medical assistant circled whether the examinee appeared to have acne.
3. The location of the photographs was circled.
4. A Completion Code was filled in (see Appendix B for completion codes).
5. The interpretation of the physician was transcribed from the Acne Skin Photograph Sheet (Fig. 1) to the Recording Form.

| EXAMINEE CLAIMS HISTORY OF ACNE .......... | 1. YES 2. NO |
| ACNE OBVIOUS TO TECHNICIAN ............. | 1. YES 2. NO |
| (If answer to either question yes, take photo. Otherwise, do not) | |
| PHOTOGRAPH: TAKEN WHERE: ............. | |
| COMPLETE CODE ........................ | |
| PHYSICIAN INTERPRETATION: ............. | ACNE IS: 1.PRESENT 2.ABSENT 3.QUESTIONABLE |
| CHEEK: 1. LEFT 2. RIGHT |
| FOREHEAD: 1. LEFT 2. RIGHT 3. CENTER |
Quality control:

The quality of the photographs was monitored throughout all sites by the interpreting dermatologist. A batch of photographs was sent for evaluation every two weeks and the dermatologist noted how many of the photographs were unreadable. If more than 5 percent of the photographs were unreadable, the medical assistant was retrained. Retraining was necessary only during South Carolina enrollment screening.

After the Dayton enrollment screening examinations, all the acne photographs were independently read by two dermatologists. The results were as follows:

- 74% (83 cases): both dermatologists agreed on positive findings
- 9% (10 cases): both dermatologists agreed on negative findings
- 12% (13 cases): dermatologist A evaluated as negative, dermatologist B evaluated as positive
- 5% (6 cases): dermatologist A evaluated as positive, dermatologist B evaluated as negative

Subsequently it was decided to add a third category, "Questionable," to the scoring of acne photographs.

Reliability measurements:

All acne skin photographs are independently reevaluated by a second dermatologist. Comparison of scores (multi-reader reliability) will give an estimate of the inter-observer reliability of the scores.

Since two photographs are taken, one of the cheek and one of the forehead, the reliability of the scores can be determined for each type of photograph. In addition, it can be determined if there is a correlation between cheek and forehead scores.
ALCOHOLISM AND LIVER DISEASE

Test: Blood Alcohol Level

Blood was selected as the specimen for analysis because the systemic effects of alcohol have been best correlated with blood alcohol concentrations (Payne, 1966).

Description of test: Blood was drawn during the screening examination and sent to a local laboratory for analysis.

Time required: Total time for venipuncture was approximately 5 minutes.

Population screened: All persons 14 years of age or older

Equipment: Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoseal, cotton balls, band-aids.

Maintenance of equipment: None

Personnel administering test: Licensed medical technician

Two licensed medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other medical technician worked in all subsequent sites.

Exit Examinations
Registered nurse
Training of personnel administering test:

The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Procedure:

Enrollment Examinations
Venipuncture was performed and 15 ml of blood drawn into a red-top vacutainer. The blood was allowed to clot for 30 minutes, then centrifuged. While the specimen was spinning, a serum tube was labeled with the identification sticker of the examinee. The specimen was removed from the centrifuge and 7 ml of serum was drawn off and placed in the serum tube. The tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and blood was drawn (5 ml) into a grey-top tube containing a preservative. The tube was labeled with a patient identification sticker and placed on an aliquot mixer for 10 minutes. The blood was then packaged, refrigerated overnight, and sent to the cooperating laboratory.

The preservative in the tube was 20 mg potassium oxalate and 25 mg sodium fluoride.

Method of analysis:

Enrollment Examinations
In Dayton the blood alcohol level was determined by using the Clark method, utilizing a molecular sieve column (Poropak S) and a Hewlett-Packard Gas Chromatograph.

In Seattle, the blood alcohol level was determined by the DuPont Automatic Clinical Analyzer which uses a modified alcohol dehydrogenase enzymatic procedure. This method utilized serum, rather than whole blood.

In the Massachusetts and South Carolina sites, the alcohol dehydrogenase enzymatic method was used.

Exit Examinations
The method used for all exit examination samples is U.V. enzymatic (Metpath Laboratory).
Enrollment Examinations
Staff at the laboratory recorded the value on the Laboratory Recording Form. A
copy of the form can be found in Appendix C.

Exit Examinations
Laboratory results were recorded on computer tape.

Quality control:
The performance of the medical technician was monitored by the on-site supervisor
(R.N.), who observed task performance daily. This included the time between veni-
puncture and mixing of specimens, and the amount of time the specimen remained on
the mixer.

Quality control at the laboratory required a repeat analysis of all specimens with
test results which fell outside normal ranges established by the laboratory (see
Appendix B for recording forms with printed ranges).

Test results were monitored by the Document Control Center editor of the subcon-
tractor. If the difference between initial and repeat values was large, then the
laboratory was requested to reanalyze the specimen.

Each laboratory also had its own quality control program. Generally, the plan was
threefold and consisted of participation in the periodic "proficiency testing"
program of one or more external organizations which sponsor such programs, certifi-
cation by Medicare, and an in-house quality control program.

Reliability measurements:
At the beginning of the screening examination, a random sample of examinees was
selected to have extra blood drawn for "split sample analysis." Duplicate samples
from the same examinee (but labeled so that the laboratory would not recognize that
the two samples were in fact from the same examinee) were sent to the laboratory in
different batches. Test results were compared to determine split sample test reli-
ability. These duplicate samples were collected on 5 to 10 percent of the participants.
**ALCOHOLISM AND LIVER DISEASE**

<table>
<thead>
<tr>
<th>Test:</th>
<th>Serum Glutamic-Oxalacetic Transaminase (SGOT)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of test:</strong></td>
<td>Blood was drawn during the screening examination and sent to a local laboratory for analysis.</td>
</tr>
<tr>
<td><strong>Time required:</strong></td>
<td>Total time for venipuncture was approximately 5 minutes.</td>
</tr>
<tr>
<td><strong>Population screened:</strong></td>
<td>All persons 14 years of age or older</td>
</tr>
<tr>
<td><strong>Equipment:</strong></td>
<td>Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoseal, cotton balls, band-aids.</td>
</tr>
<tr>
<td><strong>Maintenance of equipment:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Personnel administering test:</strong></td>
<td>Enrollment Examinations Licensed medical technician</td>
</tr>
<tr>
<td></td>
<td>Two licensed medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other medical technician worked in all subsequent sites.</td>
</tr>
<tr>
<td><strong>Exit Examinations</strong></td>
<td>Registered nurse</td>
</tr>
<tr>
<td><strong>Training of personnel administering test:</strong></td>
<td>The venipuncture technician reviewed the laboratory procedures with the physician and the on-site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.</td>
</tr>
</tbody>
</table>
Enrollment Examinations
Venipuncture was performed and 15 ml of blood drawn into a red-top vacutainer. The blood was allowed to clot for 30 minutes, then centrifuged. While the specimen was spinning, a serum tube was labeled with the identification sticker of the examinee. The specimen was removed from the centrifuge and 7 ml of serum was drawn off and placed in the serum tube. The tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and 15 ml of blood was drawn into two red-top Corvac vacutainers for tests included in the SMA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells. The Corvac tube makes shipping and handling easier.

After 15 ml of blood is drawn into the tube, the tube is inverted six to eight times, the tube is allowed to sit for 20 minutes, no longer, and is then placed into a centrifuge and spun for 15 minutes. After spinning, the tube is then inverted and rotated 360° so that the R.N. can check to insure that no red cells have seeped through the gel barrier.

SGOT was determined by the SMA 12/60 system diazo method based on the procedure of Morgenstern.

Exit Examinations
SGOT was determined by the modified Reitman-Frankel alpha-keto glutarate hydrozone method.

Recording form:
Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix C.

Exit Examinations
Results were recorded on computer tape.
Alcoholism and Liver Disease--Serum Glutamic-Oxalacetic Transaminase (SGOT) (continued)

Quality control:

The performance of the medical technician was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. Preparation of the serum specimen required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the Document Control Center editor of the subcontractor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements:

At the beginning of the screening examination a random sample of examinees was selected to have extra blood drawn for "split sample analysis." Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5 to 10 percent of the participants.
ALCOHOLISM AND LIVER DISEASE

Test: Total Bilirubin

Description of test: Blood was drawn during the screening examination and sent to a local laboratory for analysis.

Time required: Total time for venipuncture was approximately 5 minutes.

Population screened: All persons 14 years of age or older

Equipment: Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoseal, cotton balls, band-aids.

Maintenance of equipment: None

Personnel administering test: Enrollment Examinations
Licensed medical technician

Exit Examinations
Registered nurse

Training of personnel administering test: The venipuncture technician reviewed the laboratory procedures with the physician and the on-site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.
Alcoholism and Liver Disease--Total Bilirubin (continued)

**Procedure:**
Enrollment Examinations
Venipuncture was performed and 15 ml of blood drawn into a red-top vacutainer. The blood was allowed to clot for 30 minutes, then centrifuged. While the specimen was spinning, a serum tube was labeled with the identification sticker of the examinee. The specimen was removed from the centrifuge and 7 ml of serum was drawn off and placed in the serum tube. The tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and 15 ml of blood was drawn into two red-top Corvac vacutainers for tests included in the SMA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells. The Corvac tube makes shipping and handling easier.

After 15 ml of blood is drawn into the tube, the tube is inverted six to eight times, the tube is allowed to sit for 20 minutes, no longer, and is then placed into a centrifuge and spun for 15 minutes. After spinning, the tube is then inverted and rotated 360° so that the R.N. can check to insure that no red cells have seeped through the gel barrier.

**Method of analysis:**

Enrollment Examinations
Total bilirubin was included in the SMA 12/60 panel. The SMA 12/60 system method is based on the procedure of Jendrassik and Groff, as adapted by Gambino and Schreiber. Serum bilirubin is reacted with diazotized sulfanilic acid in the presence of caffeine-sodium benzoate reagent.

Exit Examinations
Specimens were analyzed using a spectrophotometric method.

**Recording form:**

Enrollment Examinations
Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix C.
Alcoholism and Liver Disease—Total Bilirubin (continued)

Exit Examinations
Results were recorded on computer tape.

Quality control:
The performance of the medical technician was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. Preparation of the serum specimen required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the subcontractor's Document Control Center editor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements:
At the beginning of the screening examination a random sample of examinees was selected to have extra blood drawn for "split sample analysis." Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5 to 10 percent of the participants.
### ANEMIA

<table>
<thead>
<tr>
<th>Test:</th>
<th>Complete Blood Count (WBC, RBC, HGB, HCT, MCV, MCH, MCHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of test:</td>
<td>Blood was drawn during the screening examination and sent to a local laboratory for analysis.</td>
</tr>
<tr>
<td>Time required:</td>
<td>Total time for venipuncture was approximately 5 minutes.</td>
</tr>
<tr>
<td>Population screened:</td>
<td>All persons 6 months of age or older, except those persons answering &quot;Yes&quot; to the question &quot;Has a doctor ever told you that you (your child) have hemophilia or another bleeding disorder?&quot;.</td>
</tr>
<tr>
<td>Equipment:</td>
<td>Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoseal, cotton balls, band-aids.</td>
</tr>
<tr>
<td>Maintenance of equipment:</td>
<td>None</td>
</tr>
<tr>
<td>Personnel administering test:</td>
<td>Enrollment Examinations Licensed medical technician under the supervision of a registered nurse</td>
</tr>
<tr>
<td></td>
<td>Two medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other worked in all subsequent sites.</td>
</tr>
<tr>
<td></td>
<td>Exit Examinations Registered nurse</td>
</tr>
</tbody>
</table>
Anemia--Complete Blood Count (WBC, RBC, HGB, HCT, MCV, MCH, MCHC) (continued)

Training of personnel administering test:

The venipuncture technician reviewed the laboratory procedures with the physician and the on-site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Enrollment Examinations

Procedure:

Samples from children ages 6 months to 1 year were obtained using a finger stick. A finger was stuck with a lancet and then the first drop of blood wiped away with cotton. A draw tube was then attached to a 44.7 micrometer micropipette and a full tube of blood was drawn. Blood was then blown into a red-top vacutainer (15 ml) containing 10 ml Isotone solution. The vacutainer was labeled with the examinee's identification sticker and refrigerated.

Exit Examinations

During exit examinations, the finger stick method of hematocrit was analyzed on site, rather than at the laboratory. Pipettes were filled, one end was sealed and pipettes were spun in the Infant Readacrit Centrifuge Model 0591 for 3 minutes. The results of each tube were read and the average reading was recorded on the appropriate form.

Samples from all other examinees were obtained through venipuncture. Blood was drawn into two lavender-top vacutainers (5 ml) containing EDTA, potassium sorbate. The tubes were labeled, capped, and immediately put on the aliquot mixer for 10 minutes. The tubes were then refrigerated until delivery to the laboratory.

Method of analysis:

Coulter S

Recording form:

Enrollment Examinations

The values printed out by the Coulter S were transcribed by staff at the cooperating laboratory onto the Laboratory Recording Form. A copy of the form can be located in Appendix C.

Exit Examinations

Results were recorded on computer tape.
Anemia--Complete Blood Count (WBC, RBC, HGB, HCT, MCV, MCH, MCHC) (continued)

Quality control:
The performance of the medical technician was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. Whole blood preparation required that the specimen be placed immediately on the aliquot mixer.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for Recording Forms with printed ranges). Test results were reviewed by the editor of the subcontractor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements:
At the beginning of the screening examination, a random sample of examinees was selected to have extra blood drawn for "split sample analysis." Duplicate samples from the same batches (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5 to 10 percent of the participants.
Chest X-ray

One posterior-anterior chest x-ray was taken of all examinees 25 years of age or older and of examinees 14 to 24 years of age who reported a history of hypertension, heart disease, or lung disease. In addition, an x-ray was taken of any examinee 14 years or older with a blood pressure reading ≥90 mm Hg diastolic or ≥140 mm Hg systolic. No x-rays were taken of pregnant women.

5 minutes

All examinees 25 years of age or older, except pregnant women. Any examinee 14 to 24 years of age who answered "Yes" to any of the following questions:

1. Have you ever taken any of these heart medicines: digitalis, digitalis leaf, digitoxin, or digoxin?
2. During the past 12 months, have you ever felt short of breath or has the doctor ever told you that you had heart failure?
3. Have you had pain, discomfort, heaviness, or pressure in your chest in the past 12 months, not related to an injury or a "chest cold"?
4. Has a doctor ever said you have high blood cholesterol?
5. Have you ever been told by a doctor that you had high blood pressure?
6. Are you now taking pills or medicine for high blood pressure?
7. Has a doctor ever told you that you had bronchitis or emphysema?
8. Do you bring up phlegm (sputum) on most days for at least three months of the year?
9. Did anyone ever say you had a positive TB skin test?

Any examinee with a blood pressure reading ≥90 mm Hg diastolic or ≥140 mm Hg systolic.
**Cardiovascular Disease—Chest X-ray (continued)**

**X-rays were not given to any women who knew or suspected they were pregnant.**

Determination of pregnancy was made on the basis of written response to the question, "Are you now pregnant?" and verbal response to the question, "Do you have any reason to suspect you may be pregnant?"

<table>
<thead>
<tr>
<th><strong>Equipment</strong></th>
<th><strong>Enrollment Examination</strong></th>
<th><strong>Exit Examination</strong></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Toshiba, capacitor x-ray unit</td>
<td>Picker (capacitor discharge, photo timer)</td>
</tr>
<tr>
<td></td>
<td>Kodak M-7 processor</td>
<td>x-ray unit</td>
</tr>
<tr>
<td></td>
<td>Chest chamber</td>
<td>Kodak RP X-Omat processor Model M6AN</td>
</tr>
<tr>
<td></td>
<td>Toshiba KCD 121L</td>
<td>DuPont daylight system</td>
</tr>
<tr>
<td></td>
<td>Profexray J-550-1</td>
<td>DuPont film loader</td>
</tr>
<tr>
<td></td>
<td>Hospital gowns</td>
<td>DuPont highplus cassette</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DuPont cronex medical x-ray film #4</td>
</tr>
</tbody>
</table>

**Standardization & maintenance of equipment:**

The calibration of the x-ray unit was performed by a certified x-ray serviceman prior to screening in each of the four HIS sites. Calibration was also performed each time 500 x-rays were taken, approximately every six weeks.

Calibration of the x-ray unit was performed by a representative of the Picker Corporation prior to testing in Dayton. Calibration was in accordance with Picker Corporation Technical Manual P103:TM, July 1975.

**Daily calibration:**

The Toshiba unit was turned on daily and allowed to warm up for 30 minutes prior to screening. Three exposures were made at 4MAS-50KV to test the unit.

The processor required daily adjustment of the micro switches and cleaning of the cross-over racks. Cross-overs were removed, the rollers cleaned with a damp cloth, and then wiped dry. The inside of the processor was wiped off to remove all chemical deposits above the processing level.

Cleanup, preventive maintenance, and replenishment of the Kodak processor were done in accordance with Kodak RP X-Omat Processor Operation Checklist (Revised July 1970).

**Periodic calibration:**

Cleaning of the processor deep racks was performed monthly.
Cardiovascular Disease—Chest X-ray (continued)

Personnel administering test: Certified x-ray technician, registered with the American Registry of Radiologic Technologists

One x-ray technician took all the x-rays during Dayton screening. Another x-ray technician took all the x-rays during screening in subsequent sites.

(Personnel interpreting test): Board-certified radiologist

Training of personnel administering test: In addition to the formal training required for certification, the x-ray technician received one day of training with the radiologist appointed to read screening examination x-rays. The radiologist watched the x-ray technician positioning patients and taking x-rays and offered suggestions for improving techniques. A quality x-ray has the following characteristics: 1) the ability to see through the heart; 2) clear lung fields (not too black); 3) entire lung field on the x-ray. The radiologist accepted nineteen of twenty "special training" x-rays taken by the x-ray technician and examined by the radiologist for quality.

On-site training of the x-ray technician included a short training session on the proper use of recording forms and a practice session in explaining the x-ray procedure to the examinee. Emphasis was placed on the maintenance of examinee privacy.

For exit examinations, the x-ray technician received two days of training by Synergetics, Inc., in Gainesville, Florida in addition to training described in the previous paragraphs.

Enrollment Examination

Procedure: Examinees eligible to receive a chest x-ray were instructed to undress from the waist up. Women were given a hospital gown to wear. All examinees wore a lead apron covering the area from the waist down.

A 14" x 17" cassette was placed into the chest board with the light green side toward the examinee. The examinee was positioned standing with the chest against the chest board, with the cassette 1-1/2" above the examinee's shoulders.
The light on the x-ray unit was turned on, to position the unit properly. The dark plus mark was centered to about 2" above the examinee's waist, directly on the spine so that the x-ray head was not hitting the spine at an angle. The cassette was placed 72" from the x-ray cone.

The amount of radiation exposure used was as follows:

Small examinees: 8MAS-70 to 75KV
Medium examinees: 20MAS-80KV
Large examinees: 50MAS-80 to 90KV

After the cone was positioned, the examinee was instructed to take a deep breath and hold it in while remaining still. The technician pushed both the stand-by button and the exposure button. After the exposure was completed, the examinee was instructed to release the breath, step back from the chest board, and relax.

In order to label the x-ray, the printer card was folded along the dotted line and the identifier numbers were placed over the film, with the name over the green square. The printer was inserted into a slot behind the silver nameplate marker and left for approximately 5 seconds.

X-ray films were developed before the examinee continued the remainder of screening tests. If the x-ray was of poor technical quality, the x-ray was repeated.

Exit Examination

Procedure:

Examinees eligible to receive a chest x-ray were instructed to undress from the waist up. Women were given hospital gowns to wear. All examinees were given a lead apron to wear covering the area from the waist down.

A 14" x 17" cassette was placed into the chest board with the light green side towards the examinee. The examinee was positioned standing with chest against the chest board with the cassette 1-1/2" above the shoulders.

The collimator light was turned on to position the unit properly. The cassette was placed 72" from the x-ray tube. The "r" mark was centered about 4" above the examinee's waist directly on the spine so the x-ray did not hit the spine at an angle.
Cardiovascular Disease--Chest X-ray (continued)

The amount of radiation exposure used was as follows:

Small examinees:  6MAS  65-70KV
Medium examinees: 12MAS  75-80KV
Large examinees: 20MAS  85-90KV

After the examinee was positioned, he was instructed to take a deep breath and
hold it while remaining still. The technician stepped into the radiationproof
booth, closed the lead-lined door and pushed both the stand-by button and the
exposure button. After the exposure was completed, the examinee was instructed
to release his breath, step back from the chest board, and relax. X-ray confirma-
tion was then sent through the computer. After each x-ray film was developed, an
individual patient identification sticker was placed on the film.

X-ray films were developed before the examinee continued the remainder of screening
tests. If the x-ray was of poor technical quality, the x-ray was repeated.

Interpretation of x-rays:

Enrollment Examination

X-rays were read by a board-certified radiologist using the x-ray interpretation
card (Fig. 1) as a guide.

The interpretation was recorded on the x-ray interpretation card. The card has
been divided into three sections: Cardiovascular Pathology, Pulmonary Pathology,
and Other Pathology. Each of these sections contains a list of conditions which
the radiologist may have found when reading the x-ray. The radiologist recorded
his interpretation by circling the appropriate condition in each of the three sec-
tions. Space was provided for the recording of comments.

Exit Examination

X-rays were read by a board-certified radiologist. Immediate notification was made
to the technician if the quality of x-rays dropped.
### Cardiovascular Disease—Chest X-ray (continued)

#### Cardiovascular Pathology

**2100 WNL**
- **Cardiac Enlargement**
  - **2210 Borderline**
  - **2221 L/H**
  - **2222 Generalized**
  - **2223 Other (specify)**
- **C-T Ratio** __cm: __cm__

#### Pulmonary Pathology

(Please Select No More Than 10)
- **1100 WNL**
- **1200 Chronic Lung Disease**
  - **1210 Suspicion**
  - **1211 Definite**
  - **1221 Patchy hypovascularity**
  - **1222 Hyperexpansion**

#### Findings of Congestive Heart Failure

- **2310 Redistribution of pulmonary flow**
- **2320 Kerley lines**
- **2330 Pulmonary edema**
- **2340 Pleural effusion**
- **2410 Aortic changes consistent with hypereosaion**

#### Vascular Calcification

- **2510 Aortic calcification**
- **2520 Non-aortic vascular calcification**
- **2600 Other cardiovascular pathology, and comments:**

#### Consistent with Tuberculosis

- **1310 Old TB**
- **1320 Acute TB**
- **1410 Infiltrate**
- **1420 Granuloma**
- **1430 Lung calcifications**
- **1440 Lung mass lesion**

#### Other Pathology

- **3100 WNL**
- **3200 Hilar enlargement**
- **3220 Bone abnormalities**
- **3230 Mediastinal mass**
- **3260 Other (specify):**

#### Other Pulmonary Pathology

- **1510 Fibrosis**
- **1520 Pleural thickening**
- **1560 Comments:**

**Fig. 1—Chest x-ray Interpretation card**
Cardiovascular Disease--Chest X-ray (continued)

The radiologist's interpretation was recorded on the x-ray result sheet (Fig. 2). The radiologist consulted the Radiology Codes (Fig. 3) and recorded his findings on the result sheet.

The following information was reported:

1. Normal or abnormal
2. If abnormal, specific nature of the abnormality. A list of criteria was supplied to Rand (Fig. 3).

Recording form:

1. Response to question "Is examinee pregnant?" was circled. This question was included on the recording form as an exclusion device to prevent pregnant women from being x-rayed.

2. If examinee was not pregnant, responses were circled to questions relating to history of hypertension, taking of blood pressure medications, history of lung disease, history of heart disease, and question about blood pressure reading.

3. The Completion Code was filled in. (See Appendix B for codes.)

The x-ray interpretation was recorded on the form by the Coordinator of the Document Control Center. The interpretation was transcribed from the x-ray interpretation card used by the physician.

Recording of x-ray interpretation:

4. If the physician recorded WNL (within normal limits) in all three sections of the interpretation card, WNL was circled on the Recording Form.

5. If a cardiac enlargement was recorded, the cardio-thoracic ratio (C-T ratio) was recorded.
<table>
<thead>
<tr>
<th>PID</th>
<th>RESULT</th>
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</table>

Fig. 2- X-ray result sheet
MEDICAL SIGNIFICANCE
1. Normal appearance
2. Non-significant findings
3. Possibly significant findings
4. See report

LUNG VESSELS
29. Prominent conus
30. Pulmonary congestion

CHEST WALL, NECK
31. Mastectomy
32. Thoracotomy
33. Neck calcification
34. Foreign body
35. Sutures

DIAPHRAGM
7. Elevated, left
8. Elevated, right
9. Bulge, left
10. Bulge, right

BONES
36. Old rib fracture(s)
37. Cervical rib(s)
38. Old fracture clavicle
39. Osteoarthritis spine
40. Bone island
41. Rib surgery
42. Scoliosis
43. Bursal calc. shoulder
44. Rib anomaly

LUNGS
11. Azygos lobe
12. Apical lesion(s), left
13. Apical lesion(s), right
14. Calcification, slight
15. Calcification, diffuse
16. Calcified complex
17. Scar(s), left
18. Scar(s), right
19. Plate atelectasis
20. Septal thickening
21. Right cardiophrenic density
22. Suspect emphysema

PLEURA
45. Blunted angle, left
46. Blunted angle, right
47. Thickening apex, left
48. Thickening apex, right
49. Tenting
50. Adhesions
51. Calcification

HEART
23. Unusual shape
24. Borderline size
25. Unusual position

LUNG ROOTS
52. Borderline size, left
53. Borderline size, right
54. Calcification, left
55. Calcification, right
56. RRD
57. LLD

AORTA
26. Elongation
27. Calcification
28. Widening

Fig. 3—Radiology codes
Cardiovascular Disease--Chest X-ray (continued)

6. The numerical codes corresponding to conditions circled by the physician were recorded. At least three codes were always recorded, one for each of the three pathology sections. Any comments made by the physician were coded as 1600, 2600, and 3300 in their respective sections. Comments were also transcribed onto the form.

Quality control: The quality of the x-rays was monitored by the radiologist. If more than two out of every fifty x-rays were of poor quality, a retraining session would have been held for the technician. (See "Training of personnel administering test" for a description of a quality x-ray.) However, the x-rays from all sites were consistently of high quality.

Reliability measurements: In order to avoid any maturation effect, x-rays from both entry and exit screening examinations will be mixed together and evaluated at the time of the exit screening examinations. Two board-certified radiologists will independently read the x-rays. Comparisons will then be made for agreement in identification and interpretation of abnormalities.
**CHEST X-RAY**

<table>
<thead>
<tr>
<th>I. IS THE EXAMINEE PREGNANT?</th>
<th>1. YES (do NOT x-ray) 2. NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. IS THE EXAMINEE OVER 25 YEARS OF AGE?</td>
<td>1. YES - 2. NO</td>
</tr>
<tr>
<td>GIVES HISTORY OF HYPERTENSION?</td>
<td>1. YES - 2. NO</td>
</tr>
<tr>
<td>TAKING ANTI-HYPERTENSIVE MEDICATION?</td>
<td>1. YES - 2. NO</td>
</tr>
<tr>
<td>POSITIVE ANSWER TO LUNG DISEASE QUESTION?</td>
<td>1. YES - 2. NO</td>
</tr>
<tr>
<td>POSITIVE ANSWER TO HEART DISEASE Q.?</td>
<td>1. YES - 2. NO</td>
</tr>
<tr>
<td>B.P. READING ≥140 SYSTOLIC OR ≥90 DIASTOLIC?</td>
<td>1. YES - 2. NO</td>
</tr>
</tbody>
</table>

(if answer to any question in item II is YES, perform chest x-ray; otherwise do not)

**COMPLETION CODE** ..............................................................

**RADIOLOGIST INTERPRETATION** ..............................................

1. WNL 2. ABNORMAL

**C-T RATIO (If cardiac enlargement present)**

<table>
<thead>
<tr>
<th></th>
<th>cm</th>
<th>cm</th>
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**FINDINGS CODES** ............................................................

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CARDIOVASCULAR DISEASE

Test: Electrocardiogram (ECG)

Description of test: Examinees were given an electrocardiogram while in a relaxed supine position.

Time required: 10 minutes were required for the test and undressing/dressing.

Population screened:
1. Males 30 years of age and older; females 35 years of age and older.
2. Other persons 14 years of age and older who answered "Yes" to any of the following questions:
   "Have you ever taken any of these heart medicines: digitalis, digitalis leaf, digitoxin, or digoxin?"
   "During the past 12 months, have you ever felt short of breath or has the doctor ever told you that you had heart failure?"
   "Have you had pain, discomfort, heaviness or pressure in your chest in the past 12 months, not related to an injury or a 'chest cold'?"
   "Has a doctor ever said you have high blood cholesterol?"
   "Have you ever been told by a doctor that you had high blood pressure?"
   "Are you now taking pills or medicine for high blood pressure?"
3. Persons whose blood pressure reading during the blood pressure examination was ≥90 mm Hg diastolic or ≥140 mm Hg systolic.

Enrollment Examinations
12 lead electrocardiograph (Hewlett-Packard 1514A)

Exit Examinations
12 lead electrocardiograph Model 2201A ECG/VCG Station (Synergetics, Inc.)
Cardiovascular Disease—Electrocardiogram (ECG) (continued)

Enrollment Examinations
Malfunctions of the electrocardiograph were repaired by a representative from the Hewlett-Packard Medical Electronics Division

Exit Examinations
The electrocardiograph was calibrated by a representative of Synergetics, Inc., Gainesville, Florida.

Daily operator maintenance was performed according to the MITV Operator's Manual.

Enrollment Examinations
Medical technician

The same medical technician performed the electrocardiogram in all screening sites.

Exit Examinations
Registered nurse

Enrollment Examinations
In addition to past experience in operating an ECG machine, the medical technician was retrained by the Coordinator (a registered nurse) of the subcontractor in the correct procedures for taking an electrocardiogram. Training consisted of a review of the Hewlett-Packard ECG Operating Manual, a demonstration of the best methods for obtaining a quality ECG, and observation of the performance of the medical technician. Training was conducted the day prior to screening in each site.

Exit Examinations
In addition to past experience in operating an ECG machine, the R.N. was trained by the His consulting cardiologist at the University of Florida Medical Center, Gainesville, Florida.

Procedures:

Fifteen minutes before the first ECG of the day was performed the machine was turned on and the system was checked to ensure it was resting on the proper line.

The medical technician looked at the medical abstract sheet to determine whether the examinee was eligible to receive an electrocardiogram, and if eligible, the examinee was requested to undress to the waist. In addition, the examinee was instructed to remove all watches and bracelets, and to remove any keys from pockets. The examinee was then requested to lie down on the ECG table.

If the examinee answered "Yes" to the question "Are you currently taking any heart medication?", the medical technician requested the name of the medication and recorded this on the Confidential Recording Form.

Chest leads and limb leads were attached using electrode gel. Limb leads were color-coded for placement. The placement of chest leads was done as suggested in the Hewlett-Packard ECG Operating Manual (see Appendix E, Item 2).

Before starting the ECG the examinee was asked to relax by taking a few deep breaths.

Enrollment Examinations
The electrocardiogram was performed according to the instructions in the Hewlett-Packard 1514A Operating Manual. The machine was set to a normal recording sensitivity of 1 mV/cm. Paper speed was set at 25 millimeters per second. Before changing the selector button to the next lead, the medical technician checked to make certain that the ECG strip was straight. In addition, a distinct central standard mark was made by pushing quickly on the standard button.

Exit Examinations
The electrocardiogram was performed according to the instructions of the Synergetics manual. Before running the actual ECG graph, a check of all leads was made. This was done by depressing lead selector buttons in sequence and checking the proper signal for each lead on the monitor oscilloscope. When all signals were satisfactory, the "Send" switch was depressed and the ECG/VCG station cycled through 5 seconds of each lead selection.
When the ECG was completed, the leads were disconnected from the examinee and the examinee was instructed to dress.

The ECG was immediately labeled. It was then cut, mounted, and placed in the Confidential Recording Form.

Enrollment Examinations
Electrocardiograms were interpreted by a board-certified cardiologist. Interpretations were recorded on the ECG mounting and later transcribed onto the Confidential Recording Form. Codes used for ECG interpretation are listed in Appendix D.

Exit Examinations
Electrocardiograms were screened by the USPHS computer program ECAN, Version E. Abnormal or borderline electrocardiograms were interpreted by a board-certified cardiologist. Interpretations were recorded, based on the Cardiology Report Codes listed in Appendix D. The cardiologist recorded his interpretation on the Cardiology Interpretation Form (Fig. 1).
**Fig. 1**—Cardiology Interpretation Form
Cardiovascular Disease—Electrocardiogram (continued)

Enrollment Examinations

1. The medical technician determined eligibility for the ECG.
2. The Completion Code was filled in (see Appendix B for a list of codes).
3. Physician interpretation was transcribed onto the form by the Document Control Center editors of the subcontractor.

<table>
<thead>
<tr>
<th>IS EXAMINEE MALE AND 30 YEARS OR OLDER, OR FEMALE AND 35 YEARS OR OLDER?</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIVES HISTORY OF HYPERTENSION?</td>
<td>1.</td>
<td>2.</td>
</tr>
<tr>
<td>CLAIMS TO BE TAKING ANTI-HYPERTENSIVE MEDS</td>
<td>1.</td>
<td>2.</td>
</tr>
<tr>
<td>B.P. READING ≥140 SYSTOLIC OR ≥90 DIASTOLIC? (if the answer to any of the above questions is YES, perform ECG; otherwise do not)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td>1. WNL 2. ABNORMAL</td>
<td></td>
</tr>
<tr>
<td>ECG INTERPRETATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CODE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME OF MEDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Digitalis or similar? Yes</td>
</tr>
<tr>
<td>2. Quinidine or similar? Yes</td>
</tr>
<tr>
<td>3. Other cardiac: Yes</td>
</tr>
</tbody>
</table>
Cardiovascular Disease--Electrocardiogram (continued)

Quality control:

Enrollment Examinations
The performance of the medical technician taking the electrocardiograms was monitored by the Rand physician during the first three days of screening at each site. An assessment of quality was made based on observation only.

Exit Examinations
The performance of the technician taking the electrocardiograms was monitored by the Rand physician during the first three days of screening at the site.

ECGs are occasionally rejected by the computer as a result of inaccurate data. In this case an error message is relayed to the CRT operator. The CRT operator relays the message number back to the ECG operator. When the computer rejects the ECG data, the electrocardiogram automatically stops and a reject light flashes on the ECG panel.

<table>
<thead>
<tr>
<th>ECG ERROR NUMBER</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>insufficient data for lead set</td>
</tr>
<tr>
<td>3</td>
<td>PID change</td>
</tr>
<tr>
<td>4</td>
<td>data errors</td>
</tr>
<tr>
<td>5</td>
<td>station code changed</td>
</tr>
<tr>
<td>6</td>
<td>invalid station code</td>
</tr>
<tr>
<td>7</td>
<td>examinee not registered</td>
</tr>
<tr>
<td>8</td>
<td>invalid gain word</td>
</tr>
<tr>
<td>9</td>
<td>invalid gain data</td>
</tr>
</tbody>
</table>

Reliability measurements:
No reliability measurements were performed during enrollment testing. In order to avoid any maturation effect, ECGs from both enrollment and exit screening examinations will be mixed together and evaluated at the time of the exit screening examination. Two board-certified cardiologists, using an agreed-upon set of interpretive criteria (e.g., criteria for diagnosing left ventricular hypertrophy), will independently read the ECGs. Comparisons will then be made for agreement in and identification and interpretation of abnormalities.
**CARDIOVASCULAR DISEASE**

<table>
<thead>
<tr>
<th>Test:</th>
<th>Serum Cholesterol Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of test:</strong></td>
<td>Blood was drawn during the screening examination and sent to a local laboratory for analysis.</td>
</tr>
<tr>
<td><strong>Time required:</strong></td>
<td>Total time for venipuncture was approximately 5 minutes.</td>
</tr>
<tr>
<td><strong>Population screened:</strong></td>
<td>All persons 14 years of age or older</td>
</tr>
<tr>
<td><strong>Equipment:</strong></td>
<td>Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoseal, cotton balls, band-aids.</td>
</tr>
<tr>
<td><strong>Maintenance of equipment:</strong></td>
<td>None</td>
</tr>
</tbody>
</table>
| **Personnel administering test:** | **Enrollment Examinations**  
  Licensed medical technician  
  Two licensed medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other worked in all subsequent sites.  
  **Exit Enrollments**  
  Registered nurse |
Cardiovascular Disease--Serum Cholesterol Level (continued)

Training of personnel administering test:
The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Procedure:
Enrollment Examinations
Venipuncture was performed and 15 ml of blood drawn into a red-top vacutainer. The blood was allowed to clot for 30 minutes, then centrifuged. While the specimen was spinning, a serum tube was labeled with the examinee's identification sticker. The specimen was removed from the centrifuge and 7 ml of serum was drawn off and placed in the serum tube. The tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and 15 ml of blood was drawn into two red-top Corvac vacutainers for tests included in the SMA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells. The Corvac tube makes shipping and handling easier.

After 15 ml of blood is drawn into the tube, the tube is inverted six to eight times, the tube is allowed to sit for 20 minutes, no longer, and is then placed into a centrifuge and spun for 15 minutes. After spinning, the tube is then inverted and rotated 360° so that the R.N. can check to ensure that no red cells have seeped through the gel barrier.

Method of analysis:
Enrollment Examinations
Serum cholesterol level was included in the SMA 12/60 panel. The method used by the SMA 12/60 system was based on Huang's modification of the Liebermann-Burchard reagent for use in the direct determination of serum cholesterol.

Exit Examinations
The method of analysis used for serum cholesterol was enzymatic cholesterol oxidase.
Cardiovascular Disease—Serum Cholesterol Level (continued)

Recording form:
Enrollment Examinations
Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix B.

Exit Examinations
Laboratory results are recorded on computer tape.

Quality control:
Medical technician performance was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. Serum preparation required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix B for recording forms with printed ranges). Test results were reviewed by the Document Control Center editor of the subcontractor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements:
At the beginning of the screening examination a random sample of examinees was selected to have extra blood drawn for "split sample analysis." Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5 to 10 percent of the participants.
CHILD GROWTH AND DEVELOPMENT

Test:

Denver Developmental Screening Test

The Denver Developmental Screening Test (DDST) was designed to aid in the early discovery of children with developmental problems. It was included in the HIS screening examination in order to identify developmental abnormalities which might require attention from the health care system.

The DDST was selected for developmental screening for several reasons: It has been standardized on a large number of children, representing a cross-section of the population. The test can be easily administered by nonprofessionals. The developers of the test offer a training course which standardizes all testers.

Description of test:

The DDST uses a variety of simple tools and tasks to screen the development of infants and children. The items of the test are divided into four areas: gross motor skills, language skills, fine motor adaptive skills, and personal social skills. An overall score of normal, questionable, or abnormal is given.

Time required:

10 to 25 minutes

Population screened:

Children aged 2 weeks through 5 years of age—Dayton enrollment site
Children aged 6 months through 4 years of age—other sites

Equipment:

Red wool, raisins, rattle with narrow handle, eight 1" square colored blocks (red, blue, yellow, and green), small clear glass bottle with a 5/8" opening, small bell, tennis ball, pencil, DDST examination form (see Fig. 1), plain drawing paper.

Maintenance of equipment:

None
Fig. 1—Denver Developmental Screening Test form
Enrollment Examinations
Medical assistant with certification from the University of Colorado DDST Training Program

Four individuals received DDST training; however, only two individuals performed the DDST—one individual in Dayton and the other in subsequent sites.

Exit Examinations
Two registered nurses with certification from the University of Colorado DDST Training Program

Training of personnel administering test:
The individual trained in DDST administration was selected on the basis of being comfortable in relating to small children. The training course, conducted by the University of Colorado Medical Center, was a three-day workshop which consisted of filmed instructions, manual/workbook exercises, discussion and practice testing. On the last day of the training course, the medical assistant was required to pass a proficiency evaluation consisting of written and film exercises and observed testing.

Procedure:
The Denver Developmental Screening Test was administered according to the manual developed by Frankenburg, Dodds, and Fandul of the University of Colorado Medical Center (see Appendix A, Item 3).

Prior to test administration, the exact age of the child in days, months, and years was computed in order to determine what tests were to be performed. A line was then drawn on the test form (Fig. 2), using the ages shown at the top and bottom of the form as a guide. For example, if the test was administered on March 1, 1970, to a child 3 years and 3 months of age, the age line would be drawn halfway between 3 and 3-1/2 years (Fig. 2). If the child was born prematurely, the number of weeks early was subtracted from the age of the child and the line was drawn at this adjusted age (Fig. 3).

The DDST was administered in a quiet area so that the child was not distracted by other people or sounds. A small table and chairs were used so that the child was on the same level as the medical assistant. This allowed more freedom of movement.

Depending on the need of the child, the parent was allowed to be present during testing; however, the parent was requested not to coach the child in any way.
Fig. 2—Age line on Denver Developmental Screening Test form

Fig. 3—Age line on Denver Developmental Screening Test form showing adjustment for premature birth
The tasks the child was required to perform were listed to the left of the age line on the DDST form (Fig. 4). The scoring was determined by a notation of the number of delays in the accomplishment of the tasks. A "delay" was any item failed which fell completely to the left of the age line. A delay in any one of the four sub-test areas was indicated when the child was not able to pass an item which more than 90 percent of children of his chronological age were able to do. A failure through which the age line passed was not a delay. Scores were assigned as follows:

ABNORMAL--two or more sections with two or more delays; or one sector with two or more delays plus one sector or more with one delay and no passes through the age line in that sector;

QUESTIONABLE--one sector with two or more delays; or one or more sectors with one delay and no passes through the age line in that sector;

NORMAL--any condition not otherwise listed;

UNTESTABLE--refusals occurred in numbers large enough to cause the test results to be questionable or abnormal (if they were scored as failures).

The "untestable" score was a modification of the usual DDST scoring system. It was added after Dayton screening because the environment of the screening center was at times less than optimal for the DDST.
1. Try to get child to smile by smiling, talking, or waving to him. Do not touch him.
2. When child is playing with toy, pull it away from him. Pass if he resists.
3. Child does not have to be able to tie shoes or button in the back.
4. Move yarn slowly in an arc from one side to the other, about 6" above child's face.
   Pass if eyes follow 90° to midline. (Past midline; 12")
5. Pass if child grasps rattle when it is touched to the bases or tips of fingers.
6. Pass if child continues to look where yarn disappeared or tries to see where it went. Yarn
   should be dropped quickly from sight from tester's hand without arm movement.
7. Pass if child picks up raisin with any part of thumb and a finger.
8. Pass if child picks up raisin with the end of thumb and index finger using an overhand
   approach.
10. Which line is longer? Repeat. (1/2 or 1/4)
11. Pass any crossing lines.
12. Have child copy first. If failed, demonstrate.

When giving items 9, 11 and 12, do not name the forms. Do not demonstrate 9 and 12.

13. When scoring, each pair (2 ears, 2 legs, etc.) counts as one part.
14. Point to picture and have child name it. (No credit is given for sounds only.)

15. Tell child to: Give block to Mummy; put block on table; put block on floor. Pass 2 of 3.
   (Do not help child by pointing, moving head or eyes.)
16. Tell child to: Put block on table; under table; in front of chair; behind chair.
   Pass 3 of 4. (Do not help child by pointing, moving head or eyes.)
17. Ask child: What do you do when you are cold?..hungry...tired? Pass 2 of 3.
18. Ask child: If five is hot, ice is ? Mother is a woman; Dad is a ?; a horse is big, a
   mouse is . Pass 3 of 3.
   ..bed? ..window? Pass if defined in terms of size, shape, what it is made of or general
   category (such as banana is fruit, not just yellow). Pass 3 of 3.
20. Ask child: What is a spoon made of? ..a shoe made of ..a door made of? (No other objects
   may be substituted.) Pass 3 of 3.
21. When placed on stomach, child lifts chest off table with support of forearms and/or hands.
22. When child is on back, grasp his hands and pull him to sitting. Pass if head does not hang back.
23. Child may use wall or rail, not person. May not crawl.
24. Child must throw ball overhead 3 feet to within arm's reach of tester.
25. Child must perform standing broad jump over width of test sheet. (2-1/2 inches)
26. Tell child to walk forward, - - - - - - - heel within 1 inch of toe.
   Tester may demonstrate. Child must walk 4 consecutive steps, 2 out of 3 trials.
27. Bounce ball to child who should stand 3 feet away from tester. Child must catch ball with
   hands, not arms, 2 out of 3 trials.
28. Tell child to walk backward, - - - - - - - toe within 1 inch of heel.
   Tester may demonstrate. Child must walk 4 consecutive steps, 2 out of 3 trials.

DATE AND BEHAVIORAL OBSERVATIONS (how child feels at time of test, relation to tester, attention
span, verbal behavior, self-confidence, etc.):

157. 10-70 Distributed as a service by Mead Johnson Laboratories

Fig. 4—Tasks included in Denver Developmental Screening test
Child Growth and Development—Denver Developmental Screening Test (continued)

Recording form:
1. Eligibility for the test was determined by circling response to age question.
2. Test was performed and score recorded.
3. The Completion Code was filled in (see Appendix B for codes).

<table>
<thead>
<tr>
<th>IS EXAMINEE LESS THAN 5 YEARS OF AGE?</th>
<th>YES</th>
<th>NO (do not perform test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST RESULTS</td>
<td>1. NORMAL 2. JNTESTABLE 3. ABNORMAL 4. QUESTIONABLE</td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quality control: None

Reliability measurements: A comparison of our data to data collected by Frankenburg, Dodds, and Fandal in the original standardization study was made after adjustment for age, sex, and socio-economic status.
## Child Growth and Development

**Test:** Head Circumference  

**Description of test:** Infant head circumference was measured with a tape measure.  

**Time required:** 2 minutes  

**Population screened:** Children ≤2 years of age  

**Equipment:** Tape measure  

**Maintenance of equipment:** None  

**Personnel administering test:**  

- **Enrollment Examinations**  
  - Medical assistant (non-licensed) with experience in handling infants

  One medical assistant performed the measurements throughout Dayton screening. Another medical assistant performed the measurements in all other sites. During Charleston and Georgetown screening, an additional medical assistant was trained and performed the measurements for approximately two weeks.

- **Exit Examinations**  
  - Registered nurse

**Training of personnel administering test:**  

- The physician demonstrated the proper placement of the tape measure for head circumference. During the first three days of screening, the procedure performed by the medical assistant was observed by the physician. The physician also requested that the medical assistant explain the procedure as it was being performed.
Child Growth and Development—Head Circumference (continued)

Procedure: The child was placed on the examination table and the head circumference was measured by placing a tape measure tightly around the infant's head, passing over the occipital and frontal lobes (about 2-1/2 centimeters above the ears). The measurement was recorded—then the procedure was repeated.

Recording form: 1. Eligibility for the test was determined by the examinee's age.
2. Measurement was recorded to the nearest 1/4 inch.
3. Measurement was repeated and the repeat measurement recorded.

| HEAD CIRCUMFERENCE (Do not measure if child 2 years or older) | __ __ __ INCHES |
|---------------------------------------------------------------------------------------------------------------|
| REPEAT HEAD CIRCUMFERENCE | __ __ __ INCHES |

Quality control: The procedure for head circumference measurement was observed during site visits by both the physician and the Coordinator of the subcontractor.

Reliability measurements: After the head circumference was measured, the child was re-measured. This procedure resulted in an immediate test-retest reliability measure. Also, approximately 10 percent of infants measured received a repeat measurement 1 hour after the initial measurement, which resulted in a test-retest reliability measurement.
CHILD GROWTH AND DEVELOPMENT

Test: Length, Height

Description of test: Two measurements were taken of length (infants) or height (children).

Time required: 3 minutes

Population screened:
- Length was measured on all children <2 years of age
- Height was measured on all children ≥2 years of age

Equipment:
- Graham Field Infantometer
- Health-O-Meter adult height-weight scale

Standardization & maintenance of equipment: None

Personnel administering test:
- Enrollment Examinations
  - Medical assistant
- Medical assistant performed the measurements throughout Dayton screening.
  - Another medical assistant performed the measurements in all other sites. During Charleston and Georgetown screening, an additional medical assistant was trained and performed the measurements for approximately two weeks.

- Exit Examinations
  - Registered nurse

Training of personnel administering test:
- Training was conducted by the registered nurse the day before screening began.
- Training on the proper use of the infantometer included special instructions on positioning the child and reading of the scale. During the first three days of screening, the procedure performed by the medical assistant was observed by the physician to ascertain that instructions were properly carried out.

(For training in use of adult height-weight scale, see Obesity--Height and Weight.)
Procedure: Infants (<2 years) were measured using the infantometer. The infant was placed on
the table with legs straight. The infantometer was placed alongside the infant and
then closed until the infant's head and feet were touched by the ends of the
measuring device. The feet were positioned so that the infantometer met the heel
of the infant's flexed foot. At this point, the small screw was tightened on the
bottom of the instrument to hold the sliding parts firm until the measurement was
read from the scale and recorded. The infantometer was then removed and set back
to zero. The length measurement was repeated.

The procedure for height measurement on children 22 years of age can be found in
the section on Obesity: Height and Weight.

Recording form:

1. The age of the child was determined.
2. The appropriate measurement, length or height, was taken and recorded.
3. The measurement was repeated.
4. The Completion Code was filled in (see Appendix B for codes).

<table>
<thead>
<tr>
<th>HEIGHT OR LENGTH</th>
<th>1. YES (measure height)</th>
<th>2. NO (measure length)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS CHILD 2 YEARS OLD?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEIGHT</td>
<td></td>
<td>INCHES</td>
</tr>
<tr>
<td>REPEAT HEIGHT</td>
<td></td>
<td>INCHES</td>
</tr>
<tr>
<td>LENGTH</td>
<td></td>
<td>INCHES</td>
</tr>
<tr>
<td>REPEAT LENGTH</td>
<td></td>
<td>INCHES</td>
</tr>
</tbody>
</table>
### Personal Data and Measurements

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement</th>
<th>Sex</th>
<th>Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Birth (mo, day, yr)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years, months, days)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td>1. Male</td>
<td>2. Female</td>
</tr>
<tr>
<td>Height or length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is child 2 years old?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
<td>INCHES</td>
<td></td>
</tr>
<tr>
<td>Repeat Height</td>
<td></td>
<td>INCHES</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td></td>
<td>INCHES</td>
<td></td>
</tr>
<tr>
<td>Repeat Length</td>
<td></td>
<td>INCHES</td>
<td></td>
</tr>
</tbody>
</table>
| Head circumference (Do not measure if child
  2 years or older)                         |             | INCHES    |             |
| Repeat head circumference                  |             | INCHES    |             |
| Weight                                     |             | POUNDS    |             |
| Repeat weight                              |             | POUNDS    |             |
| Completion code                            |             |           |             |
Quality control:
The medical assistant was retrained prior to screening at each site.
The positioning and handling of the child by the medical assistant, as well as the reading of the scale, were observed by the registered nurse during the first three days of screening and during periodic site visits. No comparisons were made between measurements by the medical assistant and by the nurse.

Reliability measurements:
After the length or height was measured, the child was removed from the scale, the scale set back to zero, and the child was re-measured. This procedure yielded an immediate test-retest reliability measurement. Also, approximately 10 percent of infants measured received a repeat measurement 1 hour after the initial measurement, yielding a test-retest reliability measurement.
CHILD GROWTH AND DEVELOPMENT

Test: Weight

Description of test: Two weight measurements were taken.

Time required: 3 minutes

Population screened: All examinees

Equipment: Infant scale (Continental Scale Corporation, Model 380) Health-O-Meter adult height-weight scale (Continental Scale Corporation)

Maintenance of equipment: None

Personnel administering test:

Enrollment Examinations
Medical assistant

One medical assistant performed the measurements throughout Dayton screening. Another medical assistant performed the measurements in all other sites. During Charleston and Georgetown screening, an additional medical assistant was trained and performed the measurements for approximately two weeks.

Exit Examinations
Registered nurse

Training of personnel administering test:

Training was conducted by the physician the day before screening began. Training on the proper use of the infant scale included special instructions in scale calibration and reading. The procedure used by the medical assistant was observed by the physician and the Coordinator (a registered nurse) of the subcontractor during the first three days of screening for correct usage of the infant scale.

Training on proper use of the adult scale was the same as the above with special emphasis on zero calibration and correct standing position on the scale.
Child Growth and Development—Weight (continued)

Procedure: The child's age was determined to decide how the weight measurement was to be taken. If the child was less than 2 years, the infant scale was used. Infants were disrobed, except for diapers, and placed on the scale. The weight was recorded, the scale set back to zero, and the procedure repeated.

Children 2 years of age or older were weighed according to the procedure for adult weight measurement. (See section on Obesity: Height and Weight.)

Recording form:
1. Age of the child was determined.
2. Weight was measured and recorded.
3. Measurement was repeated.

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th>POUNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPEAT WEIGHT</td>
<td>POUNDS</td>
</tr>
</tbody>
</table>

Quality control: The medical assistant was retrained prior to screening at each site. Emphasis was placed on the calibration of the scale. The procedure used by the medical assistant was observed by the physician during site visits for calibration of the scale, reading of the measurement, and handling of the child. No medical assistant/physician comparison measurements (tester/expert reliability) were taken.

Reliability measurements: After the infant was weighed the scale was set back to zero and the weight taken again. This procedure resulted in an immediate test-retest reliability measurement. Approximately 10 percent of infants weighed received a repeat measurement 1 hour after the initial measurement, yielding a test-retest reliability measurement.
DENTAL DISORDERS

Test: Decayed-Missing-Filled Tooth Surfaces Index

Description of test: Dental caries experience (or susceptibility) referred to the cumulative effect of tooth decay, both past and present. By definition, it included three irreversible signs: decayed, missing and filled teeth or tooth surfaces. A modified version of the Decayed-Missing-Filled Tooth Surfaces Index (DMFS) was used in the Health Insurance Study to minimize the inter-examiner variability and to insure optimal calibration (or standardization) of the examination technique. Hence, all of the permanent teeth of each subject were examined and assessed using the criteria of a modified DMFS. The decayed-extraction indicated-filled tooth surfaces index (def index) was used to assess the primary teeth. It is similar to the DMFS Index used to assess permanent teeth except that X, substituted for the missing component, indicated a badly decayed tooth that should be extracted. Missing primary teeth were not considered because of the difficulty in determining whether they were shed normally or extracted due to caries.

Time required: 4 to 5 minutes

Population screened: All persons 3 years of age and older

Equipment: The following list of dental equipment was used for the entire dental examination: mouth mirrors, shepherd crook-type dental explorers, sterile 2x2 gauze, autoclave, latex examination gloves, headrest covers, bracket table, dental examination light, dental chair, kleenex, paper cups, scrub brushes for hands and instruments, soap, towels and clip board. The mouth mirror, dental explorer and examination light were the three essential instruments used in the DMFS examination.

Maintenance of equipment: None
Dental Disorders—Decayed-Missing-Filled Tooth Surfaces Index (continued)

Personnel administering test:

A dental examiner and dental recorder

In the Dayton, Ohio and Seattle, Washington sites, the examinations were performed by a licensed dental hygienist under the supervision of a dentist. In the Massachusetts and South Carolina sites, the examinations were performed by a licensed dentist. In all sites, a dental recorder was used to record and code the tooth scores.

Exit dental examinations are performed by a dentist in all sites. A dental recorder records the tooth scores.

Training of personnel administering test:

A three-day dental examination training program was conducted by the HIS dental consultant at the University of California at Los Angeles School of Dentistry, Los Angeles, California. Instruction was given in the performance of the Decayed-Missing-Filled Tooth Surfaces Index, the Periodontal Index, the Simplified Oral Hygiene Index, the Gross Decay Index, and in the administration of the Dental Health Habits questionnaire. Dentists (or hygienists) who performed the dental examination in each site were trained approximately two weeks prior to screening at the site (see Appendix F, Item 4).

The training protocol was as follows:

Day One:
- a. Discussion of clinical criteria for dental indices.
- b. Illustration of criteria and clinical techniques using photography, models, and instruments. (two hours)
- c. Demonstration of examination procedures on a subject.

Day Two:
- a. Demonstration of examination procedures.
- b. Duplicate examinations by the trainee and examiner for the purpose of assuring correct interpretations of the criteria. An example of a duplicate examination was when the trainee went through an index in detail and the examiner then quickly looked into the mouth of the examinee to draw attention to those conditions that illustrated sharp differences in criteria of each of the indices. Duplicate examinations were performed on approximately 24 examinees.
Dental Disorders--Decayed-Missing-Filled Tooth Surfaces Index (continued)

c. Practice by the trainee in asking examinees the questions regarding oral hygiene habits.

Day Three: a. Performance of all indices of the dental examination by the trainees and the examiner. Results were compared in order to standardize the trainees to the examiner and to each other. The exercise in standardization was performed on approximately 30 examinees. The criterion for standardization was that the examiner and the trainees achieved 75 to 80 percent agreement on the scores in all of the indices.

Dental recorders were trained at each site by the field supervisor of the screening examination center. Training involved a short session on the use of the forms, then a full day of recording and coding the scores called out by the dental examiner as the examinations were performed.

Procedure:

The examinee was seated in a dental chair in close proximity to a dental examination light. The examiner then assessed every tooth surface of all of the teeth and called out the scores to the dental recorder, who was seated adjacent to the dental chair.

The dental examination form (Figs. 1 and 2) denoted the permanent teeth by the numbers 1 through 32, and the primary teeth (baby, deciduous or milk teeth) by the letters A through T. Teeth were scored starting at the upper right segment of the arch, then proceeded to the upper left, lower left and lower right. The examiner called out the score which was recorded by the dental recorder in the upper diagram on the Recording Form. Later, the dental recorder translated the scores into numeric codes which were recorded in the lower diagram.

Each primary or permanent tooth was examined and classified according to the following summarized list of definitions:
Fig. 1—Permanent dentition
Fig. 2 — Primary dentition
Dental Disorders—Decayed-Missing-Filled Tooth Surfaces Index (continued)

<table>
<thead>
<tr>
<th>Code</th>
<th>Score</th>
<th>Tooth Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>U</td>
<td>Unerupted tooth.</td>
</tr>
<tr>
<td>20</td>
<td>N</td>
<td>Normal. A sound unfilled tooth without caries.</td>
</tr>
<tr>
<td>21</td>
<td>NR</td>
<td>A root tip was present and served as an abutment for a removable appliance.</td>
</tr>
<tr>
<td>31</td>
<td>D1</td>
<td>Decay was present and tooth could be restored by involving one surface.</td>
</tr>
<tr>
<td>32-35</td>
<td>D2-D5</td>
<td>Decay was present which involved two through five surfaces.</td>
</tr>
<tr>
<td>40</td>
<td>M</td>
<td>Tooth was missing without artificial replacement.</td>
</tr>
<tr>
<td>41</td>
<td>MF</td>
<td>Missing tooth was replaced with a fixed restoration or appliance.</td>
</tr>
<tr>
<td>42</td>
<td>MR</td>
<td>Missing tooth was replaced with a removable appliance.</td>
</tr>
<tr>
<td>43</td>
<td>MT</td>
<td>Missing tooth was due to orthodontic treatment.</td>
</tr>
<tr>
<td>51</td>
<td>F1</td>
<td>A tooth with a filling on one surface and no recurrent decay and no decay on the remaining tooth surfaces.</td>
</tr>
<tr>
<td>52-55</td>
<td>F2-F5</td>
<td>A tooth with a filling on two through five surfaces and no recurrent decay.</td>
</tr>
<tr>
<td>60</td>
<td>X</td>
<td>A tooth which required extraction due to caries only. A tooth with an obvious pulpal involvement or a crown completely destroyed by decay with only root tips remaining.</td>
</tr>
<tr>
<td>61</td>
<td>PX</td>
<td>Primary tooth was indicated for extraction when permanent tooth was erupted and occupied the same tooth space as primary tooth.</td>
</tr>
<tr>
<td>70</td>
<td>P</td>
<td>Primary tooth was present and assessed by the above definitions when permanent tooth was unerupted (i.e., P was entered in the alphabetic code box and one of the preceding codes was entered in the numeric code box).</td>
</tr>
</tbody>
</table>

10 = U
More specifically, an unerupted tooth (U) was a tooth space with no portion of a tooth visible. Prior to approximately 16 years of age, the third molars were scored as unerupted if not visible. The third molars of an examinee older than 16 years were scored as missing (M). If the examinee stated confidently that the teeth had been extracted and was able to identify which teeth had been extracted. If the examinee
Dental Disorders—Decayed-Missing-Filled Tooth Surfaces Index (continued)

stated emphatically that the teeth were not extracted, or showed any overt doubt about their being extracted, the third molars were scored as unerupted (U).

20 = N
A normal score applied to an unfilled tooth without caries. Teeth with sound fillings were coded according to the definitions for F1-F5. Supernumerary teeth were disregarded for the DMFS Index because of the rarity of their prevalence, but were noted with a written comment including their location on the page containing the DMFS Index.

21 = NR
On rare occasion, a root tip was purposely retained in the mouth after its nerve had been removed and the root canal had been filled with a metallic filling. This type of root tip then served as an abutment for an overlay type removable appliance (i.e., denture).

31 = D1
D1 type decay was defined as decay which was present and the tooth could be restored by involving only one surface. Posterior teeth (Permanent: 1-5, 12-16, 17-21, 28-32; Primary: A, B, I, J, K, L, S, T) had five surfaces and anterior teeth (Permanent: 6-11, 22-27; Primary: C-H, M-R) had four surfaces. In general, decay was defined as present when the enamel yielded to underlying soft material with the explorer tip; or the explorer tip caught in a pit, fissure or hole in the enamel; or the presence of decay was obvious enough to be detected without the use of the dental explorer. The definition of decay applied to virgin and recurrent decay. Virgin decay meant a filled tooth that had decay present around the margins of the filling. Decay on the proximal surfaces, the surface normally in contact with the adjacent tooth, of anterior teeth numbered 6-11, 22-27 and lettered C-H and M-R was coded as D1. The classification of any tooth surface as decayed superseded any other possible classification of the tooth. For example, a posterior tooth with one surface which presented virgin decay (D1) and two of the four remaining surfaces which presented sound fillings (F2) and no recurrent decay, was scored as D3.
Dental Disorders—Decayed-Missing-Filled Tooth Surfaces Index (continued)

32 = D2
D2 type decay was defined as above, but involved two and only two surfaces. A tooth with decay on both proximal surfaces of anterior teeth numbered 6-11 and 22-27, and lettered C-H and M-R was coded as D2. In addition, a tooth with virgin decay on the occlusal (chewing) surface and buccal (cheek side) or lingual (tongue side) surface was also coded as D2. A posterior tooth, however, with decay on one proximal surface, the surface normally in contact with the adjacent tooth, was automatically coded as D2.

33 = D3
D3 type decay (refer to D1 definition) was defined as decay involving three and only three surfaces. For example, a tooth with decay on both proximal surfaces was coded as a D3. (This applied to posterior teeth numbered 1-5, 12-16, 17-21 and 28-32 and teeth lettered A, B, I, J, K, L, S and T.)

If a posterior tooth had a sound filling on the proximal surface (i.e., the filling involved the proximal and occlusal surfaces or two surfaces) and decay on the buccal surface (only one surface) or lingual surface (only one surface), the tooth in question was coded as D3.

34 = D4
D4 type decay (refer to D1 definition) was defined as decay involving four surfaces (e.g., three-quarter crown). One unique condition that was included in this definition was as follows: If a tooth had fillings on five surfaces, but was not a full crown, and had recurrent decay on one or more surfaces, it was scored as a D4.

35 = D5
D5 type decay (refer to D1 definition) was defined as decay involving all five surfaces (i.e., the tooth could be restored with only a full crown). D5 also applied to a full crown with recurrent decay.
Dental Disorders—Decayed-Missing-Filled Tooth Surfaces Index (continued)

40 = M
M was defined as a tooth that was missing without an artificial replacement. In the question preceding the DMFS Index, an examinee edentulous in either arch always had the third molars (teeth numbered 1 and 16) scored as missing (M) if completely edentulous in the upper arch, and teeth numbered 17 and 32, scored as missing (M) if completely edentulous in the lower arch. If an examinee was edentulous in either arch, and was without a removable denture, all of the teeth in the edentulous arch were scored as M (missing).

41 = MF
MF designated a missing tooth that was replaced with a fixed restoration or appliance (i.e., a pontic). The pontic was usually 'fixed' to a crown on both the mesial and distal adjacent teeth, but it might be fixed to an adjacent tooth on only one surface (i.e., a cantilever bridge). The teeth adjacent to the pontic in all probability would be complex fillings that were classified as P3 (a three surface inlay or onlay), P4 (a three-quarter or seven-eighth crown) or P5 (a complete crown).

42 = MR
MR was defined as a missing tooth which had been replaced with a removable appliance. If an examinee was edentulous in either arch (question preceding DMFS Index), and had a removable denture, all of the replaced teeth were scored as MR in teeth numbered 2-15 (upper arch) or teeth numbered 18-31 (lower arch). Third molars were always scored as M (missing) under these circumstances.

43 = MT
MT was defined as a missing tooth which was due to orthodontic treatment and the tooth space was closed, with the adjacent teeth in contact. This also applied to a congenitally missing tooth when the tooth space was closed with the adjacent teeth in contact.

51 = F1
F1 was defined as a tooth with a filling on one and only one surface and no recurrent decay.
Dental Disorders—Decayed-Missing-Filled Tooth Surfaces Index (continued)

52 = F2
F2 was defined as a tooth with a filling on two and only two surfaces and no recurrent decay.

53 = F3
F3 was defined as a tooth with a filling on three and only three surfaces and no recurrent decay.

54 = F4
F4 was defined as a tooth with a filling covering four surfaces (three-quarter or seven-eighth crown) and no recurrent decay.

55 = F5
F5 was defined as a tooth with a complete or full crown and no recurrent decay.

60 = X
X was defined as a tooth which required extraction due to caries only, or a tooth with an obvious pulp involvement or a crown completely destroyed by decay with only root tips remaining.

61 = PX
PX was defined as a primary tooth which was indicated for extraction when a permanent tooth was erupted and occupied the same tooth space. The permanent tooth was assessed according to the above definitions. For example, the PX was recorded in the alphabetic code box and the score for the permanent tooth was recorded in the numeric code box.

70 = P
P was reserved to indicate the presence of a primary tooth and when present was recorded in spaces A-T and assessed by the preceding definitions when the permanent tooth was unerupted (write in spaces 4-13 or 20-29). When a primary tooth was missing and the examinee was past the eruption date of the permanent tooth, the tooth space was scored as a permanent, unerupted tooth (U). When charting deciduous teeth, the
findings were recorded (i.e., N or Fl, etc.) in the permanent tooth box (numeric box) and a 'P' (70) placed in the deciduous box (alphabetic box).

Recording form:
Letters called out by the dental examiner were recorded in the upper set of boxes by the dental recorder. Later the dental recorder translated the alphabetic codes into the corresponding numeric codes in the lower set of boxes.

Quality control:
The recording of tooth scores was checked for completeness and legibility. In addition each recorded number score was checked against the corresponding alphabetic score to insure that codes were correctly translated.

During exit examinations at Dayton, Ohio the dental consultant who conducted the training sessions visited the examination site to check the standardization of dental exams. All participants were screened by both dentists during this period to allow evaluation and correction of scoring.

Reliability measurements:
A similar site visit is planned for all exit examinations.

Ten percent of all examinees who took the test received a repeat test given by the same dental examiner approximately 1 hour after the initial test. This procedure yielded a measurement of test-retest reliability.
DENTAL

SUBJECT HAS TEETH? ........................................... 1. YES 2. NO (go to dental history)

IS SUBJECT EDENTULOUS IN EITHER ARCH? ......... 1. UPPER 2. LOWER 3. NO

DECAYED - MISSING - FILLED INDEX

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LOWER

COMPLETION CODE ............................................
DENTAL DISORDERS

Test: Gross Decay Index

Description of test: Each tooth was examined for the presence or absence of gross (crass) decay. The purpose of this examination was to provide information quickly on any significant condition that required or shortly would require professional attention in lieu of deciphering the Decayed-Missing-Filled Tooth Surfaces Index.

Time required: 1 minute

Population screened: All persons 3 years of age and older

Equipment: Mouth-mirror and light

Maintenance of equipment: None

Personnel administering test: A dental examiner and dental recorder. In the Dayton, Ohio and Seattle, Washington sites, the examination was performed by a licensed dental hygienist under the supervision of a dentist. In the Massachusetts and South Carolina sites, the examinations were performed by a licensed dentist. In all sites, a dental recorder was used to record and code the tooth scores.

Exit dental examinations are performed by a dentist in all sites. A dental recorder records all scores.

Training of personnel administering test: See Decayed-Missing-Filled Tooth Surfaces Index, "Training of personnel administering Test"
Dental Disorders—Gross Decay Index (continued)

Procedure: Each primary or permanent tooth was scored in the spaces lettered A–T and numbered 1 through 32, respectively. The presence or absence of gross (crass) decay on each primary or permanent tooth was recorded as follows:

0 = a tooth with no detectable decay when examined with a dental explorer, or a tooth that had decay which could only be detected with an explorer and was not visually obvious;

1 = gross (crass) decay was present. Gross decay was defined as decay that was so obvious that it was visually detected without the use of a dental explorer. It was a tooth that had a high probability of producing acute pain or infection and should be treated by a dentist in the very near future. A tooth that was classified as a D3 or greater (i.e., D4—decay which involved four surfaces and D5—decay which involved all five tooth surfaces) in the Decayed-Missing-Filled Tooth Surfaces Index would probably fall into this category. In addition a tooth which required extraction because of obvious pulpal involvement, or because the crown was completely destroyed with only the root tips remaining (i.e., a tooth recorded as X in the Decayed-Missing-Filled Tooth Surfaces Index) was scored as "1";

9 = Not Applicable (i.e., tooth not present or missing).

Recording form: Teeth were assessed by the dental examiner who called off the scores which were recorded by the dental recorder.
Dental Disorders—Gross Decay Index (continued)
Dental Disorders—Gross Decay Index (continued)

Quality control:
The Gross Decay Index was checked by the receptionist coordinator (field editor) against the Decayed-Missing-Filled Tooth Surfaces Index for the scoring of missing teeth. All tooth spaces with a score of missing should match between the two indices. A missing tooth in the DMFS Index corresponded to a number of 40, whereas a missing tooth in the Gross Decay Index corresponded to a score of 9.

During exit examinations at Dayton, Ohio the dental consultant who conducted the training sessions visited the examination site to check the standardization of dental exams. All participants were screened by both dentists during this period to allow evaluation and correction of scoring.

A similar site visit is planned for all exit examinations.

Reliability measurements:
Ten percent of all examinees who took the test received a repeat test given by the same dental examiner approximately 1 hour after the initial test. This procedure resulted in a measurement of test-retest reliability.

Comments:
The Gross Decay Index was not done in the first screening site, Dayton, Ohio. It was added in all other sites as an aid for the identification of likely dental needs that would probably require immediate attention.
DENTAL DISORDERS

Test: Periodontal Index

Description of test: The presence and extent of gingival inflammation as well as signs of deeper periodontal disease were estimated on the tissues surrounding and supporting each suitable tooth in the mouth using the criteria developed by Russell for the Periodontal Index (PI).

Time required: 2 minutes

Population screened:

Enrollment Examination:
Persons 14 years of age or older.

Exit Examination:
Persons 12 years of age or older.

Equipment: Mouth mirrors, examination light

Maintenance of equipment: None

Personnel administering test:

A dental examiner and dental recorder. In the Dayton, Ohio and Seattle, Washington sites, the examination was performed by a licensed dental hygienist under the supervision of a dentist. In the Massachusetts and South Carolina sites, the examinations were performed by a licensed dentist. In all sites, a dental recorder was used to record and code the tooth scores.

Exit dental examinations are performed by a dentist in all sites. A dental recorder records all scores.

Training of personnel administering test:

See Decayed-Missing-Filled Tooth Surfaces Index, "Training of personnel administering test"
Dental Disorders--Periodontal Index (continued)

Procedure: The dental examiner (i.e., the dentist or hygienist depending on the examination site) assessed all of the gingival tissues which circumscribed each fully erupted tooth that was suitable for scoring on a scale of 0, 1, 2, 6 and 8. Tooth spaces with only a root tip which remained or teeth with gingival third restorations, partial or complete veneer crowns, teeth with orthodontic bands or wires were considered unsuitable for scoring and were excluded in the Periodontal Index examination.

In a mixed dentition (which may exist in some 12 year old adolescents), when the primary tooth and permanent tooth were occupying the same space, the permanent tooth took precedence over the primary tooth.

Criteria for the Periodontal Index were as follows:

0 = Negative. There was neither overt inflammation in the investing tissues nor loss of function produced by destruction of supporting tissues.

1 = Mild Gingivitis. There was an overt area of inflammation in the free gingivae, but this area did not circumscribe the tooth.

2 = Moderate Gingivitis. Inflammation completely circumscribed the tooth, but there was no apparent break in the epithelial attachment.

6 = Gingivitis with Pocket Formation. The epithelial attachment was broken and a pocket was present (not merely a deepened gingival crevice due to swelling in the free gingivae). There was no interference with normal masticatory function, the tooth was firm in its socket and had not drifted. The presence of a pocket was inferred from calculus deposits large enough to distort the natural scallop-shaped contour of the gingivae around the tooth (calculus had formed a wedge between the tooth and the gingival tissues).

8 = Advanced Destruction with Loss of Masticatory Function. The tooth could be loose, might have drifted, or may sound dull. Gross deposits of calculus were usually present. Overt mobility might be determined with light finger pressure.

9 = Not Scored (i.e., a tooth or tooth space that was not suitable for scoring).
Dental Disorders--Periodontal Index (continued)

If there was any doubt concerning any of the above criteria, the lesser or lower score was always assigned.

The Periodontal Index examination was the most difficult to standardize because the presence or absence of inflammation was indicated primarily by a color change. Normal, healthy gingival tissue is a light pink color, whereas inflammation is a deep red to bluish-red color. In Black persons, oral pigmentation may make the appearance of inflammation an orange-pink color. True color change may be masked by salivary moisture on the gingivae and the angle of the observation by the examiner with respect to the lighting source.
Dental Disorders—Periodontal Index (continued)

Recording form:

PERIODONTAL INDEX

UPPER

RIGHT

A  B  C  D  E  F  G  H  I  J

LEFT

32  31  30  29  28  27  26  25  24  23  22  21  20  19  18  17

LOWER

COMPLETION CODE
Dental Disorders--Periodontal Index (continued)

Quality control: A simple aid in identifying teeth or tooth spaces that were not scored in the Periodontal Index consisted of teeth that had been scored as unerupted (U), missing (M), missing-filled (MF), or missing-treated (MT), and a tooth that was indicated for extraction due to extensive caries (X) in the Decayed-Missing-Filled Tooth Surfaces Index. Also, a tooth with an orthodontic band or wire in close proximity to the gingival tissue, or a tooth that was not erupted completely to the occlusal plane of the dentition, was not scored in the Periodontal Index. All of these exceptions were coded as 9 when assessing the periodontal tissues according to the Periodontal Index criteria.

During exit examinations at Dayton, Ohio the dental consultant who conducted the training sessions visited the examination site to check the standardization of dental exams. All participants were screened by both dentists during this period to allow evaluation and correction of scoring.

A similar site visit is planned for all exit examinations.

Reliability measurements: Approximately 10 percent of all examinees given the Periodontal Index examination received a repeat test given by the same examiner approximately 1 hour after the initial Periodontal Index examination. This procedure resulted in a measurement of test-retest reliability.
# DENTAL DISORDERS

<table>
<thead>
<tr>
<th>Test:</th>
<th>Simplified Oral Hygiene Index (OHI-S)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of test:</strong></td>
<td>The test was an evaluation of the presence and extent of soft (i.e., dental plaque or soft sticky debris) and hard deposits (i.e., tartar or calculus) on the teeth. Six tooth surfaces were examined according to the criteria developed by Greene and Vermillion.</td>
</tr>
<tr>
<td><strong>Time required:</strong></td>
<td>1 to 2 minutes</td>
</tr>
<tr>
<td><strong>Population screened:</strong></td>
<td>All persons 3 years of age and older</td>
</tr>
<tr>
<td><strong>Equipment:</strong></td>
<td>Mouth mirror, shepherd crook-type dental explorer, examination light</td>
</tr>
<tr>
<td><strong>Maintenance of equipment:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Personnel administering test:</strong></td>
<td>A dental examiner and dental recorder</td>
</tr>
<tr>
<td></td>
<td>In the Dayton, Ohio and Seattle, Washington sites, the examination was performed by a licensed dental hygienist under the supervision of a dentist. In the Massachusetts and South Carolina sites, the examinations were performed by a licensed dentist. In all sites, a dental recorder was used to record and code the tooth scores.</td>
</tr>
<tr>
<td></td>
<td>Exit dental examinations are performed by a dentist in all sites. A dental recorder records the tooth scores.</td>
</tr>
<tr>
<td><strong>Training of personnel administering test:</strong></td>
<td>See Decayed-Missing-Filled Tooth Surfaces Index, &quot;Training of personnel administering test&quot;</td>
</tr>
</tbody>
</table>
Dental Disorders--Simplified Oral Hygiene Index (OHI-S) (continued)

Procedure: Visualizing the division of the upper and lower dental arches into three segments each (see Fig. 1), one anterior (six most anterior teeth) and two posterior (five teeth: two premolars and three molars), one tooth surface from each segment was examined. The guidelines for selecting an appropriate tooth from each segment were as follows. In the posterior segment of a permanent dentition, the first fully erupted tooth distal to the second premolar, normally the first molar, was assessed. When the first molar was missing, the second molar was assessed; if the second was missing, the third molar was assessed. When all three molars were missing, the specific segment was scored as 9 (Not Scored or Not Suitable for Scoring). In the posterior portion of the primary dentition, the most distal fully erupted primary molar was scored. In a mixed dentition, the permanent tooth took precedence over the primary tooth and the tooth selection process proceeded according to the description given under the permanent dentition. The teeth selected for scoring in the anterior portion of the mouth were the upper right central incisor and the lower left central incisor. In the absence of either of these anterior teeth, the central incisor on the opposite side of the midline was substituted. No other substitutions were permitted. Hence, the specific surfaces examined on the six teeth were the buccal surfaces of the selected upper molars, the lingual surfaces of the selected lower molars, and the labial or facial surfaces of the upper right and lower left central incisors. For the OHI-S, a tooth surface was considered to encompass one-half of the circumference of the tooth. For example, the buccal surface of the molar included one-half of the mesial and one-half of the distal surfaces.

The precise technique for using the dental explorer was to hold it so that the tip was as parallel as possible to the buccal (or lingual) surface of the tooth. When examining for the (plaque) debris portion of the index, the explorer tip was placed on the incisal one-third of the tooth and moved in the gingival direction until debris (or plaque) was noted on the tip of the explorer. The surface area of the clinical crown of the tooth was divided into incisal, middle and gingival (cervical) thirds; the third where debris appeared corresponded to a specific number which was recorded. If no debris appeared on the explorer tip after drawing the explorer over the tooth surface from the incisal to the gingival one-third, the explorer tip was placed into the base of the gingival crevice at the distal (or mesial) contact area and gently drawn through the gingival crevice (beneath the crest of the gingival
Fig. 1-Tooth surfaces scored in OHI-S
Dental Disorders—Simplified Oral Hygiene Index (OHI-S) (continued)

margin) to the mesial (or distal) contact area. The explorer tip was then examined for the presence or absence of (plaque) debris. The base of the gingival crevice was determined by simply turning the dental explorer in a direction that was perpendicular to the facial or lingual surface until the gingival tissue blanched.

The technique of drawing the explorer tip through the gingival crevice was also used to determine the presence or absence of subgingival calculus for the calculus component of the OHI-S. Supragingival calculus was most likely to appear on the clinical crown of the tooth (gingival or cervical third) above the gingival margin.

The only teeth that were not scored or considered not suitable for scoring in the Simplified Oral Hygiene Index were:

1. A tooth space with a missing tooth (code of M or U, unerupted, in the Decayed-Missing-Filled Tooth Surfaces Index or 9 in the PI).

2. A tooth space with only a root tip remaining (code of X—tooth indicated for extraction due to caries—in the Decayed-Missing-Filled Tooth Surfaces Index or 9 in the PI).

3. A tooth with a gingival restoration, partial or complete veneer crown (code of MF in the Decayed-Missing-Filled Tooth Surfaces Index).

4. A tooth with an orthodontic band or wire in close proximity to the gingival tissue (scored as 9 in the PI).

5. A tooth that was depressed or not erupted completely to the occlusal plane of the dentition (scored as 9 in the PI).

Under the circumstances noted above, an alternate tooth was selected for scoring. If a suitable alternate tooth was not present, the appropriate segment of the arch was scored as 9. If there was any doubt concerning any of the following criteria, the lesser or lower score was always assigned.
Dental Disorders--Simplified Oral Hygiene Index (OHI-S) (continued)

In summary, the teeth that were assessed in the upper arch were the buccal surface of tooth number 3 (posterior upper right first molar); the labial surface of tooth number 8 (anterior upper right central incisor); the buccal surface of tooth number 14 (posterior upper left first molar). The surfaces that were assessed in the lower arch were the lingual surface of tooth number 19 (posterior lower left first molar); labial surface of tooth number 24 (anterior lower left central incisor); and the lingual surface of tooth number 30 (posterior lower right first molar) (see Fig. 2). The criteria for the OHI-S were as follows:

0 = No debris or stain present
1 = Soft debris which covered more than one-third of the tooth surface
2 = Soft debris which covered more than one-third but not more than two-thirds of the exposed tooth surface
3 = Soft debris which covered more than two-thirds of the exposed tooth surface

0 = No calculus present
1 = Supragingival calculus which covered not more than one-third of the exposed tooth surface
2 = Supragingival calculus which covered more than one-third but not more than two-thirds of the exposed tooth surface, or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth
3 = Supragingival calculus which covered more than two-thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth

If a tooth was scored as a 9 under plaque (oral debris), it was automatically scored as a 9 for calculus on that same tooth surface.
Dental Disorders—Simplified Oral Hygiene Index (OHI-S) (continued)

Recording form:  
1. The dental examiner called out the scores for each tooth and the dental recorder filled in the scores on the recording form.
2. The Completion Code was filled in (see Appendix B for codes).

<table>
<thead>
<tr>
<th>ORAL HYGIENE INDEX</th>
<th>DEBRIS</th>
<th>CALCULUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTERIOR UPPER RIGHT - Buccal</td>
<td>□□</td>
<td>□□</td>
</tr>
<tr>
<td>(usually first molar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UPPER RIGHT CENTRAL INCISOR - Facial</td>
<td>□□</td>
<td>□□</td>
</tr>
<tr>
<td>(or adjacent central)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POSTERIOR UPPER LEFT - Buccal</td>
<td>□□</td>
<td>□□</td>
</tr>
<tr>
<td>POSTERIOR LOWER LEFT - Lingual</td>
<td>□□</td>
<td>□□</td>
</tr>
<tr>
<td>LOWER LEFT CENTRAL INCISOR - Facial</td>
<td>□□</td>
<td>□□</td>
</tr>
<tr>
<td>(or adjacent central)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POSTERIOR LOWER RIGHT - Lingual</td>
<td>□□</td>
<td>□□</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td>□□</td>
<td></td>
</tr>
</tbody>
</table>
Quality control: Teeth that were not assessed (score of 9) were checked against scores recorded on the Decayed-Missing-Filled Tooth Surfaces Index and the Periodontal Index for the same tooth.

During exit examinations at Dayton, Ohio the dental consultant who conducted the training sessions visited the examination site to check the standardization of dental exams. All participants were screened by both dentists during this period to allow evaluation and correction of scoring.

A similar site visit is planned for all exit examinations.

Reliability measurements: Approximately 10 percent of all examinees given the Periodontal Index examination received a repeat test given by the same examiner approximately 1 hour after the initial Periodontal Index examination. This procedure resulted in a measurement of test-retest reliability.
DIABETES

Enrollment Examinations (Only)
Two-Hour Post-Prandial Glucose

Test:

Description of test:
A glucose load was administered to the examinee and blood was drawn 2 hours later.

Time required:
Administration of the glucose required 2 minutes; venipuncture required 5 minutes.

Population screened:
All persons 14 years of age or older except persons who answered "Yes" to either of the following questions: "Are you currently taking an oral hypoglycemic agent?" or "Are you currently on insulin?".

Equipment:
Glucose loading dose chart, grams/milliliters conversion chart, 100-milliliter graduated cylinder, dextrol-C glucose tolerance test beverage, paper cups, venipuncture equipment

Maintenance of equipment:
None

Personnel administering test:
Medical assistant to administer glucose load
Laboratory technician to draw the blood

Two laboratory technicians performed venipuncture during entry screening examinations. One laboratory technician worked in Dayton and the other worked in all subsequent sites.
Training of personnel administering test:

The physician instructed the medical assistant to make certain that the glucose load was properly calculated and administered. Prior to the opening of each site, the physician reviewed the procedure involved, and on at least five occasions observed the entire process, including: taking of height and weight, looking up the proper glucose amount on the basis of height and weight, proper use of the table which converted grams of glucose into milliliters of glucose solution; proper reading of the graduated cylinder; accuracy of the amount of glucose solution poured into the drinking cup, the explanation provided to the examinee; and the encouragement provided to the examinee to make certain that the entire glucose solution was ingested within no more than a 2-minute interval. On each day that the physician visited the site, the process was observed at least twice in its entirety, and suggestions were made to rectify any problems observed.

Procedure:

The glucose load was given at the beginning of the screening examination. All adult examinees (≥14) were given the glucose except for those currently taking insulin or an oral hypoglycemic agent. The examinee was told that he was drinking a sugar solution which, when the blood sample was drawn in 2 hours, would measure the blood sugar level. The amount of glucose given was computed by height and weight, calculated by a dose chart based on 40 grams per square meter of body surface. Since the glucose drink was measured in ounces, a conversion table was used to convert ounces to milliliters, and milliliters to grams.

The medical assistant watched the examinee during the drinking of the glucose and recorded the exact time and grams ingested on the Confidential Recording Form. Also, the examinee was asked for the exact time (s)he last ate or drank anything, excluding black coffee or tea. This allowed for the identification of non-compliance with the 2-hour pre-exam fasting instructions. Because of the scheduling requirements of the screening examination, virtually all examinees underwent this test between the hours of 2:00 PM and 10:00 PM.

Venipuncture was performed 2 hours (±5 minutes) after the glucose load was administered. (See section on Diabetes (Exit Examination): Random Blood Sugar for venipuncture and serum extraction specifications.)
Method of analysis: In Dayton, the Enzymatic Glucose oxidase method was used. In all other sites, glucose was included in the SMA 12/60 panel. The SMA 12/60 system method is a modification of the procedure of Brown and Bittner with McCleary. A cupricneocuproine chelate was reduced by glucose in an alkaline medium which resulted in a highly colored cuprous-neocuproine complex.

Recording form:

1. Eligibility for test was determined.
2. Time of glucose ingestion was recorded.
3. Time of venipuncture was recorded.
4. Completion code was filled in (see Appendix B for list of codes).

| GLUCOSE |
|------------------|------------------|
| HISTORY OF DIABETES? | 1. YES 2. NO |
| PATIENT TAKES ORAL AGENT? | 1. YES 2. NO |
| PATIENT TAKES INSULIN? | 1. YES 2. NO |
| (If yes to either of the above, do not give sugar load) |
| AMOUNT OF GLUCOSE GIVEN | ____ g |
| TIME GIVEN | ____ : ____ |
| TIME BLOOD DRAWN | ____ : ____ |
| COMPLETION CODE | |

Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of this form can be found in Appendix C.
Laboratory technician performance was monitored by the on-site supervisor, a registered nurse, who observed task performance daily including venipuncture and the preparation of specimens for shipment to the laboratory. The proper preparation of serum specimens required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge. The physician observed the performance of the medical assistant, who administered the glucose drink, as described in "Training of personnel administering test".

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the Document Control Center editor of the subcontractor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

At the beginning of the screening examination, a random sample of examinees was selected to have extra blood drawn for "split sample analysis". Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5-10 percent of the participants.
DIABETES

Test:

Exit Examination (Only)
Random Blood Sugar

Description of test:
Blood was drawn during the screening examination and sent to a local laboratory for analysis.

Time required:
Total time for venipuncture was approximately 5 minutes.

Population screened:
All persons 14 years of age or older

Equipment:
Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoseal, cotton balls, bandaids.

Maintenance of equipment:
None

Personnel administering test:
Registered Nurse
Training of personnel administering test:
The venipuncture nurse reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Procedure:
Examinees were asked the last time they ate in order to ensure that at least 2 hours had elapsed since time of ingestion.

Venipuncture was performed and 15 ml of blood was drawn into two red top Corvac vacutainers for tests included in the SMA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells (if the red cells are left in contact with the serum over a long period of time, the glucose will be consumed, giving false readings). The Corvac tube makes it easier for shipping and handling.

After 15 ml of blood is drawn into the tube, the tube is inverted six to eight times, the tube is allowed to sit for 20 minutes, no longer, and then placed into a centrifuge and spun for 15 minutes. After spinning the tube is then inverted and rotated 360° so that the RN can check to insure that no red cells have seeped through the gel barrier.

Method of analysis:
Enzymatic glucose oxidase
Diabetes—Random Blood Sugar (continued)

Recording form: Laboratory results were recorded directly on computer tape.

Quality control: The performance of the medical technician was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. The proper preparation of serum specimens required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the Document Control Center editor of the subcontractor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements: At the beginning of the screening examination, a random sample of examinees was selected to have extra blood drawn for "split sample analysis". Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split test reliability.
DRUG USAGE

Test: Urine Drug Screen

Description of test: Urine was collected during the screening examination and sent to a local laboratory for analysis.

Time required: 2 minutes for explanation of specimen collection requirements

Population screened: All persons 14 years of age or older

Equipment: Urine containers

Maintenance of equipment: None

Personnel administering test:
- Enrollment Examinations
- Laboratory technician
- Exit Examinations
- Registered nurse

Training of personnel administering test: None

Procedure: See Kidney Disease--Urinalysis
Drug Usage—Urine Drug Screen (continued)

<table>
<thead>
<tr>
<th>Method of analysis:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment Examinations</td>
</tr>
<tr>
<td>In all sites except Seattle, the Davidow thin layer chromatography method was used. This method involved separation with a methylene chloride/isopropanol mixture and development on Brinkman precoated Silica-Gel glass plates.</td>
</tr>
<tr>
<td>A serum drug screen was used during Seattle screening examinations. Two ml of serum were required for this test which used a gas chromatography method.</td>
</tr>
</tbody>
</table>

The chief pathologist at the Seattle laboratory suggested a serum screen be used because barbiturates and tranquilizers are excreted slowly and some are metabolized by the liver, thereby making the urine screen a less sensitive test. In an effort to test the added sensitivity of serum drug screening over urine drug screening, all examinees showing positive drug identification on serum screens were also given a urine drug screen. Unfortunately, the number of drugs identified by either method was too small to draw any conclusions about the added sensitivity of serum screens over urine screens.

<table>
<thead>
<tr>
<th>Recording form:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit Examinations</td>
</tr>
<tr>
<td>The Davidow thin layer chromatography method was used for analysis of all exit examination specimens.</td>
</tr>
</tbody>
</table>

| Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix C. |

<table>
<thead>
<tr>
<th>Quality control:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit Examinations</td>
</tr>
<tr>
<td>Laboratory results were recorded on computer tape.</td>
</tr>
</tbody>
</table>

| Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program. |

<table>
<thead>
<tr>
<th>Reliability measurements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None. During exit screening examinations, however, a split sample analysis will be performed on a random sample of urine specimens if the amount of urine provided is adequate.</td>
</tr>
</tbody>
</table>
GLAUCOMA

Test: 

Tonometry

Description of test: 

Persons 40 years of age and older were tested for increased intraocular pressure using a non-contact applanation tonometer.

Time required: 

3 minutes

Population screened: 

Persons 40 years of age or older

Equipment: 

Enrollment Examinations
Non-contact tonometer (American Optical Corporation) (see Fig. 1)

Exit Examinations
Non-contact tonometer (American Optical Corporation), Model 2421 Tonometry Station (Synergetics, Inc.)

Standardization & maintenance of equipment: 

A major consideration in maintenance of the tonometer was protection against dust; therefore, dust covers were used whenever the instrument was not in operation.

The lens surfaces were dusted daily with a camel's hair brush. Once per month the inside surface of the objective was cleaned with an acetone-dampened tissue paper.

Malfunctions of the non-contact tonometer were repaired by a representative of American Optical.

Calibration of the AO non-contact tonometer was performed daily as specified in the AO Non-Contact Tonometer Instruction Manual (see Appendix F, Item 5).
Fig. 1—Tonometer
Glaucoma—Tonometry (continued)

<table>
<thead>
<tr>
<th>Personnel administering test:</th>
<th>Enrollment Examinations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Medical technician</td>
</tr>
<tr>
<td>Two medical technicians performed tonometry—one during Dayton screening and the other in subsequent screening sites.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exit Examinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered nurse</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Training of personnel administering test:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment Examinations</td>
</tr>
<tr>
<td>The subcontractor's Coordinator, a registered nurse, was trained by the ophthalmologist consultant to use the AO non-contact tonometer. The Coordinator then trained the medical technician who tested the examinees at the screening center. Training was conducted over an 8-hour period in which the trainee was familiarized with the various controls of the tonometer, how to calibrate the tonometer, and how to conduct the test. The trainee performed tonometry on approximately ten &quot;patients&quot; while the trainer observed the procedure.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exit Examinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>The RN was trained by the ophthalmologist consultant to use the AO non-contact tonometer. Training was conducted over a two-day period in which the RN was familiarized with the various controls of the tonometer, how to calibrate the tonometer, and how to conduct the test. The RN performed tonometry tests on approximately 500 patients prior to the start of the Dayton exit examinations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to actual measurement, the examinee was asked to place his index finger about one-half inch in front of the objective orifice. The technician explained that a puff of air was used to measure eye pressure; the instrument was triggered to demonstrate the air-pulse intensity on the examinee's finger. This explanation served both to prepare the examinee and to check the calibration of the instrument. If the tonometer was properly calibrated the reading was 57 ±1 after the machine was triggered.</td>
</tr>
</tbody>
</table>

Tonometry was performed according to the instructions specified in the American Optical Corporation AO Non-Contact Tonometer Instruction Manual (see Appendix F).

Tonometry was performed in each eye, and a repeat measurement was taken for an eye with an initial measurement greater than or equal to 21 mm Hg.
Glaucma—Tonometry (continued)

Enrollment Examinations

Recording form:
1. Eligibility for tonometry was determined by circling response to the question "Is examinee 40 or older?"
2. Test results were recorded for each eye.
3. Test results of a repeat measurement were recorded if necessary.

<table>
<thead>
<tr>
<th>IS EXAMINEE 40 OR OLDER?</th>
<th>1. YES 2. NO (do not perform tonometry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT EYE</td>
<td></td>
</tr>
<tr>
<td>LEFT EYE</td>
<td></td>
</tr>
<tr>
<td>(repeat in either or both</td>
<td></td>
</tr>
<tr>
<td>if ≥21 mm)</td>
<td></td>
</tr>
<tr>
<td>RIGHT EYE</td>
<td></td>
</tr>
<tr>
<td>LEFT EYE</td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
</tr>
</tbody>
</table>

Exit Examinations
The tonometer was hooked into the van computer, and therefore the results were automatically recorded on computer tape.

Quality control:
Tonometry was observed by the screening center supervisor (RN) one per week.

Reliability measurements:
Approximately 10 percent of all examinees taking the test received a repeat test given by the same technician approximately 1 hour after the initial test which resulted in a measurement of test-retest reliability.
<table>
<thead>
<tr>
<th>Test:</th>
<th>Uric Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of test:</td>
<td>Blood was drawn during the screening examination and sent to a local laboratory for analysis.</td>
</tr>
<tr>
<td>Time required:</td>
<td>Total time for venipuncture was approximately 5 minutes.</td>
</tr>
<tr>
<td>Population screened:</td>
<td>All persons 14 years of age or older</td>
</tr>
<tr>
<td>Equipment:</td>
<td>Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephran sponges, critoseal, cotton balls, bandages.</td>
</tr>
<tr>
<td>Maintenance of equipment:</td>
<td>None</td>
</tr>
</tbody>
</table>
| Personnel administering test: | Enrollment Examinations  
                          Licensed medical technician  
                          Two licensed medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other worked in all subsequent sites.  
                          Exit Examinations  
                          Registered nurse |
Training of personnel administering test:
The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Enrollment Examinations
Venipuncture was performed and 15 ml of blood drawn into a red top vacutainer. The blood was allowed to clot for 30 minutes, then centrifuged. While the specimen was spinning, a serum tube was labeled with the examinee's identification sticker. The specimen was removed from the centrifuge and 7 ml of serum was drawn off and placed in the serum tube. The tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and 15 ml of blood was drawn into two red top Corvac vacutainers for tests included in the SMA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells. The Corvac tube makes it easier for shipping and handling.

After 15 ml of blood is drawn into the tube, the tube is inverted six to eight times, the tube is allowed to sit for 20 minutes, no longer, and then placed into a centrifuge and spun for 15 minutes. After spinning the tube is then inverted and rotated 360° so that the RN can check to insure that no red cells have seeped through the gel barrier.

Enrollment Examinations
Uric acid was included in the SMA 12/60 panel. The method used by the SMA 12/60 system was based on the reduction of a phosphotungstate complex to a phosphotungstite complex.

Exit Examinations
This method is also used for analysis of exit examination specimens.
Enrollment Examinations

Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix B.

Exit Examinations

Laboratory results are recorded on computer tape.

Quality control:

The medical technician performance was monitored by the on-site supervisor, a registered nurse, who observed task performance daily which included venipuncture and the preparation of specimens for shipment to the laboratory. The preparation of serum specimens required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the subcontractor's Document Control Center editor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements:

At the beginning of the screening examination, a random sample of examinees was selected to have extra blood drawn for "split sample analysis". Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample reliability. These duplicate samples were collected from 5-10 percent of the participants.
HEARING DISORDERS

Test:

Pure-Tone Threshold Audiometry

Pure-tone threshold audiometry was defined as the measurement of an individual's hearing sensitivity for calibrated pure tones. Although a person's threshold may be defined for a variety of test signals, pure-tones were used to provide assessment across the frequency spectrum for each ear.

A pure-tone threshold test for the frequencies 500 through 4000 Hz was selected to provide basic data on hearing sensitivity. Air conduction measurements were performed on all subjects; bone conduction measurements were performed when a loss by air conduction was found.

Description of test:

Examinees were seated in a sound-proof booth facing away from the window. Headphones were placed on the examinee and soft tones were introduced at various intervals. The examinee responded to the tones by raising his/her hand.

Time required:

6 minutes (additional 5 minutes per examinee if bone conduction test was required)

Population screened:

Persons 4 years of age and older

Equipment:

Enrollment Examinations
Beltone 12-D manual pure-tone threshold audiometer
Sound-proof booth

Exit Examinations
Beltone 12-D manual pure-tone threshold audiometer, sound-proof booth, Model 2510 Audiometry Station (Synergetics, Inc.)
Hearing Disorders—Pure-Tone Threshold Audiometry (continued)

Enrollment Examinations
The audiometer was checked for calibration daily by the medical technician. The audiometer was plugged in and allowed to warm up for 5 minutes. The technician put the earphones on, turned the hearing level dial to 30 dB, and listened to the signal first in one ear and then in the other ear. This check was to determine whether equal signals were being delivered to each earphone. The medical technician then tested the hearing threshold of another technician who served as a daily control test subject. The results were recorded in the calibration log.

Exit Examinations
Beltone 12-D
The audiometer was checked for calibration daily by the RN. The audiometer was plugged in and allowed to warm up for 60 minutes. The RN then put the earphones on, turned the hearing level dial to 30 dB and listened to the signal first in one ear, and then in the other ear. This check was to determine whether equal signals were being delivered to each earphone. The RN then tested the hearing threshold of another member of the examining team every day for hearing loss.

Model 2510 Audiometry Station
Calibration was conducted on the Model 2510 one week prior to testing by the Synergistics Service Systems Engineer under the observation of two University of Florida audiologists to insure that the sound limits of the booth and the equipment met required standards. The unit was calibrated again at the mid-point of testing at Dayton, Ohio.

The RN checked the calibration daily by testing another RN, and comparing the results.

Personnel administering test:

Enrollment Examinations
Medical technician
Three different medical technicians performed the testing during enrollment screening examinations; one for Dayton, one for Seattle, and one for both the Massachusetts and South Carolina sites.

Exit Examinations
Registered nurse
Training of personnel administering test:

**Enrollment Examinations**

Audiology training was conducted by the HIS audiologist consultant from the University of Washington, Seattle, Washington. Medical technicians received 40 hours of training, including pure-tone testing and tympanometry. The medical technician who tested hearing in Dayton was trained in Dayton; medical technicians who tested hearing at subsequent sites were trained in Seattle either prior to or during Seattle screening examination operations.

The training protocol was as follows:

**Day One:**
- a. Introduction to terms
- b. Introduction to test equipment
- c. Demonstration and instruction on pure-tone audiometer function
- d. Practice time for familiarization with pure-tone audiometer

**Day Two:**
- a. Presentation of air conduction section of pure-tone threshold audiometry techniques
- b. Lab practice on air conduction threshold techniques

**Day Three:**
- a. Presentation of air conduction masking technique rules
- b. Practice on audiometer simulator with masking problems

**Day Four:**
- a. Presentation of pure-tone bone conduction threshold technique
- b. Practice on bone conduction threshold technique

**Day Five:**
- a. Presentation of bone conduction masking rules and procedures
- b. Practice on bone conduction masking procedures with simulator

**Day Six:**
- a. Review of pure-tone air conduction/bone conduction test procedures
- b. Lab practice under supervision (with ten subjects)

**Day Seven:**
- a. Presentation of tympanometry test procedure
- b. Practice use of impedance audiometer
- c. Practice in administering tympanometry to ten subjects

**Day Eight:**
- a. Lab practice on full test battery, including pure-tone air conduction and bone conduction tests and tympanometry

**Day Nine:**
- a. Instruction on check list for hearing aids
- b. Practice in use of check list for hearing aids
- c. On-site practice with regular test battery

**Day Ten:**
- a. Instruction in checking function of equipment on-site
- b. On-site practice with complete test battery
Exit Examinations
Audiology training was conducted by the HIS audiologist consultant from the University of Florida, Gainesville, Florida. Training on hearing testing included instruction on the anatomy and physiology of the ear, and training in the use of the Beltone 12-D Audiometer for bone conduction (with and without masking). Additional training was conducted on the use and calibration of the Model 2510 at Synergetics, Inc., Gainesville, Florida.

The training protocol was the same as the Enrollment Examinations training protocol described above.

Enrollment Examinations
Pure-tone audiometry was performed as specified in the Hearing Measurement Procedures Manual (see Appendix F).

Procedure:
The basic procedure consisted of two distinct steps: (1) familiarization and (2) threshold sampling. These steps were the same regardless of the frequencies being tested or the type of test--air conduction or bone conduction. Familiarization assured the examiner that the subject understood and could perform the response task expected and also recognize the signal. Specifically the tone was turned on but completely attenuated (hearing level dial at zero); the intensity was gradually increased until a response occurred. Then the tone was turned off. This simple step accomplished both the desired goals. First, the subject had demonstrated his/her ability to complete the response task. Second, the subject was familiarized with the frequency of the tone under test. This step of familiarization was preliminary to threshold determination.

The method of threshold exploration was a standard procedure for manual pure-tone audiometry. In summary, the exploration for threshold was carried out by means of short-tone presentations, varying in duration. The presentations normally need be no longer than 1 to 2 seconds; however, they were of sufficient duration to allow the subject time to respond. The intervals between tone presentations were of variable length also, but no shorter than the test tone.
Hearing Disorders--Pure-Tone Threshold Audiometry (continued)

The level of each presentation was determined by the response to the preceding presentation. The first tone was presented at a level 20 dB below the level of the familiarization response. After each failure to respond to a tone, the hearing level was increased 5 dB until the first response occurred. Following the first response, the tone was raised 5 dB. After the second consecutive response, the tone was decreased 15 dB and another series of ascending presentations was begun.

Threshold was defined as the lowest level at which responses occurred in at least half of the ascents with at least three responses at a single level.

Thresholds were determined at octave intervals from 500 Hz through 4000 Hz for both ears. When possible the better ear was tested first. The initial test frequency was 1000 Hz. If no information was available as to which ear was better, it was suggested that the test begin in the right ear at 1000 Hz and then at 1900 Hz in the left ear. The test was continued in the better ear if one was determined. The sequence was 1000 Hz, 500 Hz, retest at 1000 Hz, 2000 Hz, and 4000 Hz. Having completed the test in one ear, the measurement in the second ear was completed following the same sequence.

When the results of the air-conduction test indicated a threshold of 20 dB or higher at any frequency for either ear, bone-conduction measurements were completed for that frequency and ear. The procedures for bone-conduction measurement were identical to those used in air-conduction measurements. The first step was to remove the air-conduction earphones and place the bone oscillator in position on the mastoid region of the skull at the ear with the better air-conduction threshold for that frequency.

Exit Examinations
Pure-tone threshold air conduction was tested with the Model 2510 Audiometry Station.

The Audiometry Station was turned on by means of the power switch located in the Front Panel. After the instrument was turned on, the reject lamp flashed. It was turned off by pressing the reset button. (If the reject lamp flashed after a test was completed, it indicates that a ret-test is requested.)
Hearing Disorders—Pure-Tone Threshold Audiometry (continued)

Pure-tone threshold air conduction was performed in strict accordance with the MHTV Operator's Manual, Audiometry chapter.

Pure-tone threshold bone conduction was tested with the Beltone 12-D Audiometer.

When the results of the air-conduction test indicated a threshold of 30 dB or higher, at any frequency for either ear, bone-conduction measurements were completed for that frequency and ear.

The first step was to remove the air-conduction earphones and place the bone oscillator in position on the mastoid region of the skull at the ear with the better air-conduction threshold for that frequency.

The basic procedure consisted of two separate and distinct steps: 1) familiarization and 2) threshold sampling. Familiarization: with the tone turned on, but completely attenuated (hearing level dial at zero) the intensity was gradually increased until a response occurred. Then, the tone was turned off. This simple step accomplished both of the desired goals. First, the subject had demonstrated his ability to complete the response task. Second, the subject was familiarized with the frequency of the tone under test.

The exploration for threshold was carried out by means of short-tone presentations, varying in duration. These presentations normally need to be no longer than 1 to 2 seconds; however, they were of sufficient duration to allow the subject time to respond. The interval between tone presentations were of variable length, but no shorter than the test tone.

The level of each presentation was determined by the response to the preceding presentation. The first tone was presented at a level of 20 dB below the level of the familiarization response. After each failure to respond to a tone, the hearing level was increased 5 dB until the first response occurred. Following the first response, the tone was raised 5 dB for the next presentation. After the second consecutive response, the tone was decreased 15 dB and another series of ascending presentations was begun. During threshold determination, the hearing level dial was never turned while the tone was on.
Following the above rules for level of signal, threshold was defined arbitrarily as the lowest level at which responses occur in at least half of the ascents with a minimum requirement of three responses at a single level.

Thresholds were determined at octaves indicated by a 30 dB or greater loss registered by the air conduction test.

Bone conduction with masking was conducted when the results of the bone conduction without masking differed more than 5 dB from the results of the air conduction test at each frequency registering a loss of 30 dB or greater. The bone conduction with masking test was accomplished by testing one ear while masking the other ear with an earphone, emitting a standard masking frequency. Threshold was determined by testing masking set at a minimum of 30 dB, or 10 dB above the bone conduction threshold. If the examinee responded to three consecutive signals masking was increased by 10 dB and checked again. If the examinee responded, threshold was determined. If the patient did not respond, the procedure was repeated beginning at the new level and continued until the examinee responded at "threshold," and 10 dB above. This was a standard procedure to accurately determine bone conduction threshold taught by the University of Florida audiologist.
### Hearing Disorders—Pure-Tone Threshold Audiometry (continued)

#### Enrollment Examinations

**Recording form:**

<table>
<thead>
<tr>
<th>AIR CONDUCTION (record threshold for each frequency)</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BONE CONDUCTION (test BC for each frequency in which the AC loss is 20 dB or more) Record threshold for each measured frequency</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REPEAT AIR CONDUCTION WITH MASKING:**

(if the AC threshold in one ear exceeds the AC threshold in the opposite ear by 40 dB or more or if the AC threshold in one ear exceeds the apparent BC threshold in the opposite ear by 40 dB or more)

| RIGHT EAR                                           |     |      |      |      |
| MASKING (of left ear)                                |     |      |      |      |
| LEFT EAR                                            |     |      |      |      |
| MASKING (of right ear)                               |     |      |      |      |

**COMPLETION CODE**

___
Hearing Disorders--Pure-Tone Threshold Audiometry (continued)

Exit Examinations
The results of the air conduction pure-tone threshold test were collected and fed to the EMTV computer automatically. Results for the bone conduction with and without masking were recorded numerically in two digits (Fig. 1). A Completion Code was filled in by the RN.

The RN also took information on the type and number hearing aids being used by the examinee, and recorded the results (Fig. 1).

Enrollment Examinations
A potential source of error in testing pure-tone audiometry was the noise level of the test environment. Therefore, noise data were collected to determine whether the test environment was in compliance with standards set by OSHA for hearing testing. The data were collected with the sound-level meter located at the position of the subject's head, with normal building factors in operation (heat, lights, other testing stations operating, etc.). Readings were completed at peak noise times of the day. A B&K Sound Level Meter (Model 2203) and an associated octave filter set (Model 1613) were used. The readings were taken by visually noting the needle excursion in a slow meter setting for approximately 15 seconds and then recording the upper limits of excursion, excluding infrequent impact type sounds. Values were recorded for linear, A, B, C scales, and octave bands from .125 through 8 kHz.

Sound levels in all sites except Seattle were within the limits set by OSHA. As can be seen in Fig. 2, it was discovered that noise in the Seattle environment exceeded acceptable levels and therefore it became necessary to purchase another sound-proof booth to provide greater attenuation. The noise in the Seattle site was due to the use of an air hammer during street construction in the area adjacent to the examination center.

Four weeks after site operations began, the hearing consultant tested the performance of the medical technician. The consultant and the medical technician independently completed forty-eight threshold measurements on the same individuals. The order of testing was randomly varied. A difference of ±5 dB was acceptable as the norm for tester-expert reliability values. The test of medical technician performance was conducted in Dayton and Seattle sites (see Fig. 3).
### Fig. 1

<table>
<thead>
<tr>
<th>Audio:</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone Conduction: Without</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bone Conduction: Right Ear</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bone Conduction: Left Ear</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Completion Code:</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Audio:**

- **How many aids**
- **If wearing aid(s), is aid(s) functional** (1. Yes, 2. No)
- **Type** (1. Body 2. Eyeglass 3. Behind ear 4. All in ear 5. Bone Conduction)
- **Completion Code:**
### Hearing Disorders--Pure-Tone Threshold Audiometry (continued)

<table>
<thead>
<tr>
<th>Octave Bands</th>
<th>Linear</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>8000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(all values in dB SPL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SEATTLE SITE -- ORIGINAL TEST ROOM

Median of 5 Readings

|                      |       |   |   |   | 68 | 31 | 49 | 62 | 47 | 25 | 11 | 9  | 9  | 11 | 14 |

#### SEATTLE SITE -- OUTSIDE OF TEST ROOM

<table>
<thead>
<tr>
<th>Location</th>
<th>Median of 3 Readings</th>
<th>Median of 3 Readings</th>
<th>Median of 3 Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playroom</td>
<td>69  46  56  62  59  48  36  28  30  24  22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receptionist</td>
<td>67  44  56  62  62  48  42  34  32  28  24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply Room</td>
<td>66  60  58  62  60  58  40  36  30  26  20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SEATTLE SITE -- NEW TEST ROOM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Median of 5 Readings</th>
<th>Median of 5 Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent Fan--ON</td>
<td>63  26  41  51  43  23  14  14  14  14</td>
<td></td>
</tr>
<tr>
<td>Vent Fan--OFF</td>
<td>34  15  10</td>
<td></td>
</tr>
</tbody>
</table>

All readings taken with B&K Sound Level Meter (model 2203) and octave filter (model 1613).

---

Fig. 2-Noise studies
### Hearing Disorders--Pure-Tone Threshold Audiometry (continued)

<table>
<thead>
<tr>
<th>Test-Retest Results Same</th>
<th>Test-Retest Results + 5 dB Difference</th>
<th>Test Results + 10 dB Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DAYTON TEST SITE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 (63%)</td>
<td>18 (37%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><strong>100% Test-Retest Within Limits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SEATTLE TEST SITE (Prior to acquisition of new sound booth)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 (48%)</td>
<td>19 (40%)</td>
<td>6 (12%)</td>
</tr>
<tr>
<td><strong>88% Test-Retest Within Limits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SEATTLE TEST SITE (After new sound booth installed)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 (63%)</td>
<td>16 (33%)</td>
<td>2 (4%)</td>
</tr>
<tr>
<td><strong>96% Test-Retest Within Limits</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3-Tester-expert reliability results
Hearing Disorders--Pure-Tone Threshold Audiometry (continued)

The analysis indicated that the test team member was producing valid test results as defined by a certified audiologist's comparative results. The lack of agreement seen in the Seattle results prior to acquisition of the test booth was best assigned to the noise problems introduced by the test site. As an example, test-retest data for the consultant alone often exceeded the +5 dB acceptable level.

Exit Examinations
A potential source of error in testing pure-tone audiometry is the noise level in the test environment. Therefore, noise data were collected to determine whether the test environment was in compliance with standards set by OSHA for hearing testing. Noise data were collected with the sound-level meter located at the position of the subject's head, during normal operations (heat, lights, other testing stations operating, etc.). Equipment used included a B&K Sound Level Meter (model 2203) and associated octave filter set (model 1613). The readings were taken by visually noting the needle excursion in a slow meter setting for approximately 15 seconds and then recording the upper limits of excursion, excluding infrequent impact type sounds. Values were recorded for linear, A, B, C scales, and octave bands from 125 through 8000 Hz (Fig. 4).

In addition, the Synergetics audiometer was calibrated midway through testing in each site. Figure 5 presents the data from the calibration performed in Dayton.

Reliability measurements:
Approximately 10 percent of all examinees taking the test received a repeat test given by the same medical technician 1 hour after the initial test, yielding a measurement of test-retest reliability.

Comments:
As indicated in the quality control section, a number of persons were tested for hearing loss using a sound booth which did not provide adequate attenuation. Prior to obtaining a sound booth which eliminated the noise interference caused by the street construction, 105 children and 330 adults were tested under imperfect conditions. A completion code of "O" was used to indicate these cases.
FIG. 4

BACKGROUND NOISE MEASUREMENT

LOCATION: DAYTON, OHIO
METV 7110 SOUND PROOF BOOTH
HIS PARKING LOT

DATE: Oct 22, 1977

TIME: 9:15 AM

1. All readings taken with B&K sound level meter model 2203, and octave filter model 1613.

2. All measured dB levels are taken re 0.0002 dynes/cm².

3. All systems on including A/C, processor, computer rack.

RESULTS:

<table>
<thead>
<tr>
<th>OCTAVE BANDS CENTER FREQUENCY IN HZ</th>
<th>Linear</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>125</td>
<td>250</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>76</td>
<td>33</td>
<td>54</td>
<td>64</td>
<td>48</td>
</tr>
</tbody>
</table>
FIG. 5

PERIODIC AUDIOMETER LEVEL CALIBRATION
SYNERGETICS INC.

AUDIOMETER: MODEL 2510
SERIAL NO. MHTV 7110
EARPHONE TYPE: TDH 47
CUSHION TYPE: MX/41/AR
DATE: 10/23/77
LOCATION: DAYTON, OHIO

CALIBRATOR MICROPHONE: MODEL 158
MANUFACTURER: B & K INSTRUMENT
CAL REF: PISTONPHONE
MODEL 4220
CALIBRATION PERFORMED BY:
RON BOOKER
SYNERGETICS INC. SYSTEM
SERVICE ENGINEER

### EARPHONE OUTPUT CHECK

<table>
<thead>
<tr>
<th>TEST TONE FREQUENCY</th>
<th>LEFT 15dB</th>
<th>LEFT 30dB</th>
<th>LEFT 45dB</th>
<th>LEFT 60dB</th>
<th>LEFT 70dB</th>
<th>RIGHT 15dB</th>
<th>RIGHT 30dB</th>
<th>RIGHT 45dB</th>
<th>RIGHT 60dB</th>
<th>RIGHT 70dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>25.4</td>
<td>39.2</td>
<td>54.2</td>
<td>69.1</td>
<td>78.9</td>
<td>24.6</td>
<td>39.2</td>
<td>54.1</td>
<td>68.9</td>
<td>78.8</td>
</tr>
<tr>
<td>1000</td>
<td>25.5</td>
<td>39.6</td>
<td>54.4</td>
<td>69.3</td>
<td>79.2</td>
<td>24.9</td>
<td>39.3</td>
<td>54.2</td>
<td>69.0</td>
<td>78.8</td>
</tr>
<tr>
<td>2000</td>
<td>24.6</td>
<td>38.8</td>
<td>53.7</td>
<td>68.7</td>
<td>78.5</td>
<td>24.4</td>
<td>38.7</td>
<td>53.7</td>
<td>68.6</td>
<td>78.4</td>
</tr>
<tr>
<td>3000</td>
<td>25.6</td>
<td>39.7</td>
<td>54.8</td>
<td>69.7</td>
<td>79.3</td>
<td>25.8</td>
<td>40.4</td>
<td>55.3</td>
<td>70.4</td>
<td>80.0</td>
</tr>
<tr>
<td>4000</td>
<td>25.8</td>
<td>40.5</td>
<td>55.2</td>
<td>70.2</td>
<td>79.9</td>
<td>26.3</td>
<td>41.1</td>
<td>55.8</td>
<td>70.9</td>
<td>80.7</td>
</tr>
</tbody>
</table>

NOTE: ALL MEASURED dB LEVELS ARE TAKEN re 0.0002 dynes/cm²

BACKGROUND NOISE 8 TO 14 dB ABSOLUTE RELATIVE TO 0.0002 dynes/cm²
BANDWIDTH 500 TO 8000 Hz.
HEARING DISORDERS

Test:

Tympanometry

Tympanometry was used as a form of acoustic-impedance measurement which described the opposition (resistance) encountered by a sound wave. Thus, acoustic-impedance measurements may be used to chart the opposition provided by the eardrum and middle-ear structures to the movement of sound energy. Most deviations from the normal state of the eardrum and middle-ear structures would cause a change in the amount of opposition encountered by a sound wave. For example, the presence of fluid in the middle ear such as occurs in otitis media would greatly increase the opposition or acoustic impedance of the system. Since acoustic-impedance measurements assess this opposition, they provide the tester with a means of determining the efficiency of the middle-ear structures. From these measurements, the presence or absence of certain middle-ear pathologies can be inferred.

Tympanometry was used as an objective measurement of the mobility or compliance of the eardrum under conditions of varying air pressure, accomplished by the introduction of changes in air pressure in the ear canal.

Tympanometry was included in the hearing measurement in order to provide information on middle-ear status and thus type of loss for persons who have a hearing loss. Also, because some individuals will show air-conduction hearing sensitivity within normal limits and yet have abnormal conditions present in the middle ear, the purpose of including tympanometry was to provide data on individuals who may have had no shift in hearing sensitivity at the time of examination, but who may have been in need of medical attention for possible middle-ear pathology. For example, among school-age children who evidence signs of either present or past aural pathology, approximately 50 percent will show hearing sensitivity within normal limits and pass a pure-tone screening test.
### Hearing Disorders—Tympanometry (continued)

**Description of test:**
A rubber-tipped probe was inserted into the ear and a seal was obtained. One measurement was taken in each ear.

**Time required:**
5 minutes

**Population screened:**
- **Enrollment Examinations**
  All persons 4 years of age or older, except for persons answering "Yes" to the question "Have you (has your child) had ear surgery in the past six months?" and/or "Have you (has your child) had ear drainage requiring the doctor to put tubes in your ears in the past six months?"

- **Exit Examinations**
  All persons 4 years of age or older and 13 years of age or less inclusive, except for persons who have had a stapedectomy, or who answered "Yes" to the question "Have you (your child) had ear surgery in the past six months?", and/or "Have you (has your child) had ear drainage requiring the doctor to put tubes in your ears in the past six months?"

**Equipment:**
- American Electromedics Impedance Audiometer Model 81
- American Electromedics Tympanograph X-Y Plotter Model 612A

**Exit Examinations**
- American Electromedics Tympanometer Model 8RR 52024

**Standardization & maintenance of equipment:**
Malfunctions of the impedance audiometer were repaired by a representative of American Electronics Corporation.

The air pressure needle was checked daily to ascertain that the reading was "0". If the reading was not "0" the brass screw knob located on the back of the impedance audiometer was adjusted to bring the reading to "0".

The X-Y Plotter was calibrated daily as specified in the Hearing Measurement Procedures Manual (see Appendix F, Item 6).
Hearing Disorders—Tympanometry (continued)

Exit Examinations
The instrument was calibrated prior to the testing in Dayton. (Routine calibration is done once a year, as specified in the Tympanometer Instruction Manual.)

The eartips and probe were cleaned daily.

Personnel administering test:

Enrollment Examinations
Medical technician

The same medical technician performed tympanometry in all sites.

Exit Examinations
Registered nurse

Training of personnel administering test:

Enrollment Examinations
Training for tympanometry was included in a ten-day audiology training program conducted by the Health Insurance Study audiologist consultant at the University of Washington, Seattle, Washington. See Hearing Disorders—Pure-Tone Threshold Audiometry for details of the training course.

Exit Examinations
Training and testing was conducted at the University of Florida, Audiology Department, under the supervision of the subcontractor audiology consultants.

Instruction on the tympanograph included background information on anatomy and physiology as well as the operation of the instrument.

Practice tympanometrics were conducted on audiologists, as well as on pediatric patients in the clinic. Training took one full day. Three days after the training, the RN returned to the Audiology Department and received 14 additional hours of instruction.
Enrollment Examinations

Procedure:

1. Before beginning, the equipment was in the "ready" position:
   a) bridge turned "on" and warmed up; b) pressure dial set at "0"; c) sensitivity dial set at "off"; d) pressure range on normal; e) recorder level in "load" position; f) both edges of recorder paper fastened down; g) the air pressure needle read "0"; if it did not, the needle was centered to zero by adjusting the brass screw knob on the back of the impedance audiometer; and h) recorder calibrated.

2. To obtain a tympanogram:
   a) an airtight seal of the probe tip in the test ear was obtained. To check the seal, 0-200mm water pressure was introduced by rotating the air pressure dial clockwise. The seal was adequate if the needle held at +200mm or leaked by no more than 20mm in 10 seconds; b) sensitivity knob was turned to "T"; c) the intensity knob was adjusted until the compliance change meter needle was on the red zero (0); d) the recorder lever was moved from the load position to "up", then to "down", allowing the arm to stop in each position to avoid damaging the mechanism; e) the air pressure was reduced smoothly to -200mm by pushing the Positive-Negative switch to the left; f) the recorder lever was put in the "load" position; g) the air discharge button was pushed and the probe tip was removed from the ear; h) pens were changed and the procedure was repeated for the other ear.

3. Recording results of tympanometry:
   a) the tympanogram was removed from the plotter and the plastic overlay placed on top of the tympanogram (Fig. 1); b) grid coordinates were determined for each ear by measuring the compliance peak on the vertical axis; the value was entered as 1 through 20; the procedure was repeated on horizontal axis and entered as 50 through 77. This measurement was taken for both ears. On the Recording Form the first two digits represent the vertical measurement; the last two digits represent the horizontal measurement; c) slope was determined by comparing to samples (upper left-hand corner of Fig. 1) and recording 1, 2, 3, or 4 for each ear; d) result was recorded by placing the overlay on top of the tympanogram and determining if the compliance peaks fell in pass or fail areas; results were recorded for each ear as 1=no seal; 2=pass; 3=fail.

4. All examinees receiving tympanometry were asked if they were wearing a hearing aid. If yes, it was recorded how many aids, the type of aid, and if the aid was operational.
 Hearing Disorders—Tympanometry (continued)

Fig. 1—Tympanometry scoring overlay (xerox copy) not exact scale
Exit Examinations

First, the instrument was prepared, following the manual's instruction with regard to loading the paper, pen height adjustment, and mode selection.

The examinee was seated in a comfortable, relaxed position. It was explained to the examinee what was going to happen and why. The ear was examined to determine the size and direction of the ear canal. The appropriate eartip to seal the ear canal opening was selected. The eartip was attached to the end of the probe. The probe was applied to the ear; if the green light came on, the test started automatically, if the red light came on, or red light blinked, the test would not start, and the probe had to be re-applied.

The instrument provides an automatic recording of the air pressure in the external canal and the change in mobility of the middle ear during the test cycle.
**Hearing Disorders—Tymanometry (continued)**

**Enrollment Examinations**

<table>
<thead>
<tr>
<th><strong>TYMANOMETRY</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HAS EXAMINEE HAD EAR SURGERY OR TUBES IN EARS FOR DRAINAGE IN THE PAST 6 MONTHS?</td>
<td>1. YES (do not perform test) 2. NO</td>
</tr>
<tr>
<td>GRID COORDINATES</td>
<td>RT. EAR <strong>/</strong> LT. EAR <strong>/</strong></td>
</tr>
<tr>
<td>SLOPE</td>
<td>RT. EAR _ LT. EAR _</td>
</tr>
<tr>
<td>RESULT (1=normal, 2=pass, 3=fail)</td>
<td>RT. EAR _ LT. EAR _</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td>_ _</td>
</tr>
</tbody>
</table>

**HEARING LOSS:**

|  |
| IS EXAMINEE WEARING A HEARING AID(S)? | 1. YES 2. NO |
| IF YES, HOW MANY AIDS? | |
| IF YES, TYPE OF AID? | 1. BODY 2. EYEGlass 3. BEHIND 4. ALL 5. BONE |
| STYLE | EAr IN EAr CONDUCTION |
| IF YES, IS AID(S) OPERATIONAL? | 1. YES 2. NO |
| COMPLETION CODE | |

**Exit Examinations**

The RN removed the tympanogram from the instrument and recorded the grid, slope, results, and Completion Code (see Fig. 2, Recording Form).
TYMPANOGRAMY:

RIGHT

GRID

SLOPE

RESULTS**

LEFT

---

* SLOPE:

---

** RESULTS:

1 = no seal
2 = pass
3 = fail

Fig. 2—Recording form
Automatic Tympanogram

Name
Date
Age
Probe Ear: Left Right

Fig. 2b
Quality control: The procedure for collecting tympanometry data was automated, so the only special task required of the medical technician was to achieve an adequate seal in the external auditory meatus. At the Dayton and Seattle sites, the audiologist consultant observed the medical technicians and found them to be achieving seal and completing the tympanogram satisfactorily.

Reliability measurements: Ten percent of all examinees who received tympanometry were requested to return to the testing station 1 hour after the initial tympanometry was performed to receive a repeat test. This procedure allowed for the measurement of test-retest reliability.
HYPERTENSION

Test:

Enrollment Examinations
Blood Pressure

Description of test:

In Dayton, both sitting and standing blood pressure readings were taken on the left arm of the examinee. The standing blood pressure reading was taken after at least 1 minute of standing. If either blood pressure was ≥140 systolic and/or ≥90 diastolic, a second sitting blood pressure reading was taken at least 10 minutes later, with at least 5 minutes of the most recent 10 minutes spent resting in a nonstimulating environment.

In other sites, a sitting blood pressure reading was taken on the right arm of the examinee. If the systolic reading was ≥140 and/or the diastolic reading was ≥90, a repeat sitting blood pressure was taken after at least 10 minutes of rest in a nonstimulating environment. Also, if the examinee was taking antihypertensive medication, a standing blood pressure measurement was obtained.

Time required: 3 minutes

Population screened:

All persons 14 years of age and older
Hypertension—Blood Pressure (continued)

Equipment: In Dayton, the Infrasonde 3000 with pediatric, adult, and large adult blood pressure cuffs was used. A sphygmomanometer was maintained for back-up.

In all other sites, the Automatic Blood Pressure Recorder (Physiometrics International Model SR-2) was used.

The problem in obtaining accurate blood pressure readings which used traditional tools such as the aneroid or mercury sphygmomanometer and stethoscope has been well-documented. Defective valves and/or dirty filters on sphygmomanometers interfere with mercury control and air resistance. In addition, studies have found significant observer differences and digit preference among medical assistants measuring blood pressure. For these reasons, we chose to measure blood pressure using an electronic sphygmomanometer which potentially minimizes the effects of medical assistant variability.

An electronic sphygmomanometer (Infrasonde 3000) was used which emitted a distinctive series of audio tones in response to subsonic arterial wall oscillations during cuff deflation. A transducer, placed under the cuff, picked up the oscillations which were then amplified, processed, and used to produce an audio tone.

In subsequent sites the Automatic Blood Pressure Recorder was used because of the advantage of producing a hard copy graph of the blood pressure reading. It can be interpreted by a number of observers, and readings separated by a period of years can be compared with no bias due to maturation effect (provided that the rules for calibration and maintenance of the instrument were assiduously followed).

The principle by which the Automatic Blood Pressure Recorder was operated was the same as for the Infrasonde 3000 used for Dayton screening examinations described by the manufacturer of the former as follows:

"(It) differs from other 'automatic' sphygmomanometers... It does not detect Korotkoff sounds but rather responds to a narrow sub-audible (infrasonic) frequency band. Research has shown that the arterial wall under an occluding cuff oscillates at low frequencies whenever the arterial and cuff pressures are identical; it is these oscillations or movements of the artery wall which are detected and recorded." The oscillations sensed by the
Physiometrics SR-2 served as a proxy for the Korotkoff sounds heard by the ear; the systolic and diastolic readings obtained in this manner have been compared with other methods and found to be acceptable by the research community. The diastolic reading produced by this device resulted in a reading located between the fourth and fifth Korotkoff sounds.

The Infrasonde required a periodic check of the batteries and calibration of the manometer against a mercury column.

The Infrasonde unit utilized two battery indicators which signaled when activity of the batteries reached a low level. If the batteries remained effective, both lamps continued to register no light emittance during blood pressure determination. Instruction for battery replacement was included in the Instruction Manual (see Appendix F, Item 7).

The system was also tested once per week by following the steps outlined in the Infrasonde 3000 Instruction Manual.

The Physiometrics SR-2 required cleaning of the ink-feed system and standard calibration. The majority of problems encountered were related to either the clogging of ink or the loosening of the stylus pivot screw.

The automatic blood pressure machine was calibrated daily. Detailed instructions for the calibration of the machine were contained in the Physiometrics International Operator's Instruction Manual (see Appendix F, Item 8). At the beginning of each day the turntable lock was released and the machine was turned on. A dated disc was inserted and calibration was done for the following values: 200 mm Hg, 180, 160, 140, 120, 100, and 80. If any of the marks were more than plus or minus 2 mm Hg away from the reading on the mercury manometer, the machine was recalibrated using an Allen wrench. Calibration was checked again and the new, corrected disc as well as the first disc of the day were retained as a quality control record.

Once per week the ink-feed system on the machine was flushed and a fresh supply of ink was added. This was done according to instructions in the Operator's Manual.
Hypertension—Blood Pressure (continued)

Personnel administering test:

Medical assistant

In each site a different medical assistant performed blood pressure procedures; that is, four medical assistants were trained but only one medical assistant performed blood pressure procedures in any one site.

Training of personnel administering test:

The first day of training in Dayton was conducted by a representative of Marion Scientific Corporation, the manufacturer of the Infrasond 3000. Training consisted of a review of the Instruction Manual and practice sessions in using the Infrasond.

The second day of training involved expert-tester measurement comparisons between the physician and the medical assistant with the screening examination staff members serving as test subjects. Because the Infrasond emits an audible sound, it was possible to take one blood pressure on each subject and have the physician and the medical assistant independently record the results. Twenty comparison measurements were taken with the following results: 20/20 (100 percent) systolic readings fell within 1 beat (2-3 mm Hg) upon comparison, 18/20 (90 percent) diastolic readings fell within 1 beat (2-3 mm Hg) upon comparison.

The blood pressure medical assistant and the registered nurse supervisor were trained by the Rand physician in the proper use of the Automatic Blood Pressure Recorder. Training consisted of the reading and review of the Physiometrics Operator's Instruction Manual as well as a review of the expanded guidelines developed by the physician. After review of the materials, the medical assistant and the nurse practiced using the machine until they were able to produce consistently readable discs.

The next phase of training involved the interpretation of 30 blood pressure discs. The physician, the medical assistant, and the nurse independently interpreted the discs. The interpretations were then compared and discrepancies discussed.

Throughout the progress of screening examinations the physician monitored the interpretation of blood pressure readings and visited the screening sites approximately every six weeks at which time a retraining session was held to maintain standardization of blood pressure interpretation.
Hypertension--Blood Pressure (continued)

Procedure: The mode of operation of the automatic blood pressure machine was as specified in the Operator's Instruction Manual. Before using the machine the medical assistant checked to ascertain that the turntable lock was released and the patient status switch was in the INACTIVE position.

The examinee was requested to raise his/her right arm over his/her head and wriggle the fingers for 3 seconds in order to eliminate any venous congestion. The right arm was then placed in the 36 cm universal cuff with the point of the elbow extending about 3/4 of an inch (2 cm) beyond the edge of the cuff. Once the arm was properly placed, the metal latch on the cuff was secured. Readings were taken only when the arm was relaxed, with palm down, resting on the foam cylinder. If the examinee's arm was too large to rest comfortably within the latched universal cuff, the oversized cuff was used.

The cuff was inflated by turning the function switch lever to INFLATE until the pen recorded 180 mm Hg. The function switch was then gently released to the record position. The switch was kept in the RECORD position until the needle stopped moving. The cuff was deflated at a rate of 3 or 4 mm Hg per pulse; greater separation between pulses would have made the reading inaccurate. In the event that there was less than 15 mm Hg (see Fig. 1) between the start of the straight pen line and the first regular pulse stroke, the cuff was deflated, a new disc inserted, and the blood pressure taken again with a higher initial inflation level.

Fig. 1--Blood pressure disc
Hypertension—Blood Pressure (continued)

The blood pressure disc was then removed from the machine and an examinee identification label placed on the back of the disc.

Standing blood pressure was taken on all examinees who used blood pressure medication. It was performed exactly as sitting blood pressure except that the examinee was standing. The examinee was requested to lightly support the cuff housing with the left hand while the blood pressure was taken on the right arm.

The mode of operation of the Infrasonde 3000 was as specified in the Instruction Manual (see Appendix F, Item 7). The left arm of the examinee was placed in the appropriate cuff with the tubing pointed toward the elbow with the edge of the cuff above the elbow. The selection of the cuff to be used was based on the fact that the cuff should be at least 20 percent wider than the diameter of the examinee's arm. The cuff position was adjusted to place the transducer over the medial brachial artery; then the cuff was wrapped and fastened. The arm of the examinee was oriented so that the center of the cuff was at the same level as the heart. The cuff was inflated rapidly to a level of at least 30 mm Hg above the expected systolic pressure. Deflation of the cuff was done slowly, at a rate of approximately 2 to 3 mm Hg per heartbeat.

Systolic pressure was determined by the sounding of a loud, high-pitched tone followed immediately by a regular series of similar tones or by a series of tones ascending in pitch and volume. Occasionally presystolic sounds occurred—a series of soft, low-pitched tones of equal volume and pitch—in these cases, the true systolic beat was higher pitched and louder in intensity. Diastolic pressure was determined by the first abrupt drop in volume and pitch of tone, or by the sudden cessation of tones. In the latter instance, diastolic pressure was considered to fall where the next tone would have occurred. This point is equivalent to midway between the fourth and fifth component of blood pressure.
Blood pressure measurements were read according to the guidelines in the Physiometrics Operator's Instruction Manual (see Appendix F, Item 8).

Concerning the systolic pressure it was particularly noted that "the first clear pen stroke which is followed by a series of strokes, increasing in amplitude and regularly spaced, is the systolic blood pressure. In rare cases, several small strokes of about equal height may precede the first large pulse; the latter then indicates systolic." For systolic reading, a "blip" or "hiccup" or "pulse" (see Fig. 2) was ignored (above the line only) if there was any question. In case of doubt, the low side was taken. We looked for the first, clear-cut double spike which went both above and below the baseline; this spike was followed by rhythmic spikes, which usually increased in height. If two small spikes of the same height were followed by a large one, the large one was taken as the systolic reading.

Fig. 2—Interpretation of the blood pressure disc

Concerning the diastolic, it was particularly noted that the Physiometrics Operator's Instruction Manual states: "Diastolic pressure is indicated by a distinct and sustained change in character of the pen strokes. In most cases, this takes the form of a sharp reduction in amplitude from the preceding series of strokes. Occasionally, the change may be a complete one, i.e., from nearly full-scale to zero. In this case, the diastolic is read at the point where the next pen stroke would have been."
Hypertension--Blood Pressure (continued)

In addition to the guidelines suggested in the Physiometrics Operator's Instruction Manual, an expanded set of guidelines was developed to aid medical assistants in the reading of diastolic pressure. The guidelines were as follows: "In the case where the (diastolic) change goes from nearly full-scale to zero, and you read where the next pen stroke would have been, that means that you count the number of boxes from the second to last stroke to the last stroke, and then count an equal number of boxes from the last spike to the point you will call the diastolic."

"When there is a question concerning whether or not a change is enough so that a particular stroke will be called the diastolic, take the first stroke which shows some change in both the upper and lower directions of the stroke. There should be at least one full box decrease from the upward direction, and any change from the downward direction. If there is a change of more than two boxes from the upward direction alone, the changed stroke may be called the diastolic; it will be rare that this much change occurs from the upward direction without any change from the downward direction."

"The diastolic change must be sustained. If pen strokes change so that you would name a particular stroke the diastolic, but thereafter the strokes increase again in amplitude, wait until the pen strokes decrease again, after the increase, and choose the diastolic reading at the decrease following the last increase."
Hypertension——Blood Pressure (continued)

Recording form: Dayton:

1. Cuff size used was recorded.
2. Sitting and standing blood pressures were recorded together with the time of the measurement.
3. If a repeat sitting blood pressure was done, the reading was recorded together with the time of the procedure.
4. A Completion Code was entered (see Appendix B for a list of codes).

<table>
<thead>
<tr>
<th>Cuff Size Used:</th>
<th>1 REG.</th>
<th>2 LARGE</th>
<th>3 PEDIATRIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diastolic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. SITTING
2. STANDING
3. REPEAT SITTING

First systolic ≥ 140 or first diastolic ≥ 90

Completion code: 

Technician
Hypertension—Blood Pressure (continued)

Other Sites:

After the blood pressure measurement was obtained and the disc was labeled with the examinee's identifying information, the recording form was filled out. The sequence for blood pressure recording was as follows:

1. If universal cuff was used, REGULAR cuff size was circled on the recording form. If the large cuff was used, LARGE was circled.
2. The medical assistant interpreted the blood pressure disc and made a notation of the blood pressure reading in the margin of the recording form. Later, the registered nurse interpreted the blood pressure disc, and recorded the reading for sitting blood pressure.
3. If a repeat blood pressure was taken because the initial reading was 2140/90, the registered nurse interpreted the second disc as well, and recorded the reading.
4. YES or NO was circled depending upon whether the examinee was taking blood pressure medication.
5. If a standing reading was obtained, the registered nurse interpreted and recorded the reading.
6. The completion code was recorded (see Appendix B for list of completion codes).
7. The blood pressure disc(s) was (were) placed in the HIS envelope and retained along with the Confidential Recording Form.

<table>
<thead>
<tr>
<th>BLOOD PRESSURE</th>
<th>REG.</th>
<th>LARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUFF SIZE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITTING BLOOD PRESSURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REPEAT B.P. (if systolic 2140 or diastolic 90)</td>
<td></td>
<td>1. YES 2. NO</td>
</tr>
<tr>
<td>TAKING B.P. MEDICATION?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF YES, STANDING BLOOD PRESSURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Hypertension--Blood Pressure (continued)

<table>
<thead>
<tr>
<th>Quality control:</th>
<th>Quality control procedures were:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Daily comparisons between medical assistant and nurse interpretations of blood pressure discs.</td>
</tr>
<tr>
<td></td>
<td>2. Periodic comparisons among medical assistant, nurse, and physician interpretations of blood pressure discs, with retraining sessions when indicated.</td>
</tr>
</tbody>
</table>

| Reliability measurements: | Ten percent of all adult examinees received a repeat blood pressure approximately 1 hour after the initial blood pressure measurements, yielding a measurement of test-retest reliability. |

| Comments: | The automatic blood pressure machine proved to be a great improvement over the standard audio-visual method of obtaining blood pressure readings which resulted in an elimination of bias from digit preference and inter-observer differences. |
HYPERTENSION

Test:

Exit Examinations
Blood Pressure

Description of test:

Two sitting blood pressure readings were done on all examinees within the age range, using one arm (left), with a time interval of 30 seconds between each reading. If, in either reading the systolic pressure reading was equal to or greater than 140 mm Hg, and/or the diastolic pressure reading was equal to or greater than 90 mm Hg, a third blood pressure was done after the examinee rested at least 10 minutes in a quiet non-stimulating environment. If the examinee is taking any anti-hypertensive medications, a standing blood pressure measurement will be obtained.

Time required:

3 minutes

Population screened:

All persons 14 years of age and older

Equipment:

Synergetics Automatic Blood Pressure Station, Model 2230
Sphygmomanometer, three sizes of cuffs

The blood pressure is measured automatically using indirect auscultation techniques. An occluding cuff with a microphone sensor is automatically inflated to 10 mm Hg above the systolic pressure. The cuff is then linearly deflated and the sensor listens for the arterial blood flow sounds (Korotkoff) as the pressure in the cuff is varied between the systolic and diastolic blood pressure. As the cuff is deflated, the first Korotkoff sound registered is associated with the pressure in the occluding cuff and this pressure is displayed as the systolic blood pressure. As the cuff continues to deflate, the additional Korotkoff sounds are registered and the associated cuff pressure values are stored. Two seconds after the last sound is registered, the last stored cuff pressure is displayed as the diastolic blood pressure. Data are then transmitted to the computer for quality control and storage.
Hypertension—Blood Pressure: Exit Examinations (continued)

The problem in obtaining accurate blood pressure readings using traditional tools such as the aneroid or mercury sphygmomanometer and stethoscope have been well documented. Defective valves and/or dirty filters or sphygmomanometer interfaces with mercury control and air resistance. In addition, studies have found significant observer differences and digits preference among technicians measuring blood pressure. For these reasons, we chose to measure blood pressure using an electronic sphygmomanometer which potentially minimizes medical technician variability.

Standardization & maintenance of equipment:

The model 2230 was checked for standardization daily using a mercury column. The cuff was inflated 150 mm of mercury. As the cuff deflated at the rate of 5 mm per second, the registered nurse generated a sound in the microphone located in the cuff by touching it at 130 mm of mercury. The sound continued until the column reached 70 mm of mercury, at which time the sound was stopped. The station display should show a systolic reading of 130 mm and a diastolic reading of 70 mm, both reading ± 3 mm.

Repeatability is checked by administering 5 blood pressures on a subject approximately 30 seconds apart at two different intervals. The two sets of readings were averaged, then compared. The compared reading should be within 10 mm of mercury.

Personnel administering test:

Registered nurse

Training of personnel administering test:

The registered nurse was trained at Synergetics, Incorporated in Gainesville. Training consisted of instructions in operating the Model 2230, blood pressure cuff position, mercury column monitoring. In addition, the HTI cardiologist retrained the nurse in manual blood pressure techniques.

Procedure:

The examinee is questioned as to the type of medication, if any, that he may be taking. The examinee's identification card is inserted into the front panel. The examinee is asked to raise his left arm above his head and wiggle his fingers to stimulate circulation. A universal cuff with the attached sensor is placed on the examinee's upper left arm. The RN should find the brachial artery
and place the sensor over it, usually the artery is located on the inside surface of the arm. Proper positioning is 1 to 2 inches above the elbow and over the brachial artery. The arrows on the cuff may be used as a guide to indicate the position of the sensors in the cuff. With the sensor properly located, the cuff should be fastened snugly in place using the fasteners attached to the cuff.

The arm should be relaxed and positioned so that the cuff does not touch either the body or another object (such as the chair) which might produce artifact "sounds" while the cuff is being inflated.

Check the yellow lamp on the blood pressure monitor front panel. The lamp should not flash when the arm and cuff are resting quietly. Instruct the examinee not to move at all, especially his or her arm during the test.

Press the start button on the front panel. Observe the following sequence which the instrument will perform during proper operation:

1. The cuff should begin to inflate
2. After several seconds, the yellow lamp on the front panel will begin to flash. During proper operation, several consecutive flashes will be seen.
3. Two seconds after the last flash, the cuff will begin to deflate.
4. When the yellow lamp first flashes during deflation, the systolic blood pressure value will appear. The lamp will continue to flash as each arterial sound is registered.
5. Two seconds after the last flash, the diastolic pressure value will be displayed.

If extraneous sounds, such as arm movements, are detected shortly after the start button is pressed, the cuff will deflate without detecting the blood pressure values. The instrument may be restarted by pressing the start button.


If the examinee's systolic pressure reading is equal to or greater than 140 mm Hg, and/or the diastolic pressure reading is equal to or greater than 90 mm Hg in
Hypertension--Blood Pressure: Exit Examination (continued)

either of the blood pressure readings, the examinee is asked to sit quietly in a non-stimulating environment for 10 minutes and the blood pressure is recorded again.

If the examinee is taking any antihypertensive medications, a standing blood pressure is taken after the examinee has stood for at least 10 seconds.

Recording form:
The send button is depressed transmitting the data to the computer for analysis.
The cuff size is recorded on the Test Verification Form (TVF). If one systolic reading is equal to or greater than 140 mm Hg and/or diastolic reading is equal to or greater than 90 mm Hg, the reading is written above the ECG Completion Code.
If both systolic readings and both diastolic readings were above the limits stated above, one reading is recorded above the ECG Completion Code and the other is recorded above the x-ray Completion Code. (This is to insure that both the ECG and the x-ray will be completed on the specific examinee.)

The standing blood pressure is recorded on the TVF.

Completion Code is completed on the TVF.

Quality control:
The Model 2230 Blood Pressure Station is calibrated against a standard manometer at the factory every two weeks. If inaccuracy is suspected, a manual blood pressure reading of the examinee should be taken for comparison.

Blood pressure readings were performed on the same test examinee daily.

A mercury manometer was connected to the Blood Pressure Station Model 2230. Comparisons were made with level of mercury and Korotkoff sounds.

Reliability measurements:
Ten percent of all examinees who received the blood pressure measurement test were requested to return to the blood pressure testing station 1 hour after the initial blood pressure measurements had been taken to receive a repeat test. This procedure allowed for the measurement of test-retest reliability.
IMMUNIZATION STATUS

Test: Exit Examinations (Only)

Description of test: Serum was extracted for the determination of immunization status

Status

Time required: 5 minutes

Population screened: All examinees 1 year of age through 13 years of age

Equipment: Red top vacutainers, small glass tubes

Maintenance of equipment: None

Personnel administering test: Registered nurse

Training of personnel administering test: The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Procedure: Venipuncture was performed and 5 ml of blood was drawn into a red top vacutainer (non-Corvac). The vacutainer was labeled with a patient identification sticker and allowed to sit for 20 minutes for a clot to form. After the clot had formed, the vacutainer was placed into a centrifuge and spun for 15 minutes. After spinning, 1 ml of serum was poured into a small glass tube, which was also labeled with an identification sticker, and placed into a freezer until shipped to the cooperating laboratory. The blood clot was then disposed of.
Shipping directions: The serum was shipped in bulk. The serum tubes were placed into plastic bags according to date. Each bag was wrapped in newspaper and placed into insulated chests containing dry ice. Several small holes were put in the sides of the chest, a tight-fitting lid was secured and the chest was shipped via air.

Specimens were shipped to: Dr. James Cherry  
Department of Pediatrics Rm 22-442  
UCLA Medical Center  
Los Angeles, California 90024

Dr. Cherry was notified of the shipment date, flight time of arrival, flight number and shipment number. Arrangements were made to have the chests delivered to Dr. Cherry's office.

Duplicate samples were maintained at the collection site in the event of failure of the original samples reaching Dr. Cherry in good condition.

Recording form: Immunization status Completion Code was filled in on the TVF.

Quality control: Duplicate samples were taken on all examinees receiving this test.
# JOINT PROBLEMS

<table>
<thead>
<tr>
<th>Test:</th>
<th>Fifty-Foot Walk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of test:</td>
<td>The examinee was instructed to walk the fifty-foot distance as rapidly as possible without running. The walk was timed with a stopwatch.</td>
</tr>
<tr>
<td>Time required:</td>
<td>3 minutes</td>
</tr>
<tr>
<td>Population screened:</td>
<td>Persons 14 years of age or older who answered &quot;Yes&quot; to the question &quot;During the past year, have you had pain, aching, swelling, or stiffness in your joints?&quot;.</td>
</tr>
<tr>
<td>Equipment:</td>
<td>Stopwatch, material to mark the distance</td>
</tr>
<tr>
<td>Maintenance of equipment:</td>
<td>None</td>
</tr>
<tr>
<td>Personnel administering test:</td>
<td>Medical assistant</td>
</tr>
</tbody>
</table>

Training of personnel administering test: Training conducted by the physician prior to screening included a demonstration of the fifty-foot walk test, instructions to be given to the examinee before the test, and encouragement to be given during the test. The administration of the fifty-foot walk was observed by the physician during the first three days of screening.
Joint Problems—Fifty-Foot Walk (continued)

Procedure: In all sites the fifty-foot walk was performed with a walk of twenty-five feet from the starting line, a turn-around, and a return to the starting line.

The examinee was positioned with toes touching the tape at the starting line and was then instructed to walk as fast as possible, without running, to the tape at the other end of the room or corridor, then to turn around and come back walking as fast as possible.

The medical assistant timed the walk with a stopwatch.

Persons requiring human assistance in walking and who requested aid from the medical assistant were not required to complete the test, but were given a score of 99.9. Those requiring the assistance of a cane or crutches were requested to complete the test using the necessary assistance.

Recording form:

1. Walking time was recorded to the nearest one-tenth of a second. Any examinee requiring more than 99.9 seconds to complete the walk was given a score of 99.9.
2. A Completion Code was filled in (see Appendix B for codes).
3. The Technician Code was filled in.

<table>
<thead>
<tr>
<th>50-FOOT WALK</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME ..................</td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE ......</td>
<td>___________ SECONDS</td>
</tr>
</tbody>
</table>

TECHNICIAN ___________
Joint Problems--Fifty-Foot Walk (continued)

Quality control: During the first few days of screening in each site, and during site visits occurring approximately six weeks after the start of screening, the physician observed the testing of the fifty-foot walk. If the test was administered improperly or if the instructions to the examinee were not complete, the physician retrained the medical assistant.

Reliability measurements: Approximately 10 percent of all examinees who received the fifty-foot walk test were given a repeat test. This allowed for the measurement of test-retest reliability.

Comments: Space constraints dictated a turn-around at twenty-five feet, rather than a straight fifty-foot walk. In order to mark off a straight twenty-five foot distance it was necessary in all the screening sites to use a corridor for the test. During peak screening hours when there were many people in the center, examinees taking the fifty-foot walk test became embarrassed in front of other examinees and did not seem to be walking as fast as possible. Therefore, it was recommended that this test be conducted in an area not visible to other examinees.
## JOINT PROBLEMS

**Test:**
- Grip Strength

**Description of test:**
- Grip strength was tested three times in each hand with a dynamometer.

**Time required:**
- 2 minutes

**Population screened:**
- Persons 14 years of age or older who answered "Yes" to the question, "During the past year, have you had pain, aching, swelling, or stiffness in your joints?" (not counting injuries).

**Equipment:**
- Dynamometer (John Bell and Croyden, Wigmore Street, London W-1)

A dynamometer is a special rubber cuff attached to a mercury manometer. This cuff measures 7 x 14 centimeters when deflated, and approximately 15 centimeters in circumference when inflated.

**Standardization & maintenance of equipment:**
- At the beginning of each week the valve at the top of the mercury column was cleaned and the filter removed.

**Personnel administering test:**
- **Enrollment Examinations**
  - Medical assistant
  - **Exit Examinations**
  - Registered nurse

**Training of personnel administering test:**
- Training was conducted the day before screening by the physician. Proper use of the dynamometer and the instructions to be given to the examinees were demonstrated by the physician. The medical assistant then practiced administering the test using other screening personnel as examinees. During the first three days of screening the testing of grip strength was observed by the physician.
Joint Problems--Grip Strength (continued)

Procedure: The dynamometer was inflated to 20 mm Hg and the medical assistant tested the cuff to make sure there was no leak in the valve. If mercury level remained at 20 mm Hg for at least 10 seconds, and, after squeezing, returned to 20 mm Hg, then the medical assistant proceeded with the test.

The examinee was instructed to hold the cuff in the right hand with the long axis of the cuff centered in the palm and the thumb centered over the middle of the bag. The examinee then squeezed the bag as hard as possible. The examinee was not allowed to watch the mercury column during the test. Also, in order to avoid falsely high values, the examinee was instructed not to pinch the end of the cuff, rest the forearm on the table, or push the hand or cuff against the table. As soon as the pressure exceeded 250 mm Hg (if it did), the examinee was told to desist from further squeezing.

Recording form:

1. Response was circled to the question "Examinee has a history of joint problems?".
2. If the answer to the above was "Yes", values for grip strength were recorded. Pressures of 250 mm Hg or higher were scored as 250 mm Hg.
3. The Completion Code was filled in (see Appendix B for a list of codes).

<table>
<thead>
<tr>
<th>EXAMINEE HAS A HISTORY OF JOINT PROBLEMS?</th>
<th>1. YES 2. NO (do not perform battery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRIP STRENGTH:</td>
<td>RIGHT HAND LEFT HAND</td>
</tr>
<tr>
<td>1st TRY</td>
<td>mmHg mmHg</td>
</tr>
<tr>
<td>2nd TRY</td>
<td>mmHg mmHg</td>
</tr>
<tr>
<td>3rd TRY</td>
<td>mmHg mmHg</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
</tr>
</tbody>
</table>
Joint Problems—Grip Strength (continued)

Quality control:

During the first few days of screening in each site and during site visits occurring approximately six weeks after the start of screening, the physician observed the testing of grip strength. If the test was administered improperly or if the instructions to the examinee were not complete, the physician retrained the medical assistant.

Reliability measurements:

Approximately 10 percent of all examinees, randomly selected, who had been tested for grip strength, were requested to take a repeat test 1 hour after the initial test. The procedure resulted in a measurement of test-retest reliability. Repeat testing was performed by the same medical assistant who performed the initial test.
JOINT PROBLEMS

Test: Joint Size

Description of test: Examinees 14 years of age or older who answered "Yes" to the question, "During the past year, have you had pain, aching, swelling, or stiffness in your joints?" received a measurement of joint size at the proximal interphalangeal (PIP) joints of their fingers.

Time required: 4 minutes

Population screened: All persons 14 years of age or older who answered "Yes" to the question, "During the past year, have you had pain, aching, swelling, or stiffness in your joints?"

Equipment: Arthrocircameter (Abbott Laboratories)

Joint size was measured with an arthrocircameter which consisted of a flexible polyethylene band threaded through itself to form a loop. One end of the band was fixed to a projecting pole of the instrument, the other to a take-up drum within the handle. When standing free, the loop formed a circle to any diameter and adhered closely to an irregular object, which included an arthritic proximal interphalangeal joint. Tension on the loop was maintained by a fine-grade watch spring attached to the take-up drum.

A dial with a millimeter scale enlarged two times for easy legibility was attached to the drum. The Abbott Laboratories arthrocircameter was calibrated to measure directly, 40 to 100 mm.

The arthrocircameter was used rather than the standard rings because it was quicker. Also, in cases of examinees with tender joints, the arthrocircameter may cause less discomfort. The accuracy of a gauge similar to the arthrocircameter was found to be equal to the ring method (Boardman, 1967).
Joint Problems--Joint Size (continued)

Standardization and maintenance of equipment:
The arthrocircumferometer did not require calibration. The polyethylene loop was cleaned daily with a damp sponge.

Personnel administering test:

Enrollment Examinations
Medical technician

Exit Examinations
Registered nurse

Training of personnel administering test:
Training was conducted by the physician one day prior to screening examinations. It was necessary to train twice due to personnel change between Dayton and Seattle screening examinations. The use of the arthrocircumferometer was demonstrated by the physician with emphasis on the proper placement of the loop on the PIP joint. After the medical technician had practiced using the arthrocircumferometer, a series of physician/medical technician comparison measurements were taken. That is, the medical technician measured the circumference of twenty PIP joints (four hands) and recorded the measurements. The physician then measured the same PIP joints and compared his measurements with those of the medical technician. Quality testing required at least fourteen of the comparison measurements to be identical and the other six to have a difference of no more than ± one millimeter.

During the first day of screening another twenty physician/medical technician comparison measurements were taken. The medical technician did not always perform the measurements first. In all sites the comparison measurements met the criteria stated in the previous paragraph, and therefore formal retraining was not necessary.

At the first screening site (Dayton), proximal interphalangeal (PIP) joint size was measured on three fingers of each hand. The medical technician measured the circumference of the two PIP joints on each hand which appeared to be the most affected by arthritis, plus the PIP joint appearing least affected. If all the joints appeared normal, the PIP joints of the thumb and ring finger were selected as the worst, and the PIP joint of the index finger as the best. Each of these fingers was measured twice.

Procedure:
The selected joints were measured at the PIP joint. The examinee's finger was inserted in the plastic loop. The examinee was instructed to hold up his/her hand with the palm facing toward the medical technician. Fingers were to be extended upward, but relaxed.
Joint Problems—Joint Size (continued)

The loop of the arthrocircameter was threaded over the finger and allowed to tighten to its own tension over the joint at the midpoint of the joint as determined by the skin creases. Before recording the measurement, the medical technician allowed approximately 2 seconds for possible further tightening after threading had taken place.

After Dayton screening, it was decided that a measure as subjective as the impression of the worst joints by the medical technician was not reliable and would result in difficulties in later comparisons of joint size. In addition, it was not clear whether certain fingers were more commonly involved than other fingers in rheumatoid arthritis. Therefore, it was decided that in subsequent sites all PIP joints on both hands would be measured.

In all sites other than Dayton, the procedure for measurement was the same; all fingers were measured at the PIP joint. Only the left ring finger was measured twice. Repeat measurements were not taken of all joints because of time constraints.
Joint Problems--Joint Size (continued)

Recording form: In Dayton, recording was done as follows:

1. The medical technician recorded the codes for the finger measured and the appearance of the joint.
2. Fingers were measured, and repeat measures were performed.
3. The Completion Code was filled in (see Appendix B for a list of codes).

<table>
<thead>
<tr>
<th>JOINT SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINGER CODE</td>
</tr>
<tr>
<td>First Number: Thumb = 1, Index = 2, Middle = 3, Ring = 4, Little = 5</td>
</tr>
<tr>
<td>Second Number: 0 = Appears Normal, 7 = Appears Abnormal</td>
</tr>
<tr>
<td>(a) Choose the 2 worst PIP joints</td>
</tr>
<tr>
<td>RIGHT HAND</td>
</tr>
<tr>
<td>FINGER: FINGER:</td>
</tr>
<tr>
<td>Measurement One:</td>
</tr>
<tr>
<td>Repeat Measurement:</td>
</tr>
</tbody>
</table>

(b) Choose the most "normal" PIP joint

| RIGHT HAND | LEFT HAND |
| FINGER: | FINGER: |
| Measurement One: | |
| Repeat Measurement: | |

COMPLETION CODE: ___
In subsequent sites the recording was as follows:

1. PIP joint size was measured on all fingers of the right hand. Measurement was recorded to the nearest millimeter.
2. Joint size was measured on all fingers of the left hand. The left ring finger PIP joint was measured twice. All measurements were recorded to the nearest millimeter.
3. The Completion Code was filled in (see Appendix B for a list of codes).

<table>
<thead>
<tr>
<th>JOINT SIZE:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT HAND:</td>
<td></td>
</tr>
<tr>
<td>THUMB MEASUREMENT</td>
<td>__ __ THM</td>
</tr>
<tr>
<td>INDEX FINGER MEASUREMENT</td>
<td>__ __ THM</td>
</tr>
<tr>
<td>MIDDLE FINGER MEASUREMENT</td>
<td>__ __ THM</td>
</tr>
<tr>
<td>RING FINGER MEASUREMENT</td>
<td>__ __ THM</td>
</tr>
<tr>
<td>LITTLE FINGER MEASUREMENT</td>
<td>__ __ THM</td>
</tr>
<tr>
<td>LEFT HAND:</td>
<td></td>
</tr>
<tr>
<td>THUMB MEASUREMENT</td>
<td>__ __ THR</td>
</tr>
<tr>
<td>INDEX FINGER MEASUREMENT</td>
<td>__ __ THR</td>
</tr>
<tr>
<td>MIDDLE FINGER MEASUREMENT</td>
<td>__ __ THR</td>
</tr>
<tr>
<td>RING FINGER MEASUREMENT</td>
<td>__ __ THR</td>
</tr>
<tr>
<td>REPEAT RING FINGER MEASUREMENT</td>
<td>__ __ THR</td>
</tr>
<tr>
<td>LITTLE FINGER MEASUREMENT</td>
<td>__ __ THR</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
</tr>
</tbody>
</table>
Quality control: Quality control tests were made the first day of screening in each site and during site visits which occurred six weeks after screening began. The medical technician measurements of PIP joints were compared with the physician measurements of the same joints. In order to pass the quality control test all comparison measurements had to be within plus or minus one millimeter and seven out of ten measurements had to be identical.

Reliability measurements: Ten percent of all examinees who received the joint measurement test were requested to return to the joint testing station 1 hour after the initial joint measurements had been taken to receive a repeat test. This procedure allowed for the measurement of test-retest reliability.
**Joint Problems**

**Test:**
Hand/Wrist X-ray

**Description of test:**
An x-ray was taken of the left and right hands and wrists of examinees who indicated joint problems in the hands and/or wrists.

**Time required:**
2 minutes

**Population screened:**
All persons 14 years of age or older who answered "Yes" to the question "Have you had any pain, aching, or swelling in your hands and/or wrists in the past 12 months?"
No x-rays were taken of pregnant women.

**Equipment:**
- Toshiba x-ray unit, J-300
- Hand-wrist x-ray board
- Kodak M-7 processor

**Standardization & maintenance of equipment:**
The calibration of the x-ray unit was performed by a certified x-ray serviceman prior to screening in each of the four HIS sites. Calibration was also performed each time 500 x-rays were taken, approximately every six weeks.

**Daily calibration:**
The Toshiba unit was turned on daily and allowed to warm up for 30 minutes prior to screening. Three exposures were made at 4MAS-50KV to test the unit.

The micro switches of the processor required daily adjustment. Cross-over racks were removed daily and the rollers were cleaned with a damp cloth, then wiped dry. The inside of the processor was wiped to remove all chemical deposits above the processing level.

**Periodic calibration:**
Cleaning of the processor deep racks was performed monthly.
Joint Problems—Hand/Wrist X-ray (continued)

Personnel administering test: Certified x-ray technician, registered with the American Registry of Radiologic Technologists

(Personnel interpreting test): Board-certified radiologist

Training of personnel administering test: Training for hand-wrist x-ray procedures was conducted by the radiologist at the same time as chest x-ray training was held. The x-rays taken by the technician during training were reviewed by the radiologist for quality.
Joint Problems—Hand/Wrist X-ray (continued)

Procedure: If the examinee was eligible to receive a hand-wrist x-ray, instructions were given for the removal of all rings, watches, and bracelets. The examinee was given a lead apron to wear for protection against unnecessary exposure to radiation. The hand-wrist board was positioned parallel to the tube and examinee was asked to step behind it.

The collimator was changed from a 14" x 17" to a 10" x 12". The cassette was marked with an "R" on the upper right-hand corner. The film was inserted and the examinee's right hand was brought around the board to rest against the film, with the palm facing down. After the hand was placed on the film with fingers spread, the technician checked to make sure that both the hand and wrist were in the field of exposure. The light on the x-ray unit was turned on to position the unit properly. The dark + mark was centered on the wrist of the examinee and the cone was positioned 40" from the cassette. The amount of radiation exposure used for all hand-wrist x-rays was 4MAS-50KV.

The x-ray tubes were centered to the third metacarpal. After the exposure was made, the examinee was asked to step back. The film was changed by turning the film upside down, and the x-ray procedure was repeated for the left hand. Film was developed.

(Interpretation of x-ray): X-rays were read by a board-certified radiologist and interpretations were recorded on the hand-wrist x-ray card (Fig. 1). The x-rays were evaluated and scored as follows: Rheumatoid arthritis was scaled as none (0), doubtful (1), minimal (2), moderate (3), and severe (4), according to the criteria of Kellgren and Bier. Osteoarthritis and gouty arthritis were scored as absent (0) or present (5). Other arthritic conditions were named and their presence noted with a (5) under "Other."
Joint Problems—Hand/Wrist X-ray (continued)

Recording form:

1. The x-ray technician circled response to question "Does examinee give indication of hand-wrist arthritis?"
2. The x-ray technician circled response to question "Is examinee pregnant?"
3. The Completion Code was filled in (see Appendix B for a list of codes). The interpretation of the x-ray was transcribed by the coordinator of the Document Control Center from the radiologist's interpretation card (see Fig. 1).
4. A result was recorded for each category. If arthritis was not present, a "O" was recorded.
5. If the physician named some "Other" condition, only a "O" or "5" was recorded—not the name of the other condition found.

### HAND-WRIST X-RAY

| DOES EXAMINEE GIVE INDICATION OF HAND-WRIST ARTHRITIS? | 1. YES (take x-ray) 2. NO (do NOT x-ray) |
| IS EXAMINEE PREGNANT? | 1. YES (do NOT x-ray) 2. NO (take x-ray) |
| RHEUMATOID | 1=none, 2=doubtful, 3=minimal, 4=moderate, 5=severe |
| OSTEO (1=absent, 5=present) |  |
| GOUTY (1=absent, 5=present) |  |
| OTHER (specify) |  |
| COMPLETION CODE |  |
| RIGHT SIDE |  |
| LEFT SIDE |  |
Joint Problems—Hand/Wrist X-ray (continued)

NAME ___________________________ NO. __________ DATE __________

AGE _______ SEX _______

HAND-WRIST X-RAY
No evidence of any type of arthritis (no further scoring is necessary)

<table>
<thead>
<tr>
<th>Side</th>
<th>Rheumatoid</th>
<th>Osteo</th>
<th>Gouty</th>
<th>Other (specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scoring for rheumatoid: 0 = none; 1 = doubtful; 2 = minimal, 3 = moderate, 4 = severe

Scoring for all other types of arthritis: 0 = absent; 5 = present

Fig. 1—Hand/Wrist X-ray Interpretation Card
Joint Problems--Hand/Wrist X-ray (continued)

Quality control:
The quality of the x-rays was monitored by the radiologist. If more than two out of every fifty x-rays were of poor quality, a retraining session would have been held for the technician. (See "Training of personnel administering test" Cardiovascular Disease--Chest X-ray for a description of a quality x-ray.) However, the x-rays from all sites were consistently of high quality.

Reliability measurements:
At the end of the Study, these x-rays will be reinterpreted by two radiologists. Interpretations will then be compared to gain a measurement of multi-reader reliability.

Comments:
The hand-wrist x-ray is not included as part of the exit screening examination. It was included in the enrollment screening examination as an adjunct, for case-finding purposes, to the rheumatoid factor test. Yield was insufficient to justify inclusion upon exit for those examinees reporting symptoms of hand or wrist arthritis.
JOINT PROBLEMS

Test: Rheumatoid Factor

This test was included in the screening examination to detect rheumatoid arthritis. Rheumatoid arthritis is a chronic systemic disease primarily affecting the joints, usually with degenerative and inflammatory changes in the synovial membrane, and cartilage. The most characteristic laboratory finding in rheumatoid arthritis is the occurrence of macroglobulins called rheumatoid factor. They occur in the blood, joint fluid, and tissues of about 85 percent of persons with the disease.

Description of test: Blood was drawn during the screening examination and sent to a local laboratory for analysis.

Time required: Total time for venipuncture was approximately 5 minutes.

Population screened: All persons 14 years of age and older who answered "Yes" to the question, "During the past year, have you had pain, aching, swelling, or stiffness in your joints?"

Equipment: Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoseal, cotton balls, band aids.

Maintenance of equipment: None

Personnel administering test: Enrollment Examinations
Licensed medical technician

Two licensed medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other worked in all subsequent sites.
Joint Problems—Rheumatoid Factor (continued)

Exit Examinations
Registered nurse

Training of personnel administering test:
The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Enrollment Examinations

Procedure:
Venipuncture was performed and blood drawn into a red top vacutainer (10 to 15 ml). The blood was allowed to clot for 30 minutes and then was placed in the centrifuge. The specimen was removed from the centrifuge and 2 ml of serum was drawn off with an eye dropper pipette and placed in a serum tube labeled with the examinee's identification sticker. The serum tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and 15 ml of blood was drawn into two red top Corvac vacutainers for tests included in the SMA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells. The Corvac tube makes it easier for shipping and handling.

After 15 ml of blood is drawn into the tube, the tube is inverted six to eight times, the tube is allowed to sit for 20 minutes, no longer, and then placed into a centrifuge and spun for 15 minutes. After spinning the tube is then inverted and rotated 360° so that the RN can check to insure that no red cells have seeped through the gel barrier.
Joint Problems--Rheumatoid Factor (continued)

Enrollment Examinations
The Charleston laboratory used a sheep cell agglutination method for identification of rheumatoid factors. All other laboratories used the latex agglutination method based on the methods of Singer and Plotz. Both methods operate on the same principle and produce equally valid results; however, the latex method is often preferred because it eliminates problems associated with sheep RBC and heterophile antibodies.

Latex Fixation Method
A macroscopic slide test was used as a screening test for rheumatoid factor. Test serum was added to Glycine-Saline Buffer Diluent, and Latex-Globulin Reagent was added to the diluted serum specimen. Controls were prepared with RA-TEST control serum (Hyland) and comparisons were made between the test serum and controls. Following the slide test, quantitative macroscopic tube tests were performed on weakly positive or positive serum, using the same basic reaction, in order to obtain the serum titer (the reciprocal of the highest dilution which exhibited definite agglutination).

Sheep Cell Agglutination
The Rheumaton Kit was used which utilized a macroscopic slide test with a reagent which consisted of sheep erythrocytes sensitized with rabbit gamma globulin that reacted with rheumatoid factor present in the serum to give a positive agglutination reaction.

Exit Examinations
The latex fixation method is used for all exit examination specimens.

Recording form:
1. The medical technician who performed venipuncture at the screening examination center circled the response to the question, "Examinee claims a history of arthritis?"
2. The medical technician circled "Yes" to the question, "Latex-fixation included?"
Joint Problems—Rheumatoid Factor (continued)

Enrollment Examinations
Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix C.

1. Laboratory personnel circled either 1) positive, 2) negative, or 3) not done. "Not done" was circled only if the examinee was not eligible to receive a latex fixation.

2. If positive, the laboratory also recorded the titer.

(See Appendix C for Laboratory Recording Form.)

<table>
<thead>
<tr>
<th>HEMATOLOGY</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXAMINEE CLAIMS A HISTORY OF ARTHRITIS? ......</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>(If yes, include latex fixation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. LATEX-FIXATION INCLUDED: .....................</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Exit Examinations
Laboratory results were recorded on computer tape.
Joint Problem--Rheumatoid Factor (continued)

Quality control: The medical technician performance was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. The preparation of serum specimens required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the subcontractor's Document Control Center editor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements: At the beginning of the screening examination, a random sample of examinees was selected to have extra blood drawn for "split sample analysis". Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5-10 percent of the participants.
**KIDNEY DISEASE**

<table>
<thead>
<tr>
<th>Test:</th>
<th>Blood Urea Nitrogen (BUN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of test:</td>
<td>Blood was drawn during the screening examination and sent to a local laboratory for analysis.</td>
</tr>
<tr>
<td>Time required:</td>
<td>Total time for venipuncture was approximately 5 minutes.</td>
</tr>
<tr>
<td>Population screened:</td>
<td>All persons 14 years of age or older</td>
</tr>
<tr>
<td>Equipment:</td>
<td>Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephrin sponges, critoseal, cotton balls, band aids.</td>
</tr>
<tr>
<td>Maintenance of equipment:</td>
<td>None</td>
</tr>
</tbody>
</table>
| Personnel administering test: | Enrollment Examinations
Licensed medical technician |
|                       | Two medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other worked in all subsequent sites. |
|                       | Exit Examinations
Registered nurse |
Kidney Disease—Blood Urea Nitrogen (BUN)

Training of personnel administering test:
The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Enrollment Examinations
Venipuncture was performed and 15 ml of blood drawn into a red top vacutainer. The blood was allowed to clot for 30 minutes, then centrifuged. While the specimen was spinning, a serum tube was labeled with the examinee's identification sticker. The specimen was removed from the centrifuge and 7 ml of serum was drawn off and placed in the serum tube. The tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and 15 ml of blood was drawn into two red top Corvac vacutainers for tests included in the SMA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells. The Corvac tube makes it easier for shipping and handling.

After 15 ml of blood is drawn into the tube, the tube is inverted six to eight times, the tube is allowed to sit for 20 minutes, no longer, and then placed into a centrifuge and spun for 15 minutes. After spinning the tube is then inverted and rotated 360° so that the RN can check to insure that no red cells have seeped through the gel barrier.

Method of analysis:
Blood urea nitrogen was included in the SMA 12/60 panel. The SMA 12/60 system method was a modification of the method of Marsh et al. In using this method, a colored product was formed when urea, in relatively weak acid solution, reacted with diacetyl-monoxime.
Kidney Disease--Blood Urea Nitrogen (BUN)

Exit Examinations
The method of analysis for all exit examination BUN tests was the Urease method, Barthlme Reaction.

Enrollment Examinations
Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix C.

Exit Examinations
Results were recorded on computer tape.

Quality control:
The performance of the medical technician was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. The proper preparation of serum specimens required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the Document Control Center editor of the subcontractor. If the difference between initial and repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements:
At the beginning of the screening examination, a random split sample of examinees was selected to have extra blood drawn for "split sample analysis". Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5-10 percent of the participants.
Kidney Disease--Blood Urea Nitrogen (BUN)

Comment: BUN was included in the 12/60 panel and therefore was cheaper to perform than creatinine, a similar test which was more specific, but which required a separate analysis.
KIDNEY DISEASE

Test:
Urinalysis—dipstick blood, protein, glucose
Urine Culture
Microscopic Urinalysis

Description of test:
Clean catch urine samples were collected during the screening examination and sent to the local laboratory for analysis.

Time required:
2 minutes for explanation of specimen collection requirements

Enrollment Examinations
Population screened:
Dipstick blood, protein, glucose and microscopic urinalysis were performed for females 6 years of age or older, and males 14 years of age or older

Urine culture was performed for females 6 years of age or older

Exit Examinations
Urine culture was performed for females 6 years of age or older, and males 14 years of age or older

Dipstick urinalysis; females 6 years of age and older

Equipment:
Zephiran towelettes
180 cc plastic urine containers with tops
100 cc plastic sterile urine containers
Isocult (Clinicult) diagnostic culturing tubes

The Isocult culturing system was used rather than having specimens cultured at the cooperating laboratory, in order to reduce the risk of contamination.

Maintenance of equipment:
None
Kidney Disease--Urinalysis (continued)

Enrollment Examinations

Personnel administering test:

Medical receptionist (gave examinee urine container and instructions)
Medical technician

Instructions for specimen collection were given by the medical receptionist. There were four medical receptionists during entry screening examinations, one for each site. One medical technician was used in Dayton, and another medical technician was used in subsequent sites.

Exit Examinations
Registered nurse

Training of personnel administering test:

Instructions were given to the medical technician by the subcontractor's Coordinator (a registered nurse) in the use of Isocult. At each site, the Rand physician checked the technique of the medical technician in using Isocult.

Procedure:

Enrollment Examinations
At the beginning of the screening examination, the examinee was given a labeled urine container with verbal and written instructions for midstream specimen collection (Figs. 1 and 2). The examinee was encouraged to drink plenty of water before specimen collection to insure an adequate quantity. Information given to examinees also included directions of the location of the bathroom and where to leave the collected urine specimen.

Female examinees were given both verbal and written instructions for clean catch urine collection. The same written instructions were also posted in the bathroom. Three Zephiran towelettes were given with instructions for wiping the genital area from front to back prior to voiding. Emphasis was placed on the cleansing of the external genital area to prevent contamination of the urine. If the examinee was too young to understand, the parent or one of the screening examination staff members assisted the child in obtaining the specimen.

After specimens were obtained and collected, they were checked to see if the examinee's identification sticker was firmly affixed to the specimen container and if a sufficient specimen had been obtained (90 cc).
Within 10 minutes of collection, clean-voided specimens of females 6 years of age and older were cultured using the Isocult culture test for bacteruria (Smith Kline Diagnostics, utilizing modified trypticase soy agar and eosin methylene blue agar with crystal violet). The Isocult system consisted of a disposable culturing device which used a special flat-sided tube which contained a removable paddle which held the culture media.

In order to prepare a urine culture, the paddle was dipped in the urine and then placed in the Isocult tube. The tube was labeled with the examinee's identifiers and refrigerated until shipment to the laboratory where it was incubated and read.

Urine specimens and Isocult tubes were refrigerated until delivery to the laboratory.

**Exit Examinations**

The examinee was offered a glass of water while filling out the questionnaire. The examinee was given written as well as verbal instruction for the collection of the clean catch urine specimen. A copy of the instruction was also placed in each bathroom. (See "Directions for Urine Specimen" Figs. 1 and 2.)

After specimens were obtained and left for the laboratory RN, they were checked to see if the examinee's identification sticker was firmly affixed to the specimen container and if a sufficient specimen had been obtained (90cc).

A dipstick urinalysis was done by the nurse in the laboratory on all specimens taken from males and the results were entered into the computer data bank via the MDES (Manual Data Entry Station).

Dipstick urinalysis was done at the cooperating laboratory on all specimens taken from females.

Females only: 10 cc of urine were poured into a plastic container, a preservative was added. The tube was capped, labeled with the examinee's identification sticker, and sent to the cooperating laboratory for analysis.

A urine culture was prepared by placing a paddle into the urine, then placing the paddle into the Isocult. The Isocult was labeled with the examinee's identification sticker and sent to the cooperating laboratory where it was incubated and read.
DIRECTIONS FOR URINE SPECIMEN

Collections for Women (ages 6 and above)

1. We strongly urge you to drink a good amount of water during the time you are filling out the questionnaire (Form B). This is necessary so that when you collect your urine later, you will be able to give us an ample amount of urine.

2. When you feel you will be able to fill the specimen cup, go to the Ladies Room.

3. In order that you can collect clean urine, we are asking you to use three (3) Zephiran towelettes (given with your specimen cup) to wipe the genital area (privates) before you start your urine stream.

4. While sitting on the toilet, unwrap the towelettes, one at a time and wipe the genital area (privates) once from the front to back and discard the towelette. Do this three times, discarding towelette after each use.

5. After the start of your stream, place the container in the stream and fill the cup.

6. Replace the top on the specimen cup and take the specimen to Room 6 (Lab).

NOTE: PLEASE DO NOT DISCARD TOWELETTE IN TOILET. USE THE RECEPTACLE BESIDE THE TOILET AS THESE TOWELETTES CAN EASILY CLOG THE TOILET PIPES.
Kidney Disease—Urine Analysis (continued)

Figure 2

DIRECTIONS FOR URINE SPECIMEN

Collections for Men (ages 14 and above)

1. We strongly urge you to drink a good amount of water during the time you are filling out the questionnaire (Form B). This is necessary so that when you collect your urine later you will be able to give us an ample amount of urine.

2. When you feel you will be able to fill the specimen cup, go to the Men's Room.

3. Start your urine stream but do not collect the first amount.

4. Collect urine in the cup as soon as the first amount of urine has been released. Remember to fill the cup as full as possible.

5. Replace the cardboard top on the specimen cup and take your specimen to Room 6 (Lab).
Kidney Disease--Urinalysis (continued)

Method of analysis:

At the laboratory, urine specimens were tested for urine glucose, urine protein, and blood with Labstix (Ames Company). "Labstix" consist of reagent strips which provide a colorimeteric analysis of pH level, protein, glucose, and blood in urine. The test strips were dipped in well-mixed urine and then removed immediately. The strips were touched against the edge of the container to remove excess urine. The resulting color in each test area was compared to the appropriate color in the corresponding color chart. Protein was read immediately after dipping; glucose was read 10 seconds after dipping; blood was read 30 seconds after dipping. Abnormal protein results were confirmed using 3 percent Sulfosalicylic Acid on centrifuged urine. Abnormal glucose results were confirmed with Clinitest tablets.

Sediment was examined after centrifugation and the discarding of supernatant. A report was made on red cells, white cells, bacteria, casts, crystals, and epithelial cells. Red and white cells were reported as 0=negative, 1=1-4, 2=5-10, 3=11-20, 4=too numerous to count. Bacteria were reported as: 0=negative, 1=few, 2=moderate, 4=many. Casts and crystals were reported as absent or present. Epithelial cells were reported as: 1=absent, 2=few (<5), 3=moderate (5-10), 4=many (10-20), 5=>20.

Isocult tubes were incubated and then examined for growth. If the growth was greater than 100,000, a new culture was prepared from the original specimen, and organisms were identified using standard methods.
Kidney Disease--Urinalysis (continued)

Recording form: Enrolment Examinations

1. The medical technician recorded whether the examinee was menstruating.
2. The Completion Code was filled in (see Appendix B for a list of codes).

Child

<table>
<thead>
<tr>
<th>URINALYSIS</th>
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<tbody>
<tr>
<td>IS EXAMINEE FEMALE AND 6 YEARS OR OLDER?</td>
</tr>
<tr>
<td>IS EXAMINEE MENSTRUATING TODAY</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
</tr>
</tbody>
</table>

Adult

<table>
<thead>
<tr>
<th>URINALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXAMINEE MENSTRUATING TODAY?</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
</tr>
</tbody>
</table>

Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix C.

Exit Examinations

Female patients were asked if menstruating; if answer was "Yes" this was recorded on the laboratory form. Urinalysis Completion Code was recorded. Results were transmitted to the computer.
Quality control: Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor certification by Medicare, and an in-house quality control program.

Reliability measurements: No method for measuring the reliability of either microscopic urinalysis or the urine culture was included in entry screening examinations because it was thought that the amount of the usual urine specimen might often be inadequate to perform a split sample analysis. During exit screening examinations, however, a split sample analysis will be performed on a random sample of urine specimens if the amount of urine provided is adequate.
LEAD POISONING

Test: Blood Lead Level

Description of test: Blood was drawn during the screening examination and sent to a local laboratory for analysis.

Time required: Total time for venipuncture was approximately 5 minutes.

Population screened: Children 1 year of age up to (but not including) 6 years of age

Equipment: Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, monolet lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zephiran sponges, critoscal, cotton balls, band aids.

Maintenance of equipment: None

Personnel administering test: Enrollment Examinations
Licensed medical technician

Two medical technicians performed venipuncture during entry screening examinations. One medical technician worked in Dayton and the other worked in all subsequent sites.

Exit Examinations
Registered nurse

Training of personnel administering test: The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Procedure: Venipuncture was performed and 5 cc of blood drawn into a lavender top vacutainer containing sodium heparin. The vacutainer was labeled with the examinee's identification sticker and then placed on the aliquot mixer for 10 minutes. Whole blood samples were refrigerated until delivery to the laboratory.
Lead Poisoning--Blood Lead Level (continued)

**Method of analysis:**
- **Enrollment Examinations**
  Blood lead level was determined by the atomic absorption micro method in all sites.
- **Exit Examinations**
  Blood lead level was determined by the anodic stripping voltammetry method.

**Recording form:**
1. Eligibility for the test was determined and response to age question circled.
2. Response to "Lead level sample obtained" was circled.

**Enrollment Examinations**
Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the enrollment examination form can be found in Appendix C.

**Exit Examinations**
Results were recorded on computer tape.

**Quality control:**
The performance of the medical technician, or venipuncture nurse, was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. The preparation of whole blood specimens required immediate placement on the aliquot mixer.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the editor of the subcontractor. If the difference between the initial and repeat values appeared too large, the laboratory was alerted.

Each cooperating laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.
Reliability measurements:

At the beginning of the screening examination, a random sample of examinees was selected to have extra blood drawn for "split sample analysis". Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5-10 percent of the participants.
**OBESITY**

**Test:** Height and Weight

**Description of test:** Two measurements were taken of height and weight.

**Time required:** 2 minutes

**Population screened:**
- Height: all persons >2 years of age
- Weight: all persons

**Equipment:**
- Enrollment Examinations
  - Health-O-Meter adult height-weight scale (Continental Scale Corporation)
- Exit Examinations
  - Model 2102 Anthropometry Station (Synergetics, Inc.), Health-O-Meter adult height-weight scale (Continental Scale Corporation)

**Maintenance of equipment:** None

**Personnel administering test:**
- Enrollment Examinations
  - Medical assistant
- Exit Examinations
  - Registered nurse

**Training of personnel administering test:** Training was conducted by the physician the day before screening began. Training on the proper use of the adult height-weight scale included: special instructions in scale calibration, the correct position for standing on the scale for measurement, and the correct end points for weighing and for measuring height. The procedure used by the medical assistant was then observed by the physician during the first three days of screening to ascertain that the measurements were being correctly taken.

Training also included practice in the proper usage of the Recording Form.
Exit Examinations
Training on the Model 2102 Anthropometry Station was conducted by Synergetics, Inc., several weeks prior to the start of testing in Dayton.

Training was conducted by the physician the day before screening began in Dayton. Training on proper use of the adult height-weight scale included special instructions in scale calibration, correct position for standing on the scale for measurement, and the correct end points for weighing and for measuring height. The procedure used by the RN was then observed by the physician during the first few days of screening to make sure that the special instructions were carried out.

Enrollment Examinations
Procedure:
The examinee was requested to remove his/her shoes for height and weight measurements. The examinee then stepped backwards onto the scale, facing away from the scale.

Height and weight measurements were taken. The examinee then stepped down from the scale and the scale was set back to zero. The procedure was repeated.

If the examinee was wearing a weight bearing cast, the examinee was weighed according to the above procedure. The medical assistant then referred to a prepared list of estimated cast weights, and the estimated weight of the cast was subtracted from the total weight. The adjusted weight was entered on the Recording Form and a Completion Code of "0" (wearing a cast) was recorded under Completion Code on the form. In addition the notation "wearing a cast" was placed in the margin of the form.

If the examinee was wearing a non-weight bearing cast the technician asked the examinee for his/her weight and recorded this value on the Confidential Recording Form. If the examinee did not know his/her weight, the technician estimated the weight. A completion code of "8" (examinee unable to comply) was recorded on the Recording Form.

For weight and other body measurements on infants, see Child Growth and Development—Weight.
Exit Examinations
The examinee identification card was placed in the card reader. The examinee was asked to stand with his feet (shoes off) centered on the floor of the scale platform. The AUTO pushbutton was pressed. The START pushbutton was pressed. The weight adjusters were positioned to balance the scale arm. Either the SEND button was pressed, or the footswitch was depressed. (The SEND button or footswitch may have been pressed after the height caliper had been adjusted to the top of the examinee's head.)

When the computer received the height data, the SFI indicator lamp lit up.

Height and weight measurements were taken once. The examinee then stepped down from the scale, and the scale was set to zero. The procedure was repeated.

If the examinee was wearing a weight bearing case, the examinee was weighed according to the above procedure and the estimated weight of the case was subtracted from the total weight. The adjusted weight was entered on the TVP.

For weight and other body measurements on infants, see Child Growth and Development.

Recording form:
1. Height was recorded to the nearest 1/4 inch; weight was recorded to the nearest 1/4 pound.
2. Repeat measurements were recorded in the same way as the first measurements.

If the examinee weighed more than 350 pounds, weight was recorded as 351 on the form. All values of 351 recorded on the Confidential Recording Form were interpreted as >350 pounds.
Quality control:
The physician retrained the medical assistant (R.N. during exit examinations) prior to each site. In addition, the procedure performed by the medical assistant was observed during site visits by the physician and/or the screening administrator. The quality of the measurement was also monitored during site visits. This was done by periodically requesting one of the other medical assistants (or the physician) to be measured several times in a few hours. It was acceptable to vary 1/4 of an inch in height, and 1/2 pound in weight.

Reliability measurements:
The reliability measurements built into the height and weight screening procedures were:

1. Height and weight measurements were taken twice to allow for immediate test-retest reliability testing.
2. Approximately 10 percent of all examinees taking the test received a repeat testing, thereby allowing a measurement of test-retest reliability.
Exit Examinations

The reliability measurements built into the height and weight screening procedures were:

1. Height and weight measurements were taken twice to allow for examining immediate test-retest reliability.
2. Approximately 10 percent of all examinees taking the test received a repeat test, thereby giving a measurement of test-retest reliability.
3. If the weight was not balanced evenly on the Model 2102, the data was rejected, signaling the RN with a buzzer and a light to "rebalance the weight."
RESPIRATORY PROBLEMS

Test:

Chest X-ray

(See Procedure under Cardiovascular Disease—Chest X-ray)
RESPIRATORY PROBLEMS

Test:

Spirometry

Spirometry included a measure of forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁), the percentage of FEV₁/FVC (FEV₁ %), and maximum mid-expiratory flow rate (MMFR).

The choice of machinery for spirometry was dictated by several needs: accuracy, plus speed of measurement; ease of operation; reduction or elimination of the need for technical calculation; and provision of all the desired measurements. Because of the awareness of the difficulties associated with the early generation of "electronic" spirometers (see FitzGerald, et al, 1973), a spirometer was sought with care. Nevertheless, an electronic spirometer was selected because it satisfied the above-mentioned needs.

Description of test:

After full inspiration, the examinee blew as hard and as fast and as long as possible into a hose, thus performing an expired Forced Vital Capacity (FVC). This performance was repeated three times; each time the medical technician encouraged the examinee to perform better.

Time required:

5 minutes

Population screened:

All persons 14 years or older

Equipment:

Enrollment Examinations
SRL Model M10 Predictive Pulmonary Screener, daily log, noseclips, cardboard mouthpieces

Exit Examinations
Synergetics Spirometry Model 2301 (Synergetics Inc., Gainesville, Florida) noseclips, cardboard mouthpieces
Respiratory Problems—Spirometry (continued)

Enrollment Examinations
The hose was washed daily and hung up for the water to run out. Care was taken to ensure that the hose was completely dry before reusing.

Cleaning and calibration were performed daily according to the specifications of the SRL M10 Instruction Manual (see Appendix F, Item 9). Specific instructions can be found in the manual, which is stored in the HIS archives.

Exit Examinations
The hose was washed daily. Care was taken to ensure that the hose was completely dry before reusing.

The spirometry was cleaned according to the specifications of the Operation Manual. Cleaning was performed daily, prior to machine calibration.

Calibration was performed daily according to the following instructions:

a) turn power switch on
b) allow machine to warm-up for 30 minutes
c) press calibrating button
d) reverse mouth piece on spirometry hose
e) turn on calibrating unit in cabinet under the computer
f) ensure that the metal bar in the calibrating is at level 4
g) place calibrating hose on main spirometer hose
h) press start
i) after 3 seconds, readings should be as follows:
   1/2 sec PEV 2.00
   1 sec PEV 4.00
   FVC 6.00
   MFR 4.00

Calibration procedures are described in greater detail in the 2301 Operator's Manual.
Respiratory Problems--Spirometry (continued)

**Personnel administering test:**

**Enrollment Examinations**
Medical technician

The same medical technician performed spirometry in all sites.

**Exit Examinations**
X-ray technician

**Training of personnel administering test:**

**Enrollment Examinations**
The medical technician was trained at Systems Research Laboratory, Inc. in Dayton, Ohio by a representative from the Medical Data Systems Division. The four-hour training session consisted of familiarization with the machine, a demonstration in calibration of the machine, and practice in performing spirometry.

The screening administrator trained the medical technician in proper techniques for obtaining maximum cooperation from the examinees. The physician reviewed the technical and verbal competence of the medical technician on each visit, and offered suggestions for eliciting the fullest possible cooperation from the examinee.

**Exit Examinations**
The technician was trained at and by Synergetics, Inc., Gainesville, Florida. The two 8-hour training sessions consisted of familiarization with the machine, a demonstration in calibration of the machine, and practice in performing spirometry.

**Procedure:**

**Enrollment Examinations**
Spirometry was performed as specified in the Model M10 Instruction Manual (see Appendix F, Item 9).

The medical technician referred to the Confidential Recording Form and transcribed the age, sex, and height from the front of the form onto the spirometry section. The examinee's age, height, and sex as well as the barometric pressure were set on the machine. A clean mouthpiece was put on the hose and noseclips were put on the examinee's nose.
The Mode switch was turned to "Percent Predicted" and the reading was recorded on the Confidential Recording Form below the recorded results for the particular blow. The machine did not have a memory for percent predicted for MMEFR, so this was done after every trial. The Mode switch was turned to "Actual" position. The "Start" button was pushed. The procedure was repeated twice.

Obtain Predicted Values
"Last/Best" switch was placed in last position; Mode switch in predicted position. The performance dial was turned to FVC, FEV₁, MMEFR to get predicted positions. Values were recorded.

Obtain Percent of Predicted Values
SRL in best position. The Mode switch in Percent Predicted position. Record results for FVC, FEV₁.

Obtain percent of MMEFR by taking the highest percent value, recorded on the Confidential Recording Form below each blow.

Exit Examinations
The test involved considerable effort on the part of both patient and technician. The patient first took in the deepest possible breath he could, and then he blew out as fast and as hard as he could until he could not blow any more. The technician provided constant coaching to help the patient achieve his maximal effort. The technician had the patient perform at least one practice maneuver and then several actual measurements were recorded. The technician judged whether the patient had put forth his best effort.

Specifically, the test was performed according to the following instructions:
1) Place a clean disposable cardboard tube in the rubber boot on the pneumotachograph sensor.
2) Place the noseclip on the patient's nose and have him gently try to blow air out his nose. Adjust the noseclip so he cannot blow out his nose. Show the patient how to put his lips over the cardboard tube so that air is not lost.
3) Press the ZERO button before the patient begins taking in his breath and then the patient is not breathing into the pneumotachograph.
Respiratory Problems--Spirometry (continued)

4) While the patient is taking in his deep breath, press the START button. Also while the patient is inhaling, the operator should be coaching the patient with such words as "deeper!...deeper!...more!...more!..."

5) Tell the patient to "Blow!...blow!...blow!...blow it all out!...more!...", until he cannot blow any more.

6) The measurement is complete when the numerical display lights up. Values for FEV₁/₂, FEV₁, and FVC may be seen if desired by pressing the appropriate display selector.

7) The data will be held until the operator presses the SEND button. Then the data will automatically be sent to the computer.

8) Each patient performed at least one practice with at least two recorded data values.
**Respiratory Problems—Spirometry (continued)**

**Enrollment Examinations (Only)**

Recording form:
1. Technician recorded height, age, sex.
2. Spirometry results were recorded for each trial.
3. Completion Code was filled in.

<table>
<thead>
<tr>
<th>HEIGHT</th>
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<th>INCHES</th>
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<tr>
<td>AGE</td>
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<td>YEARS</td>
</tr>
<tr>
<td>SEX</td>
<td></td>
<td>1. MALE 2. FEMALE</td>
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</table>

<table>
<thead>
<tr>
<th>ACTUAL PERFORMANCE</th>
<th>PREDICTED VALUE</th>
<th>% OF PREDICTION FOR THE BEST TRY</th>
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<tbody>
<tr>
<td>1st 2nd 3rd</td>
<td>1st 2nd 3rd</td>
<td>1st 2nd 3rd</td>
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<tr>
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<td>liters</td>
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<tr>
<td>MMEF</td>
<td>liters</td>
<td>liters</td>
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</table>

*Maximum Mid-Expiratory Flow*

EXAMINEE'S COOPERATION WAS ............ 1. GOOD 2. FAIR 3. POOR 4. REFUSED
EXAMINEE'S UNDERSTANDING WAS ............ 1. GOOD 2. FAIR 3. POOR
COMPLETION CODE .......................
Respiratory Problems--Spirometry (continued)

Quality control: During the first three days of screening at each site and during site visits occurring six weeks after screening began, the physician observed the spirometry performed by the medical assistant. The physician listened to the instructions given by the medical technician to the examinee and observed spirometry to ensure that the mouthpiece was used correctly.

Reliability measurements: Ten percent of examinees age 14 and older were requested to perform a repeat spirometry 1 hour after the initial testing. This procedure allowed for the measurement of test-retest reliability.
THYROID DISEASE

Test: Serum Thyroxine (T₄), Resin T₃ Uptake, T₇

Description of test: Blood was drawn during the screening examination and sent to a local laboratory for analysis.

Time required: Total time for venipuncture was approximately 5 minutes.

Population screened: All persons 14 years of age or older received a T₄.

Persons answering "Yes" to any of the following questions also received a T₃ and computed T₇:

- Are you now taking any pills or medicine for thyroid trouble?
- Are you now taking birth control pills?
- Are you now taking female hormones?
- Are you pregnant now?

Equipment: Equipment required for laboratory procedures is 15 ml vacutainers, 15 ml Corvac tubes, 5 ml vacutainers containing EDTA, 7 ml vacutainers containing potassium oxalate, 4 ml vacutainers containing EDTA, 3 ml vacutainers containing potassium oxalate, serum tubes, multi-sample vacutainer needles 23 g and 21 g, mononot lancets, tourniquets, test tube racks, pipettes, centrifuge, aliquot mixer, zehfian sponges, critoseal, cotton balls, band aids.

Maintenance of equipment: None

Personnel administering test: Enrollment Examinations
Licensed medical technician

Two medical technicians performed venipuncture during enrollment screening examinations. One medical technician worked in Dayton and the other worked in all subsequent sites.
Thyroid Disease--Serum Thyroxine (T₄), Resin T₃ Uptake, T₇

Exit Examinations
Registered nurse

Training of personnel administering test:
The venipuncture technician reviewed the laboratory procedures with the physician and the site supervisor. The physician observed venipuncture during the first two days of screening in each site and instructed the technician in the best methods to obtain samples.

Enrollment Examinations
Procedure:
Venipuncture was performed and 15 ml of blood drawn into a red top vacutainer. The blood was allowed to clot for 30 minutes, then centrifuged. While the specimen was spinning, a serum tube was labeled with the identification sticker of the examinee. The specimen was removed from the centrifuge and 7 ml of serum was drawn off and placed in the serum tube. The tube was tightly capped and refrigerated until delivery to the laboratory for analysis.

Exit Examinations
Venipuncture was performed and 15 ml of blood was drawn into two red top Corvac vacutainers for tests included in the SHA-12. The tubes were labeled with a patient identification sticker. The blood was allowed to clot for 20 minutes, then centrifuged for 15 minutes. The Corvac tube is a self-separating closed system. A gel forms a barrier between the serum and red cells. The Corvac tube makes it easier for shipping and handling.

After 15 ml of blood is drawn into the tube, the tube is inverted six or eight times, the tube is allowed to sit for 20 minutes, no longer, and then placed into a centrifuge and spun for 15 minutes. After spinning the tube is then inverted and rotated 360° so that the RN could check to insure that no red cells have seeped through the gel barrier.

Method of analysis:
Enrollment Examinations
Dayton and Seattle laboratories used the Murphy-Pattee method for determining T₄;
Fitchburg and Charleston laboratories used the T₄ RIA method. In all sites, except Dayton, if the T₄ was abnormal or if the examinee was taking hormones, thyroid medication, or birth control pills, a T₃ Resin Uptake was performed allowing for a computed T₇. In Dayton, only T₆ was performed.
Thyroid Disease—Serum Thyroxine (T₄), Resin T₃ Uptake, T₇

Exit Examinations
All exit examination thyroid results were obtained by the immune assay method.

Recording form:
1. Technician recorded responses to questions on thyroid medications, birth control pills, female hormones, and pregnancy.
2. Completion Code was filled in.

| EXAMINEE RECEIVING THYROID MEDICATIONS? ....... | 1 | 2 |
| EXAMINEE ON BIRTH CONTROL PILLS? ............. | 1 | 2 |
| EXAMINEE TAKING FEMALE HORMONES? ............ | 1 | 2 |
| EXAMINEE PREGNANT? .......................... | 1 | 2 |
| (if yes to questions 2-5, compute T₇)       |
| COMPLETION CODE ............................. |

The thyroid section of the Confidential Recording Form was filled out to determine test eligibility.

Enrollment Examinations
Staff at the laboratory recorded the value on the Laboratory Recording Form. A copy of the form can be found in Appendix C.

Exit Examinations
Results were recorded on computer tape.
Thyroid Disease—Serum Thyroxine ($T_4$), Resin $T_3$ Uptake, $T_7$

Quality control:

The medical technician performance was monitored by the on-site supervisor, a registered nurse, who observed task performance daily. This included venipuncture and the preparation of specimens for shipment to the laboratory. The proper preparation of serum specimens required that 30 minutes elapse between venipuncture and the placement of the specimen in the centrifuge.

Quality control at the laboratory required a repeat analysis of all specimens with test results which fell outside normal ranges (see Appendix C for recording forms with printed ranges). Test results were reviewed by the editor of the subcontractor. If the difference between the initial and the repeat values appeared too large, the laboratory was alerted.

Each laboratory also had its own quality control program. Generally, the plan was threefold, and consisted of participation in the periodic "proficiency testing" program of one or more external organizations which sponsor such programs, certification by Medicare, and an in-house quality control program.

Reliability measurements:

At the beginning of the screening examination, a random sample of examinees was selected to have extra blood drawn for "split sample analysis". Duplicate samples from the same examinee (but labeled so that the laboratory would not recognize that the two samples were in fact from the same examinee) were sent to the laboratory in different batches. Test results were compared to determine split sample test reliability. These duplicate samples were collected from 5-10 percent of the participants.
TONSIL DISEASE

Test: Tonsil Examination

Description of test: Examinees from 1 year of age through 19 years of age were examined for tonsil size.

Time required: 2 minutes

Population screened: All persons 1 year of age through 19 years of age

Equipment: Light source, tongue depressors, tonsil diagram

Maintenance of equipment: None

Personnel administering test: Dental examiner (dentist or dental hygienist)

Training of personnel administering test: The dental examiners were trained by the physician the first day of screening at each site. In the morning of screening, all examinees who received a tonsil examination were assigned a score by both the physician and the dental examiner, with the physician scoring first. In general this procedure was carried out for ten to fifteen examinations. In the afternoon of screening, the dental examiner examined the tonsils and assigned a score before the physician examined the tonsils. Scores were compared and differences were discussed. If the tonsils were present, an acceptable scoring difference was plus or minus one grade. Standardization of tonsil scoring required that the physician and the dental examiner agree in 25 percent of the cases and be within one grade in 90 percent of the cases.
Tonsil Disease--Tonsil Examination (continued)

Procedure: All examinees were asked if their tonsils had been removed. This included examinees who were not eligible to receive the tonsil examination. Tonsils were scored for all examinees 1 year of age through 19 years of age.

The tonsils were examined and scored (Fig. 1) as absent, normal, minimally enlarged, moderately enlarged, or touching at midline (using the tonsil diagram as a guide).

Recording form: 1. The dental recorder circled whether or not the examinee's tonsils had been removed.
2. Eligibility for the tonsil examination was determined.
3. Tonsils were scored.
4. The Completion Code was filled in (see Appendix B for a list of completion codes).
Tonsil Disease—Tonsil Examination (continued)

<table>
<thead>
<tr>
<th>INFANT</th>
<th>Ages 2 weeks - 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAS CHILD EVER HAD TONSILS REMOVED?</td>
<td>1. YES 2. NO</td>
</tr>
<tr>
<td>IS CHILD 12 MONTHS OR OLDER?</td>
<td>1. YES 2. NO (do not perform test)</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td>enlarged enlarged at midline</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PEDIATRIC</th>
<th>Ages 3 - 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAS CHILD EVER HAD TONSILS REMOVED?</td>
<td>1. YES 2. NO</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td>enlarged enlarged at midline</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ADULT ≥ 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK EXAMINEE IF TONSILS HAVE BEEN REMOVED</td>
</tr>
<tr>
<td>IS EXAMINEE LESS THAN 20 YEARS OLD?</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
</tr>
</tbody>
</table>
Physician/dental examiner tonsil scores (inter-observer reliability) were compared every six weeks in order to standardize tonsil scoring. Approximately twenty examinees were given a tonsil examination by both the physician and the dental examiner. Standardization required agreement in 25 percent of cases and agreement within one score in 90 percent of the cases.

In addition to physician/dental examiner standardization, it was necessary to standardize among the dental examiners (in those sites where there were more than one). This was done at the beginning of screening and midway through screening in each site.

When the dental examiners were tested on scoring, standardization was always met and therefore retraining was not required.

Ten percent of examinees who received a tonsil examination were requested to have a repeat examination at least 1 hour after the initial tonsil examination. The repeat examination was given by the same dental examiner who gave the initial examination.
ULCER STUDY

Test:
- Serum for pepsinogen
- Blood type
- Saliva for secretor status
- Urine for pepsinogen

Description of test:
Samples were obtained and sent to the Ulcer Study laboratory for analysis.

Time required:
Ten minutes per examinee

Population screened:
All persons 14 years of age and older specified by Rand

Equipment:
Serum for Pepsinogen and Blood Clot: Venipuncture was performed and five to seven ml of blood was drawn into a small red top vacutainer. The vacutainer was labeled with a patient identification sticker and a RAND label. The blood was then allowed to sit for twenty minutes for a clot to form, then placed into a centrifuge and spun for fifteen minutes. After spinning, two ml of serum was poured into a plastic serum tube. The serum tube was also labeled. The serum was placed into a freezer within four hours of collection and remained there until shipped to the laboratory for analysis. The remaining blood clot was refrigerated within two hours of collection and remained there until shipped to the laboratory for analysis.

Saliva for Secretor Status: The patient was asked to chew a one inch square of parafilm, for two minutes, to stimulate saliva production. The patient was then asked to expectorate the saliva into a glass tube (at least one ml was necessary). The tube was labeled with a patient identification sticker and a RAND label and immediately (within one minute of collection) placed in a boiling water bath (100 degrees centigrade) for ten minutes. Within four hours of collection, the saliva was placed into a freezer and remained there until shipped to the laboratory for analysis.
Urine for Pepsinogen: The urine was obtained with the clean-catch method. Thirty ml of urine was poured into a polyethylene bottle. One to two drops of a 10% solution of sodium azide was added as a preservative. The bottle was then labeled with a patient identification sticker and a RAND sticker. The bottle was then placed in a refrigerator until shipped to the laboratory for analysis.

The 10% solution of sodium azide was made by mixing one gram of sodium azide powder with one hundred ml of distilled water.

Shipping directions:

Specimens of serum, saliva and blood clots were each placed into separate plastic bags, according to the date.

The serum and saliva were packed in large insulated chests with dry ice. Each plastic bag was wrapped in newspaper. Several small holes were placed in the sides of the chest for shipping. A tight fitting lid was secured and the chests were shipped via air.

The blood clots and urine specimens were shipped in insulated chests with regular ice. The plastic bags containing the blood clots were wrapped in newspaper. A tight fitting lid was secured and the chests were shipped via air.

Specimens were shipped to:

Michael Samloff, M.D.
Gastroenterology Department
Harbor General Hospital
Torrance, California 90509

Dr. Samloff was notified of the flight time of arrival, flight number, shipping number. Arrangements were made to deliver the specimens to Dr. Samloff's office.

Duplicate samples were maintained at the collection site in the event of failure of the original samples to arrive in good condition.
An ulcer study transmittal form was also sent with the specimens. A RAND label was attached and the type of specimen that were obtained indicated on the ulcer study form.

Duplicate samples were obtained from 10% of examinees receiving this test.
**VARICOSE VEINS**

<table>
<thead>
<tr>
<th>Test:</th>
<th>Varicose Veins Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of test:</strong></td>
<td>Examinees eligible to receive this test were examined by the technician for varicose veins. The lateral leg, medial leg, posterolateral thigh, and anteromedial thigh of both legs were scored for varicosity severity, location, and drainage system.</td>
</tr>
<tr>
<td><strong>Time required:</strong></td>
<td>3 minutes</td>
</tr>
<tr>
<td><strong>Population screened:</strong></td>
<td>All women examinees 20 years of age or older, and male examinees who answered &quot;Yes&quot; to the question, &quot;Have you ever had surgery for varicose veins?&quot; or, &quot;Have you noticed varicose veins in your legs within the last 12 months?&quot;</td>
</tr>
<tr>
<td><strong>Equipment:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Maintenance of equipment:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Personnel administering test:</strong></td>
<td>Enrollment Examinations Medical technician and registered nurse</td>
</tr>
<tr>
<td></td>
<td>The same medical technician performed the varicose veins examination at all sites.</td>
</tr>
<tr>
<td><strong>Exit Examinations</strong></td>
<td>Registered nurse</td>
</tr>
</tbody>
</table>
Enrollment Examinations
The medical technician who performed the varicose veins enrollment examination was trained by a physician in Dayton, Ohio. The nurse who performed the examination for exit examinations was trained by a physician in Gainesville, Florida. The medical technician attended rounds at a hospital with the physician and examined the legs of patients visited during rounds (approximately 30 patients). The medical technician identified and scored varicosities and the physician verified the scoring.

On-site training was similar to the training given at the hospital; however, training was limited by the low incidence of varicose veins in the examinee population. During the first week of screening, and during subsequent site visits by the physician, the medical technician identified and scored varicosities and the physician verified the scoring.

The scoring of the medical technician was acceptable when the physician and the medical technician agreed on grading of 25 percent of the legs examined and were plus or minus one grade for 90 percent of the legs examined.

Exit Examinations
The nurse who performed the examination for exit examinations was trained by a physician in Gainesville, Florida. The medical technician attended rounds at a hospital with the physician and examined the legs of patients visited during rounds (approximately 30 patients). The medical technician identified and scored varicosities and the physician verified the scoring.

On-site training was similar to the training given at the hospital; however, training was limited by the low incidence of varicose veins in the examinee population. During the first week of screening, and during subsequent site visits by the physician, the medical technician identified and scored varicosities and the physician verified the scoring.

The scoring of the medical technician was acceptable when the physician and the medical technician agreed on grading of 25 percent of the legs examined and were plus or minus one grade for 90 percent of the legs examined.
Varicose Veins--Varicose Veins Examination (continued)

Procedure: Varicosity was defined as a vein which showed distention and tortuosity for at least 1 inch. The basic decision for assigning a degree of severity was the number of varicosities. However, other abnormalities were reason to advance the examinee to the next most severe category.

The scoring system used was as follows:

1 = no varicosities present
2 = spider angioma only; if there were six or more full spider angioma only, scored as a category 3
3 = minimal: 1-3 varicosities; however, if there was also any edema, redness, or hardening of the skin, scored as a category 4
4 = moderate: 4-6 varicosities; however, if there was also any edema, redness, or hardening of the skin, scored as a category 5
5 = severe: more than six varicosities, with or without additional abnormalities

The examinee was asked to remove all clothing from his/her legs for the examination. The examinee then stood with feet apart and gown held to the top of the thighs. Veins were scored according to the above scoring system. A repeat examination was performed by the screening center supervisor on examinees identified by the medical technician as having varicosities.

Recording form: 1. The medical technician circled the entry on the Recording Form if the examinee was female and 20 years of age or older.
2. The medical technician circled the entry on the Recording Form if the examinee was male and claimed a history of varicose veins.
3. The presence and severity of varicosities were scored.
4. The Completion Code was filled in (see Appendix B for a list of codes).
Varicose Veins -- Varicose Veins Examination (continued)

| IS THE EXAMINEE FEMALE AND 20 OR OLDER? | 1. YES | 2. NO |
| IS THE EXAMINEE MALE AND CLAIMS TO HAVE | 1. YES | 2. NO |
| OR HAVE HAD VARICOSE VEINS? | (if yes to either of the above, perform test. otherwise, do not perform test) |

SEVERITY:

| (1=absent, 2=spider angiomata only, 3=minimal, 4=moderate, 5=severe) |
| RIGHT LEG |
| LEFT LEG |

(If absent (1) for either leg, do not perform test for that leg)

DRAINAGE SYSTEM:

| (1=anterior, 2=posterior, 3=both 4=not applicable [spider angiomata only]) |
| RIGHT LEG |
| LEFT LEG |

LOCATION:

| ANTEROMEDIAL THIGH: | YES | NO |
| RIGHT Leg | 1 | 2 |
| LEFT Leg | 1 | 2 |

POSTEROLATERAL THIGH:

| RIGHT LEG | 1 | 2 |
| LEFT LEG | 1 | 2 |

MEDIAL LEG:

| RIGHT LEG | 1 | 2 |
| LEFT LEG | 1 | 2 |

LATERAL LEG:

| RIGHT LEG | 1 | 2 |
| LEFT LEG | 1 | 2 |

COMPLETION CODE
Varicose Veins—Varicose Veins Examination (continued)

Quality control:
The first two days of each site, and during periodic site visits, the physician monitored the scoring of varicose veins by the medical technician. First, the medical technician noted the scoring and then the physician.

Unfortunately, the low incidence of varicose veins identified during these times made it impossible to reach a conclusion regarding the quality and consistency of the scoring of the medical technician.

All findings of varicosities by the medical technician during enrollment examinations in Dayton were checked by the RN for accuracy before being recorded on the form.

Reliability measurements:
Approximately 10 percent of all examinees who received a varicose veins examination were requested to have a repeat examination after all other screening tests had been completed. By comparing the first set of scores to the latter set of scores, test-retest reliability was measured.

Comments:
In the first site (during enrollment examinations), the medical technician scored every finding of varicosities. The RN then checked for accuracy before the findings were entered on the Recording Form. In subsequent sites, varicose veins were scored only by the medical technician.
**VISUAL DISORDERS**

<table>
<thead>
<tr>
<th>Test:</th>
<th>Enrollment Examinations (Only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of test:</td>
<td>Motility</td>
</tr>
<tr>
<td></td>
<td>A cover test was used to screen for the presence of any ocular muscle imbalance.</td>
</tr>
<tr>
<td>Time required:</td>
<td>1 minute</td>
</tr>
<tr>
<td>Population screened:</td>
<td>All persons 3 years of age or older</td>
</tr>
<tr>
<td>Equipment:</td>
<td>Black cardboard square for occlusion, stick</td>
</tr>
<tr>
<td>Maintenance of equipment:</td>
<td>None</td>
</tr>
<tr>
<td>Personnel administering test:</td>
<td>Medical assistant</td>
</tr>
<tr>
<td></td>
<td>Several people were trained in the procedures for vision testing; however, only two persons actually performed the testing. One medical assistant tested vision during Dayton screening; another medical assistant tested vision in subsequent sites.</td>
</tr>
<tr>
<td>Training of personnel administering test:</td>
<td>See description of training under Visual Disorders--Visual Acuity, &quot;Training of personnel administering test&quot;.</td>
</tr>
</tbody>
</table>
Visual Disorders—Motility (continued)

Procedure: Examinees were tested in the six cardinal directions of gaze (eyes up, right; eyes right; eyes down, right; eyes down, left; eyes left; eyes up, left) with a cover-uncover test done at near (14 inches) and distance (20 feet) with an accommodative fixation target. If the examinee wore contact lenses, then the test was done with lenses.

Phoria is a latent tendency for one eye to deviate so as to not look at the same object in space when fusion is interrupted. In testing for phoria, the medical assistant covered and uncovered one eye and noted the type of movement in that eye as it was uncovered. For example, esophoria occurred when that eye, upon being uncovered, appeared away from the nose, then moved toward the nose to fixate.

The examinee focused on the stick while the cover-uncover test was given. The medical assistant observed each eye as it was uncovered to check for inward or outward movement. Phorias were scored as 1=none; 2=esophoria, a tendency for one eye to deviate inward; 3=exophoria, a tendency for one eye to deviate outward; or 4=hyperphoria, a tendency for the eye to deviate upward. If the examinee was positive for phoria, the phoria was scored comitant or incomitant; that is, the deviation was or was not equal in all cardinal directions of gaze.

Tropia is a condition in which fusion is interrupted due to a disturbance of coordination of the extraocular muscles of both eyes. It was present only when phoria was present. For example, esotropia occurred as an inward deviation of the eyes whereby an object in space was not imaged simultaneously on the fovea centralis of each eye.

To test the tropias, the examinee was instructed to fixate on the stick while the medical assistant covered and uncovered one eye, which allowed both eyes to focus on the stick at the same time. The medical assistant looked for movement of the eyes and scored tropia as 1=none; 2=esotropia, an inward movement; 3=exotropia, an outward movement. Tropias were also scored as 1=non-hyper or 2=hyper.

The examinee was also observed for nystagmus, a repeated involuntary twitching movement of the eyes. There was no test for nystagmus, only observation by the medical assistant.
Visual Disorders—Motility (continued)

Nystagmus was scored as 1=none; 2=pendular, involuntary movement back and forth horizontally in a pendulum type of movement, at a constant rate and rhythm; 3=jerk vertical, jerky movement of the eye in the vertical position; 4=jerk horizontal, jerky movement of the eye in the horizontal position, moving either inward or outward; or 5=jerk rotary, a jerky motion rotating in the orbit of the eye.

Nystagmus was scored during Dayton screening only. Nystagmus was deleted from the motility test in subsequent sites because of difficulty in identification.

Recording form:

<table>
<thead>
<tr>
<th>MOTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHORIA: 1. NONE 2. ESO 3. EXO 4. HYPER</td>
</tr>
<tr>
<td>Esotropia: 1. COMITANT 2. INCOMITANT</td>
</tr>
<tr>
<td>TROPIA: 1. NONE 2. ESO 3. EXO 4. HYPER</td>
</tr>
<tr>
<td>Nystagmus: 1. NONE 2. PENDULAR 3. JERK VERTICAL 4. JERK HORIZONTAL 5. JERK ROTARY</td>
</tr>
</tbody>
</table>

COMPLETION CODE ____________

__________________________
Technician

MOTILITY

TROPIA: ________________________________ | 1. NONE 2. ESO 3. EXO

PHORIA: ________________________________ | 1. NON-HYPER 2. HYPER

COMPLETION CODE ______________________ | 1. NONE 2. ESO 3. EXO
Visual Disorders--Mobility (continued)

Quality control: In addition to the six-month post-training standardization (see description under Visual Disorders--Visual Acuity "Training of personnel administering test") conducted by an ophthalmological consultant of the subcontractor, the Rand physician checked the performance of the medical assistant during the first three days of screening at each site. No actual tester-expert comparisons were made.

Reliability measurements: Ten percent of all examinees taking the test received a repeat test given by the same medical technician approximately 1 hour after the initial test, which resulted in a measurement of test-retest reliability.
**VISUAL DISORDERS**

**Test:** Visual Acuity

**Description of test:** Examinees were tested for visual acuity in each eye using the Snellen, Illiterate E, or picture eye testing chart.

**Time required:** 4 minutes

**Population screened:** All persons 3 years of age or older

**Equipment:** Snellen Eye Chart, Illiterate E Eye-Chart, Picture Eye Chart, Rosenbaum Near Vision Chart, optic stick

**Maintenance of equipment:** None

**Personnel administering test:**

- **Enrollment Examinations**
  - Medical assistant
  - Several people were trained in the procedures for vision testing; however, only two persons actually performed the testing. One medical assistant tested vision during Dayton screening; another medical assistant tested vision in subsequent sites.

- **Exit Examinations**
  - Registered nurse

**Training of personnel administering test:**

- **Enrollment Examinations**
  - Medical assistants were trained by the subcontractor's ophthalmological consultant in Nashville, Tennessee. Over the entire period of enrollment screening examinations (1974 to 1976), seven individuals received training in vision testing and tonometry. Training consisted of teaching the method, practice in vision testing and tonometry, a question-answer period, and a comparison of tester-expert performance. In order to "pass" the training, the medical assistant was required to agree with the physician consultant in six out of seven cases. Once a medical assistant successfully completed initial training, retraining was required every 6 months for a one-hour period. These training sessions were designed primarily as a quality control check to measure tester-expert reliability.
Visual Disorders--Visual Acuity (continued)

Exit Examinations
Registered nurses were trained by the ophthalmologist consultant in Gainesville, Florida. The training protocol was the same as described above for Enrollment Examinations.

Procedure:

Children aged 3 to 7 years were tested using the Picture Eye Chart or the Illiterate "E", whichever the medical assistant preferred. Illiterate examinees (those who needed assistance filling out questionnaires and papers at screening station #1), were tested with the Illiterate "E" Chart. All other examinees were tested with the Snellen Eye Chart.

If the picture chart was used, the examinee was first asked to name as close range the pictures on the chart to be certain that the symbols were identifiable. If the Illiterate "E" was used, the examinee was given a black cardboard E the size of the largest E on the chart. The examinee was told that various letters would be pointed to and that he must move the legs of the E being held to point in the same direction as the other letter.

Vision testing was done with 300 to 500 foot lumens of light, the equivalent of a 100 watt bulb, at eye level. The height of the letter for 20/20 vision was equal to 1 minute of arc. At 20 feet the height of the letter was 8 mm. In all sites, except Dayton, limitations in space made it impossible to test vision at a distance of 20 feet, and therefore the height of the letters were a fraction of the heights of letters used for 20 feet. Testing was done at a distance of 15 feet. With the Snellen chart, vision of 20/15 being equivalent to 20/20 and vision of 20/20 being equivalent to 20/25, at 15 feet.

The examinee was instructed to stand with toes behind the white line. The medical assistant noted the type of glasses the examinee brought to the examination center.

With the left eye occluded the examinee was asked to read the line equivalent to 20/20 with the right eye. If more than one letter was missed, the examinee was asked to read the next line up, equivalent to 20/25 and on up the chart until only one letter per line was missed. The right eye score was recorded and then the left eye was tested with the right eye occluded. If the examinee had glasses or contact lenses, both the corrected and uncorrected vision were tested. Examinees with contact lenses were allowed several minutes for adjustment of the eyes before testing was done without the lenses.
Examinees with far vision of less than 20/20 who did not wear glasses or lenses, and examinees with vision of less than 20/20 corrected far vision who did have glasses or lenses, were tested for pinhole acuity. Only the eye or eyes with vision less than 20/20 were tested. The examinee was asked to peer through any pinhole on the optic stick while the medical assistant occluded the eye not being tested with a black glasses case. The examinee was asked to read the line equivalent to 20/20 and on up the chart until only one letter per line was missed.

Near vision testing was performed for all examinees 3 years of age and older. The near vision chart was held 14 inches from the examinee's face. The distance was measured by stretching a string 14 inches from the examinee's eye. With the left eye occluded, the examinee was asked to read the 20/20 line on the near vision chart. If more than one letter was missed the examinee was asked to read the 20/25 line and on up the chart until only one letter per line was missed. The right eye score was recorded—then the procedure was repeated testing the left eye. If the examinee wore glasses or lenses, both corrected and uncorrected vision was tested.

Recording forms

1. The medical assistant recorded the type of eye chart used.
2. A notation was made of the visual aids used by the examinee.
3. Vision test scores were recorded.
4. The Completion Code was filled in (see Appendix B for a list of completion codes).
### Visual Disorders—Visual Acuity (continued)

<table>
<thead>
<tr>
<th>VISUAL ACUITY</th>
<th>1. E</th>
<th>2. SNELLEN</th>
<th>3. PICTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTOTYPE USED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXAMINEE IS WEARING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. no visual aids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. contact lenses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. single vision lenses</td>
<td>20/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. bifocals</td>
<td>20/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. trifocals</td>
<td>20/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. hand lenses</td>
<td>20/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. other</td>
<td>20/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VISUAL ACUITY WITH GLASSES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VISUAL ACUITY WITHOUT GLASSES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEAR VISION WITH GLASSES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEAR VISION WITHOUT GLASSES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PINHOLE ACUITY (if vision in either eye &lt;20/20 with/without glasses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Quality control:**
In addition to the six-month post-training standardization (see description under Visual Disorders—Visual Acuity "Training of personnel administering test") conducted by the ophthalmological consultant of the subcontractor, the Rand physician checked the performance of the medical assistant during the first three days of screening at each site. No actual tester-expert comparisons were made.

**Reliability measurements:**
Ten percent of all examinees who took the test received a repeat test given by the same medical assistant approximately 1 hour after the initial test, which yielded a measurement of test-retest reliability.
# Stereoscopic Vision Disorder

<table>
<thead>
<tr>
<th>Test:</th>
<th>Exit Examinations (Only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TNO test for stereoscopic vision</td>
</tr>
<tr>
<td>Description of test:</td>
<td>The examinee is presented with a series of plates at a distance of 16 inches.</td>
</tr>
<tr>
<td>Time required:</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Population screened:</td>
<td>All examinees over 3 years of age, but less than 14 years of age</td>
</tr>
<tr>
<td>Equipment:</td>
<td>TNO plates 1 through 5</td>
</tr>
<tr>
<td>Maintenance of equipment:</td>
<td>None</td>
</tr>
<tr>
<td>Personnel administering test:</td>
<td>Registered nurse</td>
</tr>
</tbody>
</table>

**Training of personnel administering test:**
The RN was trained by the ophthalmologist consultant to use the TNO Test for Stereoscopic Vision. Training consisted of one 8-hour block of instruction, and an additional 4-hour block of instruction.

**Procedure:**
The procedure for carrying out the TNO test for stereoscopic vision is modified from "TNO Test for Stereoscopic Vision," second edition, Lameris Instrumenten, Utrecht, Netherlands, 1972.

The RN presented each plate at a distance of 16" from the child. The plates were well illuminated. It was important for the plates to be placed squarely in front of the child (not turned to the left or to the right). If the child wore glasses, they were not removed.
If the child failed to discover the stereoscopic shape on a plate, the plate was re-exhibited upside down. A plate could be "passed" in either the right-side-up or upside-down position, if the stereoscopic shape(s) were seen.

On any plate where more than one correct decision had to be made, "pass" meant that at least half the time a correct decision had been made (that one choice out of two had been correct; or two choices out of four had been correct).

The plates were in the following order: Plate One, Two, Three and Five (sic). Plate Four was presented only if at least two of the first three plates had been failed. Plates Six and Seven were never used.

Algorithms for presenting Plates and Scoring: If two or three of the first three plates were passed, Plate 5 was then presented. If Plate 5 was passed, a "5" was recorded; if Plate 5 was failed, a "4" was recorded. If two or three of the first three plates were failed, Plate 4 was presented. If the child saw three discs, a "3" was recorded; if the child saw two discs, a "2" was recorded.

Interpretation of Results:
5 = normal stereoscopic vision
4 = questionable stereoscopic vision
3 = abnormal stereoscopic vision
2 = abnormal stereoscopic vision, with suppression present

Recording form: The RN recorded the results, the highest plate passed on the Recording Form (Fig. 1), and completed the Completion Code.

Results

Highest plate passed (1 through 5, 5 HIGHEST)........

Fig. 1—Vision stereopsis
Stereoscopic Vision Disorder--TNO Test for Stereoscopic Vision (continued)

Quality control: The TNO was observed by the Field Director as well as the HIS physician.
Appendix A

HEALTH INSURANCE STUDY SCREENING EXAMINATION BROCHURE
THE HEALTH INSURANCE STUDY

Some information about your SCREENING EXAMINATION

<table>
<thead>
<tr>
<th>Name</th>
<th>Date of Appointment</th>
<th>Time</th>
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The Health Insurance Examination Center
20 West Monument Street
Dayton, Ohio
Telephone: (513) 224-4692 (call collect)
WHAT WILL THE SCREENING EXAMINATION INCLUDE?

You will find that some parts of the screening examination are similar to a regular visit to your family doctor. For example, we will check your blood pressure, height and weight, your blood and urine, and we will take a chest X-ray. In addition, we will check your teeth, hearing, and eyesight. All this will be done in just one visit.

The screening examination that you will be given is not what you may usually think of as a physical examination. Many tasks that would be done in a regular exam will not be included. For example, no internal examination or breast examination will be done. The examination is not being given to diagnose the presence or absence of disease of abnormality. The exam is solely for the purpose of gathering information for the Health Insurance Study. Our tests are not taken for your own physician's or dentist's examination.

Some tests may be done twice during your visit. Do not be concerned. We do this to double check our testing procedures.

All tests have been carefully selected by doctors. All tests are free of embarrassment. Of course, you have the right to refuse any of these screening tests.

WHAT WILL HAPPEN TO THE INFORMATION FROM YOUR SCREENING EXAMINATION?

All results will be sent to the doctor of your choice. If you want to know your results, you or your doctor can contact us.

Information from the screening examination is being used for the Health Insurance Study. This information will not be used to make changes to your insurance. Examination results will not affect your participation in the Study.

Information from the screening examination that would permit identification of you or your family will be kept strictly confidential. It will be used only for the purposes of conducting and evaluating the study, and will not be disclosed or released except to the physician of your choice for any other purpose without the written consent of the head of your family or the adult individual, except as required by law.

WHAT IS YOUR PART IN THE SCREENING EXAMINATION?

What should you bring?

- The completed medical history forms (Form A) that you filled out at home.
- Any eyeglasses, contact lenses, and magnifying or reading glasses you use.
- Any hearing aid (if you use one).
- Any medicine (pills, liquids, etc.) that you have used within two days of your appointment, being the container, even if it is empty.

What should you do?

- Please do not eat or drink, anything for two hours before you come for your appointment (You may drink plain water). The screening examination includes a test of your blood sugar level.
- Women will be more comfortable during the examination if they wear a two-piece outfit and avoid wearing jewelry.
- If you need a ride to the examination center, please call us in advance and we will arrange for transportation.
- If you cannot keep your appointment, please let us know and we will change it to a more convenient time.
- If you need to telephone us, call collect to (800) 722-1112.

What if you have children?

- Children who are 14 or older will receive the adult examination. Children under 14 will receive a short version of the examination. For very young children, normal growth and development will also be checked.
- Please bring the same things (medical history forms, glasses, medications, etc.) for your children that you are bringing for yourself.
- Children under 14 may eat and drink before the appointments.
- Child care will be provided in a supervised play area at the examination center while you are having your own examination.

WHY IS THE SCREENING EXAMINATION IMPORTANT?

You and your family have been asked to take a screening examination because it is one of the best ways to learn important facts about your health. This information, and the information from other families in the Health Insurance Study, are necessary to help develop better health insurance plans for the United States.
Appendix B

COMPLETION CODES FOR ENROLLMENT AND EXIT EXAMINATIONS
Enrollment Examinations

At the end of each part of the examination, there will be found a notation code: Completion Code. This code must be filled in to verify that each test has been completed. The codes are as follows:

1. Yes
2. No/not applicable
3. Refused
4. Patient unable to comprehend
5. Administrative problems
6. Equipment failure
7. Uncooperative enrollee
8. Enrollee unable to comply
9. Additional data requested

**0. Weight estimated because participant is wearing a cast (if appears in completion code for "personal data and measurements)***

**In Seattle only, the Completion Code "0" was used for audiometry to indicate that the hearing test was performed in an environment with potential noise interference; therefore, the results should be suspect.**
Exit Examinations

At the end of each part of the examination, there will be found a notation code: Completion Code. This code must be filled in to verify that each test has been completed. The codes used for exit examinations are as follows:

1. Test completed
2. No/test not applicable
3. Participant refused test
4. Unobtainable
5. Test should have been performed; missing due to HTI error
6. Test performed, however not applicable for the participant
7. Unreliable data due to examinee's inability to respond to instructions
Appendix C

RECORDING FORMS, LABORATORY SHEETS

1. Enrollment Examination Confidential Recording Forms, including Laboratory Recording Sheets -- infant, pediatric, adult

2. Test Verification Forms (exit examination recording forms) infant, pediatric, adult
CONFIDENTIAL RECORDING FORM
INFANT

Name: _____________________________________________

Address: ___________________________________________

Telephone No. _______________________________________

Notice

All information obtained in the screening examination which would permit identification of the individual will be regarded as strictly confidential, will be used only for the purpose of operating and evaluating the Health Insurance Study, and will not be disclosed or released to others (except to the physician of the family’s choice) without the consent of the individual or the head of his or her family, except as required by law.

These screening tests are not intended to be a substitute for a physician’s examination, but are an important aid to the doctor in his diagnosis and treatment or any abnormalities discovered. These tests administered at the Health Insurance Study Examination Center cannot constitute a guaranteed determination of the presence or absence of diseases or abnormalities.

I HEREBY AUTHORIZE RELEASE OF THE RESULTS OF THIS EXAMINATION TO THE PHYSICIAN OR CLINIC DESIGNATED BY ME.

______________________________________________
Signature

Parent or guardian should sign for children under 18 years of age

______________________________________________
Physician’s name

______________________________________________
Address

______________________________________________
Telephone No.
HEALTH INSURANCE STUDY

SCREENING EXAMINATION INFANT
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<tr>
<td>1. HAS A DOCTOR TOLD YOU THAT YOUR CHILD HAS HEMOPHILIA OR ANOTHER BLEEDING DISORDER?</td>
<td>1. YES  2. NO</td>
</tr>
<tr>
<td>2. HAS YOUR CHILD EVER HAD HIS OR HER TONSILS REMOVED?</td>
<td>1. YES  2. NO</td>
</tr>
<tr>
<td>3. DID YOU BRING ANY PILLS OR LIQUID MEDICATIONS BELONGING TO YOUR CHILD WITH YOU TODAY?</td>
<td>1. YES  2. NO</td>
</tr>
<tr>
<td>4. HAS YOUR CHILD EVER HAD DRAINAGE FROM THE EARS REQUIRING THE DOCTOR TO PUT TUBES IN HIS OR HER EARS IN THE PAST 6 MONTHS?</td>
<td>1. YES  2. NO</td>
</tr>
<tr>
<td>5. HAS YOUR CHILD HAD EAR SURGERY IN THE PAST 6 MONTHS?</td>
<td>1. YES  2. NO</td>
</tr>
</tbody>
</table>
# Infant

**Ages 2 Weeks - 2 Years**

**Today's Date (mo, day, yr):** __ __ | __ __ | __ __ | 43-47/

**Exam Type:** 0 Infant 48/

**Time Exam Began:** __ __ __ __ 49-52/

## Personal Data and Measurements

| Date of Birth (mo, day, yr) | __ __ | __ __ | __ __ | 18-24/
| Age (years, months, days)  | __ __ | __ __ | __ __ | 01-02/
| Sex                        | 1. Male 2. Female | 27/

**Height or Length**

| Is Child 2 Years Old? | 1. Yes (measure height) 2. No (measure length) | 28/
| Height                | __ __ __ __ INCHES | 33-35/
| Repeat Height         | __ __ __ __ INCHES | 33-36/
| Length                | __ __ __ __ INCHES | 37-40/
| Repeat Length         | __ __ __ __ INCHES | 41-44/
| Head Circumference (Do not measure if child 2 years or older) | __ __ __ __ INCHES | 45-48/
| Repeat Head Circumference | __ __ __ __ INCHES | 49-52/
| Weight                | __ __ __ __ POUNDS | 52-56/
| Repeat Weight         | __ __ __ __ POUNDS | 57-60/

**Completion Code:** __ __ __ 61/

## ODST

| Is Child 3 Months or Older? | 1. Yes 2. No (Do not perform test) | 54/

**Test Results:** 1 = Normal 2 = Unobtainable 3 = Abnormal 4 = Questionable

**Completion Code:** __ __ __ __ 54/

## Tonsils

| Has Child Ever Had Tonsils Removed? | 1. Yes 2. No | 66/

**Is Child 12 Months or Older?**

| Test Results | 1 = Absent 2 = Normal 3 = Minimally Enlarged 4 = Moderately Enlarged 5 = Touching Midline |

**Completion Code:** __ __ __ __ 67/

## Hematology

| Is Child 6 Months or Older? | 1. Yes 2. No (Do not take sample) | 69/
| Hematology Sample Obtained? | 1. Yes 2. No | 70/
| Is Child 1 Year or Older? | 1. Yes 2. No (Do not take sample) | 71/

**Lead Level Drawn?**

| 1. Yes 2. No | 72/

**Completion Code:** __ __ __ 73/
PHYSICAL EXAM FOLLOW-UP

1. PHYSICIAN NOTIFICATION

Type letter sent ____________

1. Normal
2. Slightly abnormal
3. Abnormal
4. Severely abnormal plus phone call
5. Normal (ME requested)
6. Slightly abnormal (ME requested)
7. Abnormal (ME requested)
8. Severely abnormal plus phone call (ME requested)

Letter accepted ____________ 24/

2. First
3. Second
4. Alternate MD obtained

alternate arrangement made

Date letter accepted __ / __ / ____ 25-26/

Physician code ____________________________ 21-22/

If alternate MD obtained, number of the MD who refused the confidential:

Physician code ____________________________ 23-26/

2. ABNORMALITIES REPORTED TO MD

______ _______ 37-40/

______ _______ 41-44/

______ _______ 45-48/

______ _______ 49-52/

______ _______ 53-56/

3. EXAMINEE NOTIFICATION

Type notification ____________ 67/

1. Normal
2. Slightly abnormal
3. Abnormal
4. Severely abnormal plus phone call
5. Normal plus dental
6. Slightly abnormal plus dental
7. Abnormal plus dental

Letter accepted ____________ 68/

1. Normal letter—assume unanswered
2. First
3. Second
4. Slightly abnormal or abnormal letter sent by regular mail when Certified letter not picked up at Post Office; confirmed by phone.

Date letter accepted __ / __ / ____ 69-64/

CARD 08
# HEALTH INSURANCE STUDY
## LABORATORY RECORDING FORM
### INFANT

**Sample No.**

**paste i.d. here**

**Date:**

### PART 2

#### HEMATOCRIT-Normal Values

<table>
<thead>
<tr>
<th>TEST</th>
<th>One Month</th>
<th>Two Months</th>
<th>Six Months</th>
<th>REPEAT (if abnormal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb</td>
<td>13-18 g/dl</td>
<td>13-18 g/dl</td>
<td>13-18 g/dl</td>
<td></td>
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<tr>
<td>RBC</td>
<td>5.0-5.5 x 10^12/mm³</td>
<td>4.2-5.0 x 10^12/mm³</td>
<td>4.0-5.0 x 10^12/mm³</td>
<td></td>
</tr>
<tr>
<td>WBC</td>
<td>5000-12,000</td>
<td>5000-12,000</td>
<td>5000-12,000</td>
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<tr>
<td>MCV</td>
<td>80-100 fL</td>
<td>80-100 fL</td>
<td>80-100 fL</td>
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<tr>
<td>MCH</td>
<td>27-31 pg</td>
<td>27-31 pg</td>
<td>27-31 pg</td>
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<tr>
<td>MCHC</td>
<td>32-35 g/dl</td>
<td>32-35 g/dl</td>
<td>32-35 g/dl</td>
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</table>

#### BLOOD TEST Normal Range

<table>
<thead>
<tr>
<th>TEST (age 1-5)</th>
<th>20-60 mg/dl</th>
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<tbody>
<tr>
<td>Blood Lead</td>
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</table>

**NOTE:**

**CARD 04/05**
CONFIDENTIAL RECORDING FORM
AGES 3-13

Name: ____________________________

Address: ____________________________

Telephone No.: ____________________________

Notice

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I HEREBY AUTHORIZE RELEASE OF THE RESULTS OF THIS EXAMINATION TO THE PHYSICIAN OR CLINIC DESIGNATED BY ME.

__________________________
Signature

Parent or guardian should sign for children under 18 years of age.

Physician's name ____________________________

Address: ____________________________

__________________________
Zip Code

Telephone No.: ____________________________
HEALTH INSURANCE STUDY

SCREENING EXAMINATION
PEDIATRIC
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<td><strong>2.</strong> NO</td>
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<tr>
<td><strong>2.</strong> HAS YOUR CHILD EVER HAD HIS OR HER TONGILS REMOVED?</td>
<td><strong>1.</strong> YES</td>
<td><strong>2.</strong> NO</td>
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<td><strong>3.</strong> DID YOU BRING ANY PILLS OR LIQUID MEDICATIONS BELONGING TO YOUR CHILD WITH YOU TODAY?</td>
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<td><strong>4.</strong> HAS YOUR CHILD EVER HAD DRAINAGE FROM THE EARS REQUIRING THE DOCTOR TO PUT TUBES IN HIS OR HER EARS IN THE PAST 6 MONTHS?</td>
<td><strong>1.</strong> YES</td>
<td><strong>2.</strong> NO</td>
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<td><strong>5.</strong> HAS YOUR CHILD HAD EAR SURGERY IN THE PAST 6 MONTHS?</td>
<td><strong>1.</strong> YES</td>
<td><strong>2.</strong> NO</td>
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# PEDIATRIC

**AGES 3 - 13**

**TODAY'S DATE (mo, day, yr)**

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**EXAM TYPE**

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**TIME EXAMINATION BEGAN**

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**DATE OF BIRTH (mo, day, year)**

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**AGE (years, months, days)**

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**SEX**

1. MALE 2. FEMALE

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**HEIGHT (without shoes)**

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**REPEAT HEIGHT**

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**WEIGHT**

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**REPEAT WEIGHT**

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**PERSONAL DATA AND MEASUREMENTS COMPLETION CODE**

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**DENVER DEVELOPMENTAL SCREENING**

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**IS EXAMINEE LESS THAN 5 YEARS OF AGE?**

1. YES 2. NO (do not perform test)

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**TEST RESULTS**

1. NORMAL 2. INTERMEDIATE 3. ABNORMAL 4. QUESTIONABLE

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**TONSILS**

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**HAS CHILD EVER HAD TONSILS REMOVED?**

1. YES 2. NO

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**EXAM RESULTS**

1. ABSENT 2. NORMAL 3. MINIMALLY ENLARGED 4. MODERATELY ENLARGED 5. TUMID

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**HEMATOLOGY**

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**IS CHILD LESS THAN 6 YEARS OF AGE?**

1. YES 2. NO (do not draw lead level)

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**LEAD LEVEL DRAWN?**

1. YES 2. NO

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**HEMATOLOGY SAMPLE OBTAINED?**

1. YES 2. NO

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**COMPLETION CODE**

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**URINALYSIS**

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</table>

**IS EXAMINEE FEMALE AND 6 YEARS OR OLDER?**

1. YES 2. NO

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</table>

**IS EXAMINEE MENSTRUATING TODAY?**

1. YES 2. NO

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**COMPLETION CODE**

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</table>

**CARD 01/02**
### Audiology

**Is examinee 4 years or older?**
- 1. Yes
- 2. No (do not perform test)

**Air Conduction** (record threshold for each frequency)
- **Right Ear**
- **Left Ear**

**Bone Conduction** (test BC for each frequency in which the AC loss is 20 dB or more)
- Record threshold for each measured frequency
- **Right Ear**
- **Left Ear**

**Repeat Air Conduction with Masking:**
- (If the AC threshold in one ear exceeds the AC threshold in the opposite ear by 40 dB or more or if the AC threshold in one ear exceeds the apparent BC threshold in the opposite ear by 40 dB or more)
- **Right Ear**
- **Masking (of left ear)**
- **Left Ear**
- **Masking (of right ear)**
- **Completion Code**

### Tympanometry

**Has examinee had ear surgery or tubes in ears for drainage in the past 6 mos.?**
- 1. Yes (do not perform test)
- 2. No

**Grid Coordinates**
- **Right Ear**
- **Left Ear**

**Slope**

**Result** (1=no seal, 2=pass, 3=fail)

**Completion Code**

**Hearing Loss:**
- 1. Yes
- 2. No

**Is examinee wearing a hearing aid(s)?**
- If yes, how many aids?
- If yes, type of aid?

**1. Body 2. In-Ear 3. In-Bone 4. All in 1 Bone Style Ear Conduction**

**If yes, is aid(s) operational?**

**Completion Code**

---

CARD 03/04
<table>
<thead>
<tr>
<th>VISUAL ACUITY</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>OPTOTYPE USED</td>
<td>1. E 2. SNELLEN 3. PICTURE</td>
</tr>
<tr>
<td>EXAMINEE IS WEARING</td>
<td>14/</td>
</tr>
<tr>
<td>1. no visual aids 2. contact lenses</td>
<td></td>
</tr>
<tr>
<td>3. single vision lenses 4. bifocals</td>
<td></td>
</tr>
<tr>
<td>5. trifocals 6. hand lenses 7. other</td>
<td></td>
</tr>
<tr>
<td>VISUAL ACUITY WITHOUT GLASSES</td>
<td>15-20/</td>
</tr>
<tr>
<td>VISUAL ACUITY WITH GLASSES</td>
<td>20/</td>
</tr>
<tr>
<td>NEAR VISION WITHOUT GLASSES</td>
<td>20/</td>
</tr>
<tr>
<td>NEAR VISION WITH GLASSES</td>
<td>20/</td>
</tr>
<tr>
<td>PINHOLE ACUITY (if vision in either eye &lt;20/20 with/without glasses)</td>
<td>20/</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td>33-44/</td>
</tr>
<tr>
<td>MOTILITY</td>
<td></td>
</tr>
<tr>
<td>TROPIA</td>
<td>48/</td>
</tr>
<tr>
<td>PHORIA</td>
<td>48/</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td>48/</td>
</tr>
</tbody>
</table>
GROSS DECAY INDEX

0 = ABSENT  1 = PRESENT

ORAL HYGIENE INDEX

<table>
<thead>
<tr>
<th>Area</th>
<th>Debris</th>
<th>Calculus</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior Upper Right—Buccal</td>
<td>[ ]</td>
<td>[ ]</td>
<td>66-67/</td>
</tr>
<tr>
<td>(usually first molar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Right Central Incisor—Facial</td>
<td>[ ]</td>
<td>[ ]</td>
<td>68-69/</td>
</tr>
<tr>
<td>(or adjacent central)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior Upper Left—Buccal</td>
<td>[ ]</td>
<td>[ ]</td>
<td>70-71/</td>
</tr>
<tr>
<td>Posterior Lower Left—Lingual</td>
<td>[ ]</td>
<td>[ ]</td>
<td>72-73/</td>
</tr>
<tr>
<td>Lower Left Central Incisor—Facial</td>
<td>[ ]</td>
<td>[ ]</td>
<td>74-75/</td>
</tr>
<tr>
<td>(or adjacent central)</td>
<td></td>
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<tr>
<td>Posterior Lower Right—Lingual</td>
<td>[ ]</td>
<td>[ ]</td>
<td>76-77/</td>
</tr>
<tr>
<td>Completion Code</td>
<td></td>
<td></td>
<td>78/</td>
</tr>
<tr>
<td>Question</td>
<td>Options</td>
<td>Notes</td>
<td></td>
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<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>----------------</td>
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<tr>
<td>1. Orthodontic appliances present?</td>
<td>Yes, No (go to 0.3)</td>
<td>13/</td>
<td></td>
</tr>
<tr>
<td>2. Orthodontic appliance present on which arch?</td>
<td>Upper, Lower, Both, Neither</td>
<td>14/</td>
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<tr>
<td>3. Full denture present on which arch?</td>
<td>Upper, Lower, Both, Neither</td>
<td>15/</td>
<td></td>
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<tr>
<td>4. How many years has full denture been worn?</td>
<td>Upper, Lower, Not Applicable</td>
<td>16/</td>
<td></td>
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<tr>
<td>HOW MANY YEARS WITHOUT TEETH?</td>
<td></td>
<td>17/</td>
<td></td>
</tr>
<tr>
<td>5. If subject is edentulous and full denture is absent</td>
<td></td>
<td>18/</td>
<td></td>
</tr>
<tr>
<td>PERIODONTAL PROFILE:</td>
<td></td>
<td>19/</td>
<td></td>
</tr>
<tr>
<td>DO GUMS BLEED FREQUENTLY WHEN YOU BRUSH YOUR TEETH?</td>
<td>Yes, No</td>
<td>20/</td>
<td></td>
</tr>
<tr>
<td>DO YOU REGULARLY USE:</td>
<td></td>
<td></td>
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<tr>
<td>Frequency Code:</td>
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<td></td>
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<tr>
<td>1 = once a month or less</td>
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<tr>
<td>2 = once a week</td>
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<tr>
<td>3 = a few times a week</td>
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<tr>
<td>4 = almost every day</td>
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<td>5 = at least once a day</td>
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<tr>
<td>TOOTHBRUSH</td>
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<tr>
<td>IF YES, FREQUENCY</td>
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<tr>
<td>IF YES, FREQUENCY</td>
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<tr>
<td>WATER IRRIGATOR</td>
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<tr>
<td>IF YES, FREQUENCY</td>
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<tr>
<td>INTERDENTAL STIMULATOR</td>
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<tr>
<td>IF YES, FREQUENCY</td>
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<tr>
<td>DENTAL FLOSS</td>
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<tr>
<td>IF YES, FREQUENCY</td>
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<td></td>
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<tr>
<td>PIPE CLEANERS</td>
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<tr>
<td>IF YES, FREQUENCY</td>
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<tr>
<td>COMPLETION CODE</td>
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<tr>
<td>EXAMINER NUMBER</td>
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<td>32-34/</td>
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<tr>
<td>RECORDER NUMBER</td>
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<td>35-37/</td>
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1. PHYSICIAN NOTIFICATION

Type letter sent

1. Normal
2. Slightly abnormal
3. Abnormal
4. Severely abnormal plus phone call
5. Normal (MD requested)
6. Slightly abnormal (MD requested)
7. Abnormal (MD requested)
8. Severely abnormal plus phone call (MD requested)

Letter accepted

1. First
2. Second
3. Alternate MD obtained
4. Letter not accepted by a physician; alternate arrangement made

Date letter accepted __/__/____

If alternate MD obtained, number of the MD who refused the confidential:

Physician code ____________

2. ABNORMALITIES REPORTED TO MD

3. EXAMINEE NOTIFICATION

Type notification

1. Normal
2. Slightly abnormal
3. Abnormal
4. Severely abnormal plus phone call
5. Normal plus dental
6. Slightly abnormal plus dental
7. Abnormal plus dental

Letter accepted

1. Normal letter—assume answered
2. First
3. Second
4. Slightly abnormal or abnormal letter sent by regular mail when certified letter not picked up at Post Office; confirmed by phone.

Date letter accepted __/__/____

CARD 10
CONFIDENTIAL RECORDING FORM
AGES 214

Name: ________________________________

Address: ________________________________

Telephone No: __________________________

Notice

All information obtained in the screening examination which would permit identification of the individual will be regarded as strictly confidential, will be used only for the purpose of operating and evaluating the Health Insurance Study, and will not be disclosed or released to others (except to the physician of the family's choice) without the consent of the individual or the head of his or her family, except as required by law.

These screening tests are not intended to be a substitute for a physician's examination, but are an important aid to the doctor in his diagnosis and treatment of any abnormalities discovered. These tests administered at the Health Insurance Study Examination Center cannot constitute a guaranteed determination of the presence or absence of diseases or abnormalities.

I HEREBY AUTHORIZE RELEASE OF THE RESULTS OF THIS EXAMINATION TO THE PHYSICIAN OR CLINIC DESIGNATED BY ME.

______________________________
Signature

Parent or guardian should sign for children under 18 years of age

Physician's name

Address

______________________________
zip code

Telephone No
HEALTH INSURANCE STUDY

SCREENING EXAMINATION
ADULT
| GROUP A |  
| --- | --- |
| 1. DID YOU BRING ANY PILLS OR LIQUID MEDICATIONS WITH YOU TODAY? | YES | NO | 37/ | 38/ |
| 2. ARE YOU NOW TAKING ANY PILLS OR MEDICINE FOR THYROID TROUBLE? | YES | NO | 39/ | 38/ |
| 3. DO YOU THINK YOU HAVE ACNE (PIMPLES ON THE FACE)? | YES | NO | 39/ | 38/ |
| 4. HAS A DOCTOR RECENTLY SAID THAT YOU HAD ACNE? | YES | NO | 40/ | 38/ |
| 5. DURING THE PAST YEAR, HAVE YOU HAD PAIN, ACHING, SWELLING OR STIFFNESS IN YOUR JOINTS (NOT COUNTING INJURIES)? | YES | NO | 41/ | 38/ |
| 6. HAS A DOCTOR EVER TOLD YOU THAT YOU HAVE HEMOPHILIA OR ANOTHER BLEEDING DISORDER? | YES | NO | 42/ | 38/ |

| GROUP B |  
| --- | --- |
| 1. HAVE YOU EVER TAKEN ANY OF THESE HEART MEDICATIONS: DIGITALIS, DIGITALIS LEAF, DIGITOXIN, OR DIGOXIN? | YES | NO | 43/ | 38/ |
| 2. DURING THE PAST 12 MONTHS, HAVE YOU EVER FELT SHORT OF BREATH OR HAS THE DOCTOR EVER TOLD YOU THAT YOU HAD HEART FAILURE? | YES | NO | 44/ | 38/ |
| 3. HAVE YOU HAD PAIN, DISCOMFORT, HEAVINESS OR PRESSURE IN YOUR CHEST IN THE PAST 12 MONTHS, NOT RELATED TO AN INJURY OR A "CHEST COLD"? | YES | NO | 45/ | 38/ |
| 4. HAS A DOCTOR EVER SAID THAT YOU HAD HIGH BLOOD CHOLESTEROL? | YES | NO | 46/ | 38/ |
| 5. HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAD HIGH BLOOD PRESSURE? | YES | NO | 47/ | 38/ |
| 6. ARE YOU NOW TAKING PILLS OR MEDICINE FOR HIGH BLOOD PRESSURE? | YES | NO | 48/ | 38/ |

| GROUP C |  
| --- | --- |
| 1. DURING THE PAST 12 MONTHS, HAVE YOU EVER FELT SHORT OF BREATH OR HAS THE DOCTOR EVER TOLD YOU THAT YOU HAD HEART FAILURE? | YES | NO | 49/ | 38/ |
| 2. HAS A DOCTOR EVER TOLD YOU THAT YOU HAD BRONCHITIS OR EMPHYSEMA? | YES | NO | 50/ | 38/ |
| 3. DO YOU BRING UP PHLEGM (SPUTUM) ON MOST DAYS FOR AT LEAST 3 MONTHS OF THE YEAR? | YES | NO | 51/ | 38/ |
| 4. HAS A DOCTOR EVER SAID THAT YOU HAD TUBERCULOSIS (T.B.)? | YES | NO | 52/ | 38/ |
| 5. DID ANYONE EVER SAY YOU HAD A POSITIVE TB SKIN TEST? | YES | NO | 53/ | 38/ |

| FOR MEN ONLY: |  
| --- | --- |

| GROUP D |  
| --- | --- |
| 1. HAVE YOU EVER HAD SURGERY FOR VARICOSE VEINS? | YES | NO | 54/ | 38/ |
| 2. HAVE YOU NOTICED VARICOSE VEINS IN YOUR LEGS WITHIN THE LAST 12 MONTHS? | YES | NO | 55/ | 38/ |

| FOR WOMEN ONLY: |  
| --- | --- |

| GROUP E |  
| --- | --- |
| 1. ARE YOU NOW TAKING BIRTH CONTROL PILLS? | YES | NO | 56/ | 38/ |
| 2. ARE YOU NOW TAKING FEMALE HORMONES? | YES | NO | 57/ | 38/ |
| 3. ARE YOU PREGNANT NOW? | YES | NO | 58/ | 38/ |
| 4. ARE YOU MENSTRUATING (HAVING YOUR PERIOD) TODAY? | YES | NO | 59/ | 38/ |

| GROUP F |  
| --- | --- |
| 1. HAVE YOU HAD EAR SURGERY IN THE PAST 6 MONTHS? | YES | NO | 60/ | 38/ |
| 2. HAVE YOU HAD EAR DRAINAGE REQUIRING THE DOCTOR TO PUT TUBES IN YOUR EARS IN THE PAST 6 MONTHS? | YES | NO | 61/ | 38/ |
ADULT 214

TODAY'S DATE  ____________ ____________ ____________  ____________

EXAM TYPE  ③ ADULT

TIME EXAMINATION BEGAN  ____________

PERSONAL DATA AND MEASUREMENTS

| DATE OF BIRTH (mo, day, year) | ____________ | ____________ | ____________ | 13-66/ |
| AGE | ____________ | ____________ | ____________ | 21-22/ |
| SEX | 1. MALE 2. FEMALE | ____________ | ____________ | 23/ |
| HEIGHT WITHOUT SHOES | ____________ | ____________ | INCHES | 24-67/ |
| REPEAT HEIGHT | ____________ | ____________ | INCHES | 28-31/ |
| WEIGHT | ____________ | ____________ | POUNDS | 32-36/ |
| REPEAT WEIGHT | ____________ | ____________ | POUNDS | 37-41/ |
| COMPLETION CODE | ____________ | 42/ |

GLUCOSE

| HISTORY OF DIABETES? | 1. YES 2. NO | ____________ | ____________ | 43/ |
| PATIENT TAKES ORAL AGENT? | 1. YES 2. NO | ____________ | ____________ | 44/ |
| PATIENT TAKES INSULIN? | 1. YES 2. NO | ____________ | ____________ | 45/ |
| (If yes to either of the above, do not give sugar load) | 46-48/ |
| AMOUNT OF GLUCOSE GIVEN | ____________ | ____________ | Gms. | 46-48/ |
| TIME GIVEN | ____________ | ____________ | 49-51/ |
| TIME BLOOD DRAWN | ____________ | ____________ | 52-54/ |
| COMPLETION CODE | ____________ | 55/ |

BLOOD PRESSURE

| CUFF SIZE | ① REG. 2. LARGE |
| SITTING BLOOD PRESSURE | ____________ | ____________ | 14-16/ |
| REPEAT B.P. (if systolic ≥140 or diastolic ≥90) | ____________ | ____________ | 18-20/ |
| TAKING B.P. MEDICATION? | 1. YES 2. NO | 21/ |
| IF YES, STANDING BLOOD PRESSURE | ____________ | ____________ | 22-24/ |
| COMPLETION CODE | ____________ | 25/ |

SALIVA

| COMPLETION CODE | ____________ | 26/ |

URINALYSIS

| EXAMINEE MENSTRUATING TODAY? | 1. YES 2. NO 3. MALE EXAMINEE | ____________ | ____________ | 27/ |
| COMPLETION CODE | ____________ | 28/ |

The Examinee Last Ate

CARD 01/02/03
### Ophthalmic Examination

<table>
<thead>
<tr>
<th>VISUAL ACUITY</th>
<th>1. E 2. SNELLEN 3. PICTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OTOTYPE USED</strong></td>
<td>12/18</td>
</tr>
<tr>
<td><strong>EXAMINEE IS WEARING</strong></td>
<td>1. NO 2. YES (DO NOT PERFORM TEST)</td>
</tr>
<tr>
<td>1. NO VISUAL AIDS 2. CONTACT LENSES 3. SINGLE VISION LENSES 4. BIFOCALS</td>
<td></td>
</tr>
<tr>
<td>5. TRIFOCALS 6. HAND LENSES 7. OTHER</td>
<td></td>
</tr>
<tr>
<td><strong>VISUAL ACUITY WITH GLASSES</strong></td>
<td>20/20 20/20</td>
</tr>
<tr>
<td>20/20 20/20</td>
<td>25-28/</td>
</tr>
<tr>
<td>20/20 20/20</td>
<td>31-34/</td>
</tr>
<tr>
<td>20/20 20/20</td>
<td>37-40/</td>
</tr>
<tr>
<td><strong>NEAR VISION WITH GLASSES</strong></td>
<td></td>
</tr>
<tr>
<td><strong>NEAR VISION WITHOUT GLASSES</strong></td>
<td></td>
</tr>
<tr>
<td><strong>PINNACLE ACUITY</strong></td>
<td></td>
</tr>
<tr>
<td>(If vision in either eye &lt;20/20 with/without glasses)</td>
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</tr>
<tr>
<td>COMPLETION CODE</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MOTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TROFIA:</td>
</tr>
<tr>
<td>PHORIA:</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>TONOMETRY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IS EXAMINEE 40 OR OLDER?</strong></td>
</tr>
<tr>
<td><strong>RIGHT EYE</strong></td>
</tr>
<tr>
<td><strong>LEFT EYE</strong></td>
</tr>
<tr>
<td>(Repeat in either or both if ≥21 mm)</td>
</tr>
<tr>
<td><strong>RIGHT EYE</strong></td>
</tr>
<tr>
<td><strong>LEFT EYE</strong></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
</tr>
<tr>
<td>AIR CONDUCTION (record threshold for each frequency)</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>RIGHT EAR</td>
</tr>
<tr>
<td>LEFT EAR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BONE CONDUCTION (test BC for each frequency in which the AC loss is 20 dB or more)</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REPEAT AIR CONDUCTION WITH MASKING:</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>(If the AC threshold in one ear exceeds the AC threshold in the opposite ear by 40 dB or more OR if the AC threshold in one ear exceeds the apparent BC threshold in the opposite ear by 40 dB or more)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASKING (of left ear)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASKING (of right ear)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYMPANOMETRY</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAS EXAMINEE HAD EAR SURGERY OR TUBES IN EARS FOR DRAINAGE IN THE PAST 6 MOS.?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRID COORDINATES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLOPE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESULT (1=no seal, 2=pass, 3=fail)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEARING LOSS:</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS EXAMINEE WEARING A HEARING AID(S)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF YES, HOW MANY AIDS?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF YES, TYPE OF AID?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. BOIT 2. EYGLASS 3. BEHIND 4. ALL IN 5. BOIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STYLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONDUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF YES, IS AID(S) OPERATIONAL?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DENTAL

SUBJECT HAS TEETH? ................................................. 1. YES 2. NO (go to dental history) 23/
IS SUBJECT EDENTULOUS IN EITHER ARCH? ............................. 1. UPPER 2. LOWER 3. NO 14/

DECAYED - MISSING - FILLED INDEX

UPPER

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>I</td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RIGHT

| T | S | R | Q | P | O | N | M | L | K |

LEFT

| 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 |

LOWER

<table>
<thead>
<tr>
<th>15-22/</th>
<th>23-30/</th>
<th>31-38/</th>
<th>39-46/</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>J</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RIGHT

<table>
<thead>
<tr>
<th>47-54/</th>
<th>55-62/</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-20/</td>
<td>21-28/</td>
</tr>
<tr>
<td>29-36/</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>S</td>
</tr>
</tbody>
</table>

LEFT

| 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 |

| 32-40/ | 41-48/ | 49-56/ | 57-64/ |

COMPLETION CODE ................................................. 65/

CARD 07/08
### Oral Hygiene Index

<table>
<thead>
<tr>
<th>Area</th>
<th>Debris</th>
<th>Calculus</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior Upper Right - Buccal</td>
<td></td>
<td></td>
<td>13-14/</td>
</tr>
<tr>
<td>(usually first molar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Right Central Incisor - Facial</td>
<td></td>
<td></td>
<td>16-16/</td>
</tr>
<tr>
<td>For adjacent central</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior Upper Left - Buccal</td>
<td></td>
<td></td>
<td>17-18/</td>
</tr>
<tr>
<td>Posterior Lower Left - Lingual</td>
<td></td>
<td></td>
<td>19-20/</td>
</tr>
<tr>
<td>Lower Left Central Incisor - Facial</td>
<td></td>
<td></td>
<td>21-22/</td>
</tr>
<tr>
<td>(or adjacent central)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior Lower Right - Lingual</td>
<td></td>
<td></td>
<td>23-24/</td>
</tr>
</tbody>
</table>

**Completion Code:** 25/

### Periodontal Index

![Periodontal Index Diagram](image)

**Completion Code:** 78/
### DENTAL HISTORY

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Answer</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ORTHODONTIC APPLIANCES PRESENT?</td>
<td>1. YES</td>
<td></td>
<td>15/</td>
</tr>
<tr>
<td>2. ORTHODONTIC APPLIANCE PRESENT ON WHICH ARCH?</td>
<td>1. UPPER</td>
<td></td>
<td>14/</td>
</tr>
<tr>
<td>3. FULL DENTURE PRESENT ON WHICH ARCH?</td>
<td>1. UPPER</td>
<td></td>
<td>15/</td>
</tr>
<tr>
<td>4. HOW MANY YEARS HAS FULL DENTURE BEEN WORN?</td>
<td></td>
<td></td>
<td>16/</td>
</tr>
<tr>
<td>HOW MANY YEARS WITHOUT TEETH?</td>
<td></td>
<td></td>
<td>17/</td>
</tr>
<tr>
<td>8. PERIODONTAL PROFILE:</td>
<td></td>
<td></td>
<td>18/</td>
</tr>
<tr>
<td>7. DO GUMS BLEED FREQUENTLY WHEN YOU BRUSH YOUR TEETH?</td>
<td>1. YES</td>
<td></td>
<td>20/</td>
</tr>
<tr>
<td>8. DO YOU REGULARLY USE:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Code:</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>1 = once a month or less</td>
<td></td>
<td></td>
<td>21/</td>
</tr>
<tr>
<td>2 = once a week</td>
<td></td>
<td></td>
<td>22/</td>
</tr>
<tr>
<td>3 = a few times a week</td>
<td></td>
<td></td>
<td>23/</td>
</tr>
<tr>
<td>4 = almost every day</td>
<td></td>
<td></td>
<td>24/</td>
</tr>
<tr>
<td>5 = at least once a day</td>
<td></td>
<td></td>
<td>25/</td>
</tr>
<tr>
<td>TOOTHBRUSH</td>
<td>1 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WATER IRRIGATOR</td>
<td>1 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTERDETERAL STIMULATOR</td>
<td>1 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DENTAL FLOSS</td>
<td>1 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIPE CLEANERS</td>
<td>1 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
<td>31/</td>
</tr>
<tr>
<td>EXAMINER NUMBER</td>
<td></td>
<td></td>
<td>32-34/</td>
</tr>
<tr>
<td>RECORDER NUMBER</td>
<td></td>
<td></td>
<td>35-37/</td>
</tr>
<tr>
<td>ECG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS EXAMINEE MALE AND 30 YEARS OR OLDER,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR FEMALE AND 35 YEARS OR OLDER?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GIVES HISTORY OF HYPERTENSION?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLAIMS TO BE TAKING ANTI-HYPERTENSIVE MEDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.P. READING 2140 SYSTOLIC OR 290 DIASTOLIC?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(if the answer to any of the above questions is YES, perform ECG; otherwise do not)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECG INTERPRETATION CODE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1. WNL 2. ABNORMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>NAME OF MEDICATION</td>
</tr>
<tr>
<td>1. Digitalis or similar? Yes_</td>
</tr>
<tr>
<td>2. Quinidine or similar? Yes_</td>
</tr>
<tr>
<td>3. Other cardiac_</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HAND-WRIST X-RAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOES EXAMINEE GIVE INDICATION OF HAND-WRIST ARTHRITIS?</td>
</tr>
<tr>
<td>YES(take x-ray)  NO(do NOT x-ray)</td>
</tr>
<tr>
<td>IS EXAMINEE PREGNANT?</td>
</tr>
<tr>
<td>YES(do NOT x-ray)  NO(take x-ray)</td>
</tr>
<tr>
<td>RHEUMATOID (1=None, 2=doubtful, 3=minimal, 4=moderate, 5=severe)</td>
</tr>
<tr>
<td>OSTEON (1= absent, 5= present)</td>
</tr>
<tr>
<td>GOUTY (1= absent, 5= present)</td>
</tr>
<tr>
<td>OTHER (specify)</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RIGHT SIDE</th>
<th>LEFT SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40-41/</td>
</tr>
<tr>
<td></td>
<td>42-43/</td>
</tr>
<tr>
<td></td>
<td>44-45/</td>
</tr>
<tr>
<td></td>
<td>46-47/</td>
</tr>
<tr>
<td></td>
<td>48/</td>
</tr>
</tbody>
</table>
## CHEST X-RAY

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. IS THE EXAMINEE PREGNANT?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>II. IS THE EXAMINEE OVER 25 YEARS OF AGE?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>GIVES HISTORY OF HYPERTENSION?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TAKING ANTI-HYPERTENSIVE MEDICATION?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>POSITIVE ANSWER TO LUNG DISEASE QUESTION?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>POSITIVE ANSWER TO HEART DISEASE Q.?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>B.P. READING ≥140 SYSTOLIC OR ≥90 DIASTOLIC?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

(if answer to any question in item II is YES, perform chest x-ray; otherwise do not)

<table>
<thead>
<tr>
<th>Completion Code</th>
<th>10/</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Radiologist Interpretation</th>
<th>22/</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>C-T Ratio (if cardiac enlargement present)</th>
<th>22-36/</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINDINGS CODES</td>
<td>34-41/</td>
</tr>
<tr>
<td></td>
<td>45-52/</td>
</tr>
<tr>
<td></td>
<td>50-57/</td>
</tr>
<tr>
<td></td>
<td>68-65/</td>
</tr>
</tbody>
</table>
### ARTHRITIS BATTERY

<table>
<thead>
<tr>
<th>EXAMINEE HAS A HISTORY OF JOINT PROBLEMS?</th>
<th>1. YES 2. NO (do not perform battery)</th>
<th>RIGHT HAND</th>
<th>LEFT HAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRIP STRENGTH:</td>
<td></td>
<td>mmHg</td>
<td>mmHg</td>
</tr>
<tr>
<td>1st TRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd TRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd TRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOINT SIZE:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT HAND:</td>
<td></td>
</tr>
<tr>
<td>THUMB MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>INDEX FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>MIDDLE FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>RING FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>LITTLE FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEFT HAND:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>THUMB MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>INDEX FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>MIDDLE FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>RING FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>REPEAT RING FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>LITTLE FINGER MEASUREMENT</td>
<td>mm</td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>50-FOOT WALK:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME:</td>
<td>SECONDS</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
</tr>
</tbody>
</table>

| TECHNICIAN | |
PULMONARY FUNCTION - SPIROMETRY

HEIGHT ............................................ 
AGE ...................................................
SEX ..................................................

| ACTUAL PERFORMANCE | PREDICTED 
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>FVC</td>
<td>i i</td>
</tr>
<tr>
<td>FEV 1</td>
<td>i</td>
</tr>
<tr>
<td>$PEFR*</td>
<td>i</td>
</tr>
<tr>
<td>MMFR*</td>
<td></td>
</tr>
</tbody>
</table>

% OF PREDICTION (for the best try)

- 61-63/  
- 63-65/  
- 67-68/  
- 66-68/  

* MAXIMUM MID-EXPIRATORY FLOW

EXAMINEE'S COOPERATION WAS ............ 1. GOOD 2. FAIR 3. POOR 4. REFUSED 60/ 
EXAMINEE'S UNDERSTANDING WAS ........... 1. GOOD 2. FAIR 3. POOR 70/ 
COMPLETION CODE ..........................

HEMATOLOGY

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EXAMINEE CLAIMS A HISTORY OF ARTHRITIS? ..... 1 2 74/</td>
<td></td>
</tr>
<tr>
<td>(if yes, include latex fixation)</td>
<td></td>
</tr>
<tr>
<td>2. LATEX-FIXATION INCLUDED? ..................... 1 2 73/</td>
<td></td>
</tr>
<tr>
<td>3. EXAMINEE RECEIVING THYROID MEDICATIONS? ...... 1 2 74/</td>
<td></td>
</tr>
<tr>
<td>4. EXAMINEE ON BIRTH CONTROL PILLS? ............. 1 2 75/</td>
<td></td>
</tr>
<tr>
<td>5. EXAMINEE TAKING FEMALE HORMONES? ............ 1 2 76/</td>
<td></td>
</tr>
<tr>
<td>(if yes to questions 2-5, compute $T_7$)</td>
<td></td>
</tr>
</tbody>
</table>

COMPLETION CODE .......................... 76/
IS THE EXAMINEE FEMALE AND 20 OR OLDER?........ 1. YES  2. NO  13/  
IS THE EXAMINEE MALE AND CLAIMS TO HAVE  
OR HAVE HAD VARICOSE VEINS? ................. 1. YES  2. NO  14/  
(if yes to either of the above, perform test.  
otherwise, do not perform test)

SEVERITY:  
(1=absent, 2=spider angiomata only,  
3=minimal, 4=moderate, 5=severe)

RIGHT LEG ........................................ 15/  
LEFT LEG........................................ 16/  
(if absent (1) for either leg, do not perform test for that leg)

DRAINAGE SYSTEM:  
(1=anterior, 2=posterior, 3=both  
4=not applicable [spider angiomata only])

RIGHT LEG ........................................ 17/  
LEFT LEG ........................................ 18/  

LOCATION:

ANTERIOR MEDIAL THIGH: YES  NO  
RIGHT LEG ...................... 1  2  19/  
LEFT LEG ............................... 1  2  20/  

POSTERIOR LATERAL THIGH:  
RIGHT LEG ...................... 1  2  21/  
LEFT LEG ............................... 1  2  22/  

MEDIAL LEG:  
RIGHT LEG ...................... 1  2  23/  
LEFT LEG ............................... 1  2  24/  

LATERAL LEG:  
RIGHT LEG ...................... 1  2  25/  
LEFT LEG ............................... 1  2  26/  

COMPLETION CODE .............................. 27/
<table>
<thead>
<tr>
<th>SKIN PHOTOGRAPH</th>
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</thead>
<tbody>
<tr>
<td>EXAMINEE CLAIMS HISTORY OF ACNE ......</td>
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<tr>
<td>ACNE OBVIOUS TO TECHNICIAN ............</td>
</tr>
<tr>
<td>(If answer to either question yes, take photo. Otherwise, do not)</td>
</tr>
<tr>
<td>PHOTOGRAPH: TAKEN WHERE: .............</td>
</tr>
<tr>
<td>COMPLETION CODE .....................</td>
</tr>
<tr>
<td>PHYSICIAN INTERPRETATION: .............</td>
</tr>
</tbody>
</table>
PHYSICAL EXAM FOLLOW-UP

1. PHYSICIAN NOTIFICATION

Type letter sent
1. Normal
2. Slightly abnormal
3. Abnormal
4. Severely abnormal plus phone call
5. Normal (MD requested)
6. Slightly abnormal (MD requested)
7. Abnormal (MD requested)
8. Severely abnormal plus phone call (MD requested)

Letter accepted

1. First
2. Second
3. Alternate MD obtained
4. Letter not accepted by a physician; alternate arrangement made

Date letter accepted

Physician code

If alternate MD obtained, number of the MD who refused the confidential:

Physician code

2. ABNORMALITIES REPORTED TO MD

3. EXAMINEE NOTIFICATION

Type notification
1. Normal
2. Slightly abnormal
3. Abnormal
4. Severely abnormal plus phone call
5. Normal plus dental
6. Slightly abnormal plus dental
7. Abnormal plus dental

Letter accepted

1. Normal letter—assume answered
2. First
3. Second
4. Slightly abnormal or abnormal letter sent by regular mail when certified letter not picked up at Post Office; confirmed by phone.

Date letter accepted
<table>
<thead>
<tr>
<th>Test</th>
<th>Male Normal</th>
<th>Female Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC</td>
<td>4.5-6.0 x 10^6/mm^3</td>
<td>4.0-5.5 x 10^6/mm^3</td>
</tr>
<tr>
<td>HGB</td>
<td>14-17 g/dL</td>
<td>12-16 g/dL</td>
</tr>
<tr>
<td>HCT</td>
<td>37-44</td>
<td>37-44</td>
</tr>
<tr>
<td>HCV</td>
<td>11.2</td>
<td>11.2</td>
</tr>
<tr>
<td>MCV</td>
<td>80-100</td>
<td>80-100</td>
</tr>
<tr>
<td>MCH</td>
<td>27-31</td>
<td>27-31</td>
</tr>
<tr>
<td>MPV</td>
<td>31-37</td>
<td>31-37</td>
</tr>
</tbody>
</table>

**ERB/CULTURE**

RESULT: 1 POSITIVE, 2 NEGATIVE, 3 NOT DONE

IF POSITIVE, GROWTH IS 1. LESS THAN 100,000, 2. 100,000 OR GREATER. ORDER:

ORDER: 6-27

**DIAGNOSIS**

COMMENTS:

TAKING BEDSIDE TUBE (S) FOR BLOOD

CLAIM TO BE MONITORING

TAKING THIOPAZ MEDICATION

PRESCRIBED MEDICATION

COMMENTS:
HEALTH INSURANCE STUDY

CONFIDENTIAL INFANT PEDIATRICS QUESTIONNAIRE
MEDICAL QUESTIONNAIRE

PLEASE PRINT

Your Last Name_________________________  First Name_________________________  Middle Initial_________________________

Your Street Address_________________________

City_________________________  State_________________________  Zip Code_________________________

Social Security Number  NOT APPLICABLE  Age_________________________  Sex_________________________

________________________________________

PLEASE SEND MY REPORT TO:
Your Personal Physician's Full Name_________________________  M.D.

Physician's Street Address_________________________

City_________________________  State_________________________  Zip Code_________________________

Physician's Telephone Number_________________________

Or Clinic:_________________________

Name_________________________

Street Address_________________________

City_________________________  State_________________________  Zip Code_________________________

Please be sure the above information is complete and correct, otherwise your report cannot be sent.

CONSENT

All information obtained in the screening examination which would permit identification of the individual will be regarded as strictly confidential, will be used only for the purpose of operating and evaluating the Health Insurance Study, and will not be disclosed or released to others (except to the physician of the family's choice) without the consent of the individual or the head of his or her family, except as required by law.

These screening tests are not intended to be a substitute for a physician's examination, but are an important aid to the doctor in his diagnosis and treatment of any abnormalities discovered. These tests administered at the Health Insurance Study Examination Center cannot constitute a guaranteed determination of the presence or absence of diseases or abnormalities.

I HEREBY AUTHORIZE RELEASE OF THE RESULTS OF THIS EXAMINATION TO THE PHYSICIAN OR CLINIC DESIGNATED BY ME.

Signature_________________________

Parent or guardian should sign for children under 18 years of age
# Infant/Pediatrics Questionnaire

**YOUR ANSWERS TO THIS QUESTIONNAIRE WILL BE COMPLETELY CONFIDENTIAL. PLEASE BE AS ACCURATE AS POSSIBLE.**

READ EACH QUESTION CAREFULLY. IF YOUR ANSWER IS *YES*, MARK AN “Y” IN THE “Y” BOX; IF YOUR ANSWER IS *NO*, MARK AN “N” IN THE “N” BOX. USE THE PENCIL PROVIDED AND MAKE HEAVY, DARK MARKS. IF YOU WANT TO CHANGE AN ANSWER WHICH HAS ALREADY BEEN MARKED, ERASE THE MARK COMPLETELY WITH THE ERASER ON THE PENCIL PROVIDED.

**EXAMPLE**

DO YOU LIKE ICE CREAM? **N**

IF YOU LIKE ICE CREAM, YOU WOULD MARK THE “Y” BOX AS ShOWN.

MARK ONLY INSIDE THE BOX.

IF YOUR CHILD IS LESS THAN 2 YEARS, COMPLETE FIRST 3 QUESTIONS ONLY.

<table>
<thead>
<tr>
<th>PLEASE USE HEAVY MARKS IN PENCIL ONLY</th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did you bring all patient medications belonging to your child with you today?</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>2. Has a doctor told you that your child has hemophilia or another bleeding disorder?</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>3. Has your child ever had his or her tonsils removed?</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>4. Does your child wear a hearing aid?</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>5. Is it working?</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>6. Has your child had ear surgery in the past 6 months?</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>7. Has your child ever had an ear infection requiring the doctor to put tubes in his or her ears in the past 6 months?</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

**FOR FEMALES ONLY**

8. Has your daughter ever had a period? | N  | Y   |

9. Is your daughter having her period menstruating today? | N  | Y   |

10. Has your daughter felt any pain or burning while urinating (passing her urine) today or in the past few days? | N  | Y   |
**MEASUREMENTS**

**HEIGHT/LENGTH**

<table>
<thead>
<tr>
<th>2 YEARS OLD</th>
<th>11-12/</th>
</tr>
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<tbody>
<tr>
<td><strong>HEIGHT</strong></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>inches</td>
</tr>
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<tr>
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</tr>
<tr>
<td>25</td>
<td>inches</td>
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<tr>
<td>26</td>
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<td>27</td>
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<tr>
<td>28</td>
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</tr>
<tr>
<td><strong>WEIGHT</strong></td>
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</tr>
<tr>
<td>29</td>
<td>pounds</td>
</tr>
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<td>31</td>
<td></td>
</tr>
<tr>
<td>32</td>
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</tr>
<tr>
<td><strong>REPEAT</strong></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>pounds</td>
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<tr>
<td>34</td>
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<td>35</td>
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<table>
<thead>
<tr>
<th>&lt; 2 YEARS OLD</th>
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<tbody>
<tr>
<td><strong>HEAD CIRCUMFERENCE</strong></td>
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<td>40</td>
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<tr>
<td><strong>REPEAT</strong></td>
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<td>41</td>
<td>inches</td>
</tr>
<tr>
<td>42</td>
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<td>43</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

**COMPLETION CODE**

| 45           | 45/    |
EXAM CENTER       CARD 02
PAGE 2

DDST

TEST RESULT (1=normal, 2=untestable,
3=abnormal, 4=questionable)  
□ 46

COMPLETION CODE
□ 47

HCT

□ □ □ 48 49 50 48-50/

COMPLETION CODE
□ 51

TONSILS

TEST RESULT (1,2,3,4,5)
(1. ABSENT 2. NORMAL 3. MINIMALLY ENLARGED
4. MODERATELY ENLARGED 5. TOUCHING AT MIDDLE)
□ 52

COMPLETION CODE
□ 53
COMPLETION
CERTIFICATE
NORC

UPON SUCCESSFUL COMPLETION OF THE HEALTH SCREENING EXAMINATION, HEAD OF HOUSEHOLD SHOULD GATHER ALL "COMPLETION CERTIFICATES" FROM MEMBERS OF HIS/HER HOUSEHOLD, AND PRESENT THESE TO NORC.
HEALTH INSURANCE STUDY

CONFIDENTIAL INFANT / PEDIATRICS QUESTIONNAIRE
MEDICAL QUESTIONNAIRE

PLEASE PRINT

Your Last Name_________________________ First Name_________________________ Middle Initial________

Your Street Address_______________________

City_________________________State_________Zip Code_________

Social Security Number NOT APPLICABLE Age________ Sex________

PLEASE SEND MY REPORT TO:
Your Personal Physician's Full Name_________________________________________M.D.

Physician's Street Address_______________________________________________

City_________________________State_________Zip Code_________

Physician's Telephone Number____________________________________________
Or Clinic:_________________________

Name_________________________

Street Address______________________________

City_________________________State_________Zip Code_________

Please be sure the above information is complete and correct, otherwise your report cannot be sent.

CONSENT

All information obtained in the screening examination which would permit identification of the individual will be regarded as strictly confidential, will be used only for the purpose of operating and evaluating the Health Insurance Study, and will not be disclosed or released to others except to the physician of the family's choice, without the consent of the individual or the head of his or her family, except as required by law.

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I HEREBY AUTHORIZE RELEASE OF THE RESULTS OF THIS EXAMINATION TO THE PHYSICIAN OR CLINIC DESIGNATED BY ME.

Signature__________________________________________

Parent or guardian should sign for children under 18 years of age.
Infant/Pediatrics Questionnaire

Your answers to this questionnaire will be completely confidential. Please be as accurate as possible.

Read each question carefully. If your answer is ‘YES’, mark an ‘X’in the ‘Y’ box. If your answer is ‘NO’, mark an ‘X’in the ‘N’ box.

Use the pencil provided and make heavy ‘dark marks’ if you want to change an answer which has already been marked. Erase the mark completely with the eraser on the pencil provided.

Example: No

Do you like ice cream? [X] Yes

If you like ice cream, you would mark the ‘Y’ box as shown.

Mark only inside the box.

If your child is less than 6 years, complete first 9 questions only.

---

1. Did you bring any food or liquid medications belonging to your child with you today? [N] No [Y] Yes
2. Has a doctor told you that your child has hemophilia or another bleeding disorder? [N] No [Y] Yes
3. Has your child ever had his or her tonsils removed? [N] No [Y] Yes
5. Is he working? [N] No [Y] Yes
6. Has your child had ear surgery in the past 6 months? [N] No [Y] Yes
7. Has your child ever had surgery from the ears requiring the doctor to put tubes in his or her ears in the past 6 months? [N] No [Y] Yes

---

**For females only:**

8. Has your daughter ever had a period? [N] No [Y] Yes
9. Is your daughter having her period (menstruating) today? [N] No [Y] Yes
10. Has your daughter felt any pain or burning while urinating (passing her urine) today or in the past few days? [N] No [Y] Yes
### TEST VERIFICATION FORM

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Audio</td>
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<tr>
<td>Bone/Air</td>
<td></td>
</tr>
<tr>
<td>Tympanometry</td>
<td></td>
</tr>
<tr>
<td>Acuity</td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td></td>
</tr>
<tr>
<td>Exam Center</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Head Cir.</td>
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<tr>
<td>Blood</td>
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<tr>
<td>Lead</td>
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<td>Immun</td>
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<tr>
<td>Tonsil</td>
<td></td>
</tr>
<tr>
<td>50' Walk</td>
<td></td>
</tr>
</tbody>
</table>

**Rand Sticker**

- M/F: [ ]
- vs. mos. days: [ ]
- Sex: [ ]
- Age: [ ]

**HTI Sticker**

- Gastro

**NO TYPANOMETRY**

- List medication "Medication form"
- Ask examiners if V.P.
- Examiners needs appr. to test hearing aid

- Joint, Grip
- Latex fixation
- 60' Walk
- ECG
- Standing S/P
- Chest X-Ray
- "Chest X-Ray" Spiro-Discretion

**NO CHEST X-RAY**

- T4, T3, T7
- Varicose Veins Exam
MEASUREMENT CENTER  CARD 02
PAGE 1

MEASUREMENTS

HEIGHT

13 14 15 16 inches 13-16/

REPEAT

17 18 19 20 inches 17-20/

WEIGHT

21 22 23 24 25 pounds 21-25/

REPEAT

26 27 28 29 30 pounds 26-30/

COMPLETION CODE

31

DDST

TEST RESULTS [1=normal, 2=untestable, 3=abnormal, 4=questionable] 32

COMPLETION CODE

33

HEMATOLOGY

LEAD LEVEL DRAWN 1) YES 2) NO

HEMATOLOGY SAMPLE OBTAINED 1) YES 2) NO

COMPLETION CODE
MEASUREMENT CENTER CARD 02
PAGE 2

URINALYSIS
COMPLETION CODE [Box] 37 37/

TONSILS
EXAM RESULTS
1. ABSENT 2. NORMAL 3. MINIMALLY ENLARGED [Box] 38 38/
4. MODERATELY ENLARGED 5. TOUCHING AT MIDLINE

COMPLETION CODE [Box] 39 39/

VISUAL
TYPE
1. NO VISUAL AIDS 2. CONTACT LENSES
3. SINGLE VISION LENS 4. BIFOCALS
5. TRIFOCALS 6. HAND LENSES 7. OTHER [Box] 40 40/
**Visual**

**OTotype Used**

(1. E, 2. Snellen, 3. Picture)

<table>
<thead>
<tr>
<th>RIGHT EYE</th>
<th>LEFT EYE</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/14 15 16</td>
<td>20/17 18 19</td>
</tr>
</tbody>
</table>

**Visual Acuity w/o Glasses:**

| 20/20 21 22 | 20/23 24 25 |

**Visual Acuity w/ Glasses:**

| 20/20 21 22 | 20/29 30 31 |

**Near Vision w/o Glasses:**

| 20/26 27 28 | 20/29 30 31 |

**Near Vision w/ Glasses:**

| 20/32 33 34 | 20/35 36 37 |

**Pinhole Acuity:**

| 20/38 39 40 | 20/41 42 43 |

**Completion Code**

| 44/ |

AUDIO/VISUAL 

CARD 03

PAGE 2

AUDIO

BONE CONDUCTION: WITHOUT

\[ \begin{array}{ccccccc}
45 & 46 & 47 & 48 & 49 & 50 & 51 \\
45 & 46 & 47 & 48 & 49 & 50 & 51 \\
45 & 46 & 47 & 48 & 49 & 50 & 51 \\
\end{array} \]

45-52/

BONE CONDUCTION: RIGHT EAR

\[ \begin{array}{ccccccc}
500 & 1000 & 2000 & 4000 \\
53 & 54 & 55 & 56 & 57 & 58 & 59 \\
60 & 61 & 62 & 63 & 64 & 65 & 66 \\
\end{array} \]

53-60/

BONE CONDUCTION: LEFT EAR

\[ \begin{array}{ccccccc}
500 & 1000 & 2000 & 4000 \\
61 & 62 & 63 & 64 & 65 & 66 & 67 \\
68 & 69 & 70 & 71 & 72 & 73 & 74 \\
\end{array} \]

61-68/

COMPLETION CODE

\[ \begin{array}{c}
\hline
\end{array} \]

69/

CARD 04

\[ \begin{array}{c}
0 \ 1 \\
11 \ 12 \\
\end{array} \]

11-12/

TYMP:

GRID

\[ \begin{array}{ccccccc}
13 & 14 & 15 & 16 & 17 & 18 & 19 \\
13 & 14 & 15 & 16 & 17 & 18 & 19 \\
13 & 14 & 15 & 16 & 17 & 18 & 19 \\
\end{array} \]

13-20/

SLOPE

\[ \begin{array}{c}
21 \ 22 \\
\end{array} \]

21-22/

RESULTS

(1. NO SEAL 2. PASS 3. FAIL)

\[ \begin{array}{c}
23 \ 24 \\
\end{array} \]

23-24/

COMPLETION CODE

\[ \begin{array}{c}
25 \\
\end{array} \]

25/

AUDIO:

HOW MANY AIDS

\[ \begin{array}{c}
\hline \ 26 \\
\end{array} \]

26/

IF WEARING AID(S), IS AID (S) FUNCTIONAL

\[ \begin{array}{c}
\hline \ 27 \\
\end{array} \]

27/

TYPE

(1. BODY 2. EYEGLASS 3. BEHIND EAR 4. ALL IN EAR 5. BONE CONDUCTION)

\[ \begin{array}{c}
\hline \ 28 \\
\end{array} \]

28/

COMPLETION CODE

\[ \begin{array}{c}
\hline \ 29 \\
\end{array} \]

29/

VISION STEREOPSIS:

RESULTS

HIGHEST PLATE PASSED (1 - 7, 7 highest)

\[ \begin{array}{c}
\hline \ 30 \\
\end{array} \]

30/
DENTAL

SUBJECT HAS TEETH? .................. 1. YES  2. NO (go to dental history)
IS SUBJECT EDENTULOUS IN EITHER ARCH? ... 1. UPPER  2. LOWER  3. NO

DECAYED - MISSING - FILLED INDEX

UPPER

RIGHT

LEFT

LOWER

COMPLETION CODE ...................... 65/

CARD 07/08
**GROSS DECAY INDEX**

**0 = ABSENT**  **1 = PRESENT**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>I</td>
<td>J</td>
</tr>
</tbody>
</table>

**COMPLETION CODE** ........................................... 65/

**CARD 09**
# DENTAL HISTORY

<table>
<thead>
<tr>
<th>Question</th>
<th>1. Yes</th>
<th>2. No (go to Q. 3)</th>
<th>3rd Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ORTHODONTIC APPLIANCES PRESENT?</td>
<td></td>
<td></td>
<td>13/</td>
</tr>
<tr>
<td>2. ORTHODONTIC APPLIANCE PRESENT ON WHICH ARCH?</td>
<td></td>
<td></td>
<td>14/</td>
</tr>
<tr>
<td>3. FULL DENTURE PRESENT ON WHICH ARCH?</td>
<td>1. UPPER</td>
<td>2. LOWER</td>
<td>3. BOTH</td>
</tr>
<tr>
<td>4. HOW MANY YEARS HAS FULL DENTURE BEEN WORN?</td>
<td></td>
<td>UPPER</td>
<td>16/</td>
</tr>
<tr>
<td>1 = less than 1 year, 2 = 1-4 years,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = 5-9 years, 4 = 10-19 years, 5 = 20+ years,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 = not applicable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. IF SUBJECT IS EDENTULOUS AND FULL DENTURE IS ABSENT.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOW MANY YEARS WITHOUT TEETH?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = less than 1 year, 2 = 1-4 years,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = 5-9 years, 4 = 10-19 years, 5 = 20+ years,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 = not applicable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. PERIODONTAL PROFILE:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = none. Mild gingivitis may be present but not generalized.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = minimum. Moderate gingivitis exists throughout mouth with calculus present.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = moderate. Periodontal pockets present, but not generalized.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = extensive. Periodontal pockets generalized throughout mouth.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. DO GUMS BLEED FREQUENTLY WHEN YOU BRUSH YOUR TEETH?</td>
<td>1. YES</td>
<td>2. NO</td>
<td>20/</td>
</tr>
<tr>
<td>8. DO YOU REGULARLY USE:</td>
<td></td>
<td>IF YES</td>
<td></td>
</tr>
<tr>
<td>Frequency Code</td>
<td></td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>1 = once a month or less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = once a week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = few times a week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 = almost every day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 = at least once a day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOOTHBRUSH</td>
<td>1</td>
<td>2</td>
<td>Frequency</td>
</tr>
<tr>
<td>IF YES, FREQUENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WATER IRRIGATOR</td>
<td>1</td>
<td>2</td>
<td>Frequency</td>
</tr>
<tr>
<td>IF YES, FREQUENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTERDENTAL STIMULATOR</td>
<td>1</td>
<td>2</td>
<td>Frequency</td>
</tr>
<tr>
<td>IF YES, FREQUENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DENTAL FLOSS</td>
<td>1</td>
<td>2</td>
<td>Frequency</td>
</tr>
<tr>
<td>IF YES, FREQUENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIPE CLEANERS</td>
<td>1</td>
<td>2</td>
<td>Frequency</td>
</tr>
<tr>
<td>IF YES, FREQUENCY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION CODE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXAMINER NUMBER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECORDER NUMBER</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
COMPLETION
CERTIFICATE
NORC

UPON SUCCESSFUL COMPLETION OF THE HEALTH SCREENING EXAMINATION, HEAD OF HOUSEHOLD SHOULD GATHER ALL "COMPLETION CERTIFICATES" FROM MEMBERS OF HIS/HER HOUSEHOLD, AND PRESENT THESE TO NORC.
HEALTH INSURANCE STUDY

CONFIDENTIAL ADULT QUESTIONNAIRE
MEDICAL QUESTIONNAIRE

PLEASE PRINT

Your Last Name ___________________________ First Name ___________________________ Middle Initial ___________________________

Your Street Address __________________________

City __________________________ State __________________________ Zip Code __________________________

Social Security Number __________________________ NOT APPLICABLE __________________________ Age __________________________ Sex __________________________

PLEASE SEND MY REPORT TO:

Your Personal Physician's Full Name __________________________ M.D. __________________________

Physician's Street Address __________________________

City __________________________ State __________________________ Zip Code __________________________

Physician's Telephone Number __________________________

Or Clinic:

Name __________________________

Street Address __________________________

City __________________________ State __________________________ Zip Code __________________________

Please be sure the above information is complete and correct, otherwise your report cannot be sent.

CONSENT

All information obtained in the screening examination which would permit identification of the individual will be regarded as strictly confidential, will be used only for the purpose of operating and evaluating the Health Insurance Study, and will not be disclosed or released to others (except to the physician of the family's choice) without the consent of the individual or the head of his or her family, except as required by law.

These screening tests are not intended to be a substitute for a physician's examination, but are an important aid to the doctor in his diagnosis and treatment of any abnormalities discovered. These tests administered at the Health Insurance Study Examination Center cannot constitute a guaranteed determination of the presence or absence of diseases or abnormalities.

I HEREBY AUTHORIZE RELEASE OF THE RESULTS OF THIS EXAMINATION TO THE PHYSICIAN OR CLINIC DESIGNATED BY ME.

Signature __________________________

Parent or guardian should sign for children under 18 years of age.
# Adult Questionnaire

YOUR ANSWERS TO THIS QUESTIONNAIRE WILL BE COMPLETELY
CONFIDENTIAL. PLEASE BE AS ACCURATE AS POSSIBLE.
READ EACH QUESTION CAREFULLY. IF YOUR ANSWER IS "YES". MARK
AN "X" IN THE ¥ BOX IF YOUR ANSWER IS "NO". MARK AN "X" IN THE [ ] BOX
USE THE PENCIL PROVIDED AND MAKE HEAVY, DARK MARKS. IF YOU
WANT TO CHANGE AN ANSWER WHICH HAS ALREADY BEEN MARKED, ERASE THE
MARK COMPLETELY WITH THE ERASER ON THE PENCIL PROVIDED.

**EXAMPLE.**

DO YOU LIKE ICE CREAM? [ ] [ ]

IF YOU LIKE ICE CREAM, YOU WOULD MARK THE ¥ BOX AS SHOWN
MARK ONLY INSIDE THE BOX.

<table>
<thead>
<tr>
<th>USE HEAVY MARKS IN PENCIL ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO</strong></td>
</tr>
<tr>
<td>1. Did you bring any pills or medical medications with you today?</td>
</tr>
<tr>
<td>2. Has a doctor ever told you that you have hemophilia or another bleeding disorder?</td>
</tr>
<tr>
<td>3. Have you had your tonsils removed?</td>
</tr>
<tr>
<td>4. Are you wearing a hearing aid?</td>
</tr>
<tr>
<td>5. Is it operational?</td>
</tr>
<tr>
<td>6. Are you now taking any pills or medicine for thyroid trouble?</td>
</tr>
<tr>
<td>7. Do you think you have acne pimples on the face?</td>
</tr>
<tr>
<td>8. A doctor recently said that you had acne?</td>
</tr>
</tbody>
</table>
| 9. During the past year, have you had pain, aching, swelling or
  stiffness in your joints (not counting injuries)? | N [ ] [ ] |
| 10. Have you ever taken any of these heart medicines: digitalis, digoxin, digoxin and quinidine? | N [ ] [ ] |
| 11. Have you had pain, discomfort, heaviness or pressure in your chest in the past
  12 months, not related to an injury or a "chest cold"? | N [ ] [ ] |
| 12. Has a doctor ever said you have high blood cholesterol? | N [ ] [ ] |
| 13. Have you ever been told by a doctor that you had high blood pressure? | N [ ] [ ] |
| 14. Are you now taking pills or medicine for high blood pressure? | N [ ] [ ] |
| 15. During the past 12 months, have you ever felt short of breath or has the doctor
  ever told you that you had heart failure? | N [ ] [ ] |
| 16. Has a doctor ever told you that you had bronchitis or emphysema? | N [ ] [ ] |
| 17. Do you bring up phlegm (spitum) on most days for at least 3 months of the year? | N [ ] [ ] |
| 18. Has a doctor ever said that you had tuberculosis (T.B.)? | N [ ] [ ] |
| 19. Did anyone ever say you had a positive TB skin test? | N [ ] [ ] |
| 20. Do you have a history of diabetes? | N [ ] [ ] |
| 21. Are you currently taking insulin or an oral agent? | N [ ] [ ] |
| 22. Are you wearing lenses for vision? | N [ ] [ ] |

**FOR WOMEN ONLY:**

23. Are you menstruating (having your period) today? | N [ ] [ ] |
24. Have you had any pain or burning while urinating (passing your water)
  today or during the past few days? | N [ ] [ ] |
25. Are you now taking birth control pills? | N [ ] [ ] |
26. Are you now taking female hormones? | N [ ] [ ] |
27. Are you now pregnant or suspect you may be pregnant? | N [ ] [ ] |

**FOR MEN ONLY:**

28. Have you ever had surgery for varicose veins? | N [ ] [ ] |
29. Have you noticed varicose veins in your legs within the last 12 months? | N [ ] [ ] |
# Test Verification Form

**Rand Sticker**

**HTI Sticker**

<table>
<thead>
<tr>
<th>Exam Center</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A/V</td>
<td></td>
</tr>
<tr>
<td>2. Acuity</td>
<td></td>
</tr>
<tr>
<td>3. Mobility</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M/F</th>
<th>yrs. mos. days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Lab</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. DCDST</td>
<td></td>
</tr>
<tr>
<td>7. Urea</td>
<td></td>
</tr>
<tr>
<td>8. Imm</td>
<td></td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Blood</td>
</tr>
<tr>
<td>2. Hct</td>
</tr>
<tr>
<td>3. Lead</td>
</tr>
</tbody>
</table>

NO TYPANOMETRY

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. T1, T2, T3</td>
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</table>

<p>| |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>2. Joint, Grip</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>3. Latex fixation</td>
</tr>
</tbody>
</table>

50' Walk

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>4. ECG</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Standing B/P</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>6. Chest X-Ray'</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. 'Chest X-Ray' Spine-Decreasing</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8. NO CHEST X-RAY</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Varicose Veins Exam</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Test Day, Temp, 50' Walk</td>
</tr>
</tbody>
</table>
LABORATORY CARD 02

11-12/

CUFF SIZE: 1. REG. 2. PEDIATRIC 3. OB

13/

STANDING BLOOD PRESSURE

14-19/

BLOOD PRESSURE COMPLETION CODE

20/

URINE COMPLETION CODE

21/

TONO COMPLETION CODE

22/

Hematology completion code

23/

SALIVA COMPLETION CODE

24/

VISION

25/

TYPE 1. NO VISUAL AIDS 2. CONTACT LENSES 3. SINGLE VISION LENSES 4. BIOPOLAR 5. TRIFOCALS 6. HAND LENSES 7. OTHER)
VISUAL

OTTYPE USED
(1. E, 2. SNELEN, 3. PICTURE) 13/

VISUAL ACUITY W/O GLASSES: 20/ 14 15 16 20/ 17 18 19 14-19/

VISUAL ACUITY W/ GLASSES: 20/ 20 21 22 20/ 23 24 25 20-25/

NEAR VISION W/O GLASSES: 20/ 26 27 28 20/ 29 30 31 26-31/

NEAR VISION W/ GLASSES: 20/ 32 33 34 20/ 35 36 37 32-37/

PINEHOLE ACUITY: 20/ 38 39 40 20/ 41 42 43 38-43/

COMPLETION CODE 44/
<table>
<thead>
<tr>
<th>Audio/Visual Card 03</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Page 2</strong></td>
</tr>
</tbody>
</table>

**Audio**

<table>
<thead>
<tr>
<th>Bone Conduction: Without</th>
<th>45 46 47 48 49 50 51 52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone Conduction: Right Ear</td>
<td>500 1000 2000 4000</td>
</tr>
<tr>
<td></td>
<td>33 34 35 36 37 38 39 40</td>
</tr>
<tr>
<td>Bone Conduction: Left Ear</td>
<td>500 1000 2000 4000</td>
</tr>
<tr>
<td></td>
<td>61 62 63 64 65 66 67 68</td>
</tr>
</tbody>
</table>

**Completion Code**

| 69 |

**Audio:**

| How Many AIDS | 70 |

If Wearing Aid (s), Is Aid (s) Functional - 1. Yes
2. No

**Type** (1. Body 2. Eyeglass 3. Behind Ear
4. All in Ear 5. Bone Conduction)

| 72 |

**Completion Code**

| 73 |
ECG

COMPLETION CODE

GRIP STRENGTH

1ST TRY

RIGHT HAND

LEFT HAND

20-25/

23 24 25

26 27 28

29 30 31

26-31/

32/

JOINT SIZE

RIGHT HAND:

THUMB

INDEX

MIDDLE

RING

LITTLE

33-34/

35-36/

37-38/

39-40/

41-42/
ECG CARD 04

LEFT HAND:

THUMB

INDEX

MIDDLE

RING

REPEAT RING

LITTLE

COMPLETION CODE

VARICOSE VEINS

SEVERITY: 1. ABSENT 2. SPIDER ANGIOMATA ONLY
3. MINIMAL 4. MODERATE 5. SEVERE

RIGHT LEG

LEFT LEG

DRAINAGE: 1. ANTERIOR 2. POSTERIOR 3. BOTH
4. NOT APPLICABLE (SPIDER ANGIOMATA ONLY)

RIGHT LEG

LEFT LEG
<table>
<thead>
<tr>
<th>Location</th>
<th>Side</th>
<th>Yes</th>
<th>No</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anteromedial Thigh:</td>
<td>Right Leg</td>
<td>1</td>
<td>2</td>
<td>60/</td>
</tr>
<tr>
<td></td>
<td>Left Leg</td>
<td>1</td>
<td>2</td>
<td>61/</td>
</tr>
<tr>
<td>Pseudo-lateral Thigh:</td>
<td>Right Leg</td>
<td>1</td>
<td>2</td>
<td>62/</td>
</tr>
<tr>
<td></td>
<td>Left Leg</td>
<td>1</td>
<td>2</td>
<td>63/</td>
</tr>
<tr>
<td>Medial Leg:</td>
<td>Right Leg</td>
<td>1</td>
<td>2</td>
<td>64/</td>
</tr>
<tr>
<td></td>
<td>Left Leg</td>
<td>1</td>
<td>2</td>
<td>65/</td>
</tr>
<tr>
<td>Lateral Leg:</td>
<td>Right Leg</td>
<td>1</td>
<td>2</td>
<td>66/</td>
</tr>
<tr>
<td></td>
<td>Left Leg</td>
<td>1</td>
<td>2</td>
<td>67/</td>
</tr>
</tbody>
</table>

Completion Code: 

68 58/
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Code</th>
<th>Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-RAY CARD 04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIN PHOTO</td>
<td>ACNE OBVIOUS TO TECH 1 - YES 2 - NO</td>
<td>69</td>
<td></td>
<td>69/</td>
</tr>
<tr>
<td>PHOTO TAKEN</td>
<td>FOREHEAD 1. LEFT 2. RIGHT 3. CENTER</td>
<td>70</td>
<td></td>
<td>70/</td>
</tr>
<tr>
<td></td>
<td>COMPLETION CODE</td>
<td>71</td>
<td></td>
<td>71/</td>
</tr>
<tr>
<td>CHEST X-RAY</td>
<td>COMPLETION CODE</td>
<td>72</td>
<td></td>
<td>72/</td>
</tr>
</tbody>
</table>
DENTAL CARD 05

TONSIL EXAM

TEST RESULT
1. ABSENT  2. NORMAL  3. MINIMALLY ENLARGED
4. MODERATELY ENLARGED  5. TOUCHING AT MIDLINE  13

COMPLETION CODE  14

50-FOOT WALK

TIME  15  16  17 sec  15-17/

COMPLETION CODE  18

TECHNICIAN:  19
**DENTAL**

**SUBJECT HAS TEETH?**
1. YES  
2. NO (go to dental history)

**IS SUBJECT EDENTULOUS IN EITHER ARCH?**
1. UPPER  
2. LOWER  
3. NO

### DECAYED - MISSING - FILLED INDEX

#### UPPER

|   | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 1 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 11|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 12|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 13|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 14|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 15|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

#### LOWER

|   | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 1 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 11|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 12|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 13|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 14|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 15|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**COMPLETION CODE**

---

**CARD 07/08**
### Oral Hygiene Index

<table>
<thead>
<tr>
<th></th>
<th>Debris</th>
<th>Calculus</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior Upper Right - Buccal</td>
<td>□</td>
<td>□</td>
<td>13-14/</td>
</tr>
<tr>
<td>(usually first molar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Right Central Incisor - Facial</td>
<td>□</td>
<td>□</td>
<td>15-16/</td>
</tr>
<tr>
<td>(or adjacent central)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior Upper Left - Buccal</td>
<td>□</td>
<td>□</td>
<td>17-18/</td>
</tr>
<tr>
<td>Posterior Lower Left - Lingual</td>
<td>□</td>
<td>□</td>
<td>19-20/</td>
</tr>
<tr>
<td>Lower Left Central Incisor - Facial</td>
<td>□</td>
<td>□</td>
<td>21-22/</td>
</tr>
<tr>
<td>(or adjacent central)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior Lower Right - Lingual</td>
<td>□</td>
<td>□</td>
<td>23-24/</td>
</tr>
</tbody>
</table>

### Completion Code

78/

---

### Periodontal Index

[Diagram of periodontal index with teeth labeled from 1 to 28 and completion code 78/]

---

CARD 10
DENTAL HISTORY

1. ORTHODONTIC APPLIANCES PRESENT?  
   1. YES  2. NO (go to Q. 3)  

2. ORTHODONTIC APPLIANCE PRESENT ON WHICH ARCH?  
   1. UPPER  2. LOWER  3. BOTH  

3. FULL DENTURE PRESENT ON WHICH ARCH?  
   1. UPPER  2. LOWER  3. BOTH  4. NEITHER (go to q. 6)  

4. HOW MANY YEARS HAS FULL DENTURE BEEN WORN?  
   1 = less than 1 year, 2 = 1-4 years,  
   3 = 5-9 years, 4 = 10-19 years, 5 = 20+ years,  
   6 = not applicable  

5. IF SUBJECT IS EDENTULOUS AND FULL DENTURE IS ABSENT:  
   HOW MANY YEARS WITHOUT TEETH?  
   1 = less than 1 year, 2 = 1-4 years,  
   3 = 5-9 years, 4 = 10-19 years, 5 = 20+ years, 6 = not applicable  

6. PERIODONTAL PROFILE:  
   0 = none. Mild gingivitis may be present but not generalized.  
   1 = minimum. Moderate gingivitis exists throughout mouth with calculus present.  
   2 = moderate. Periodontal pockets present, but not generalized.  
   3 = extensive. Periodontal pockets generalized throughout mouth.  

7. DO GUMS BLEED FREQUENTLY WHEN YOU BRUSH YOUR TEETH?  
   1. YES  2. NO  

8. DO YOU REGULARLY USE:  
   Frequency Code:  
   1 = once a month or less  
   2 = once a week  
   3 = a few times a week  
   4 = almost every day  
   5 = at least once a day  
   
   TOOTHPASTE  
   IF YES, FREQUENCY  
   1 = 2  
   Frequency  

   WATER IRRIGATOR  
   IF YES, FREQUENCY  
   1 = 2  
   Frequency  

   INTERDENTAL STIMULATOR  
   IF YES, FREQUENCY  
   1 = 2  
   Frequency  

   DENTAL FLOSS  
   IF YES, FREQUENCY  
   1 = 2  
   Frequency  

   PIPE CLEANERS  
   IF YES, FREQUENCY  
   1 = 2  
   Frequency  

   COMPLETION CODE  
   1  

   EXAMINER NUMBER  
   1  

   RECORDER NUMBER  
   1  

   21/  
   22/  
   23/  
   24/  
   25/  
   26/  
   27/  
   28/  
   29/  
   30/  
   31/  
   32-34/  
   35-37/
COMPLETION
CERTIFICATE
NORC

UPON SUCCESSFUL COMPLETION OF THE HEALTH SCREENING EXAMINATION, HEAD OF HOUSEHOLD SHOULD GATHER ALL "COMPLETION CERTIFICATES" FROM MEMBERS OF HIS/HER HOUSEHOLD, AND PRESENT THESE TO NORC.

HAND STICKER

OFFICIAL HTI STAMP
Appendix D

TEST RESULT CODES

1. Enrollment examination x-ray interpretation codes
2. Exit examination x-ray interpretation codes
3. Enrollment examination urine culture organisms codes
4. Exit examination urine culture organisms codes
5. Enrollment examination electrocardiogram codes
6. Exit examination electrocardiogram codes
7. Enrollment examination urine drug screen codes
8. Enrollment examination abnormality codes
### X-ray Interpretation Codes

**Enrollment Examinations**

#### 1100 Pulmonary Pathology

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100</td>
<td>None</td>
</tr>
<tr>
<td>1110</td>
<td>Suspicion</td>
</tr>
<tr>
<td>1220</td>
<td>Definite</td>
</tr>
<tr>
<td>1221</td>
<td>Patchy hypovascularity</td>
</tr>
<tr>
<td>1222</td>
<td>Hyperexpansion</td>
</tr>
<tr>
<td>1300</td>
<td>Consistent with Tuberculosis</td>
</tr>
<tr>
<td>1310</td>
<td>Old TB</td>
</tr>
<tr>
<td>1320</td>
<td>Acute TB</td>
</tr>
</tbody>
</table>

#### 1400 Opacities

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1410</td>
<td>Infiltrate</td>
</tr>
<tr>
<td>1420</td>
<td>Granuloma</td>
</tr>
<tr>
<td>1430</td>
<td>Lung calcifications</td>
</tr>
<tr>
<td>1440</td>
<td>Lung mass lesion</td>
</tr>
</tbody>
</table>

#### 1500 Other Pulmonary Pathology

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1510</td>
<td>Fibrosis</td>
</tr>
<tr>
<td>1520</td>
<td>Pleural thickening</td>
</tr>
</tbody>
</table>

#### 2000 Cardiovascular Pathology

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2100</td>
<td>None</td>
</tr>
<tr>
<td>2210</td>
<td>Borderline</td>
</tr>
<tr>
<td>2220</td>
<td>Definite</td>
</tr>
<tr>
<td>2221</td>
<td>LHV</td>
</tr>
<tr>
<td>2222</td>
<td>Generalized</td>
</tr>
<tr>
<td>2223</td>
<td>Other (specify)</td>
</tr>
<tr>
<td></td>
<td>(G-T ratio = __ cm: __ cm)</td>
</tr>
</tbody>
</table>

#### 2300 Findings of Congestive Heart Failure

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2310</td>
<td>Redistribution of pulmonary flow</td>
</tr>
<tr>
<td>2320</td>
<td>Kerley lines</td>
</tr>
<tr>
<td>2330</td>
<td>Pulmonary edema</td>
</tr>
<tr>
<td>2340</td>
<td>Pleural effusion</td>
</tr>
</tbody>
</table>

#### 2600 Other Cardiovascular Pathology, and Comments:

#### 3000 Other Pathology

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3100</td>
<td>None</td>
</tr>
<tr>
<td>3210</td>
<td>Hilus enlargement</td>
</tr>
<tr>
<td>3220</td>
<td>Bony abnormalities</td>
</tr>
<tr>
<td>3230</td>
<td>Mediastinal mass</td>
</tr>
<tr>
<td>3240</td>
<td>Other (specify)</td>
</tr>
</tbody>
</table>

#### Comments:

#### 4000 X-ray Not Interpreted
### X-RAY INTERPRETATION CODES

**Exit Examinations**

<table>
<thead>
<tr>
<th>MEDICAL SIGNIFICANCE</th>
<th>LUNG VESSELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Normal appearance</td>
<td>29. Prominent conus</td>
</tr>
<tr>
<td>2. Non-significant findings</td>
<td>30. Pulmonary congestion</td>
</tr>
<tr>
<td>3. Possibly significant findings</td>
<td></td>
</tr>
<tr>
<td>4. See report</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHEST WALL, NECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. Mastectomy</td>
</tr>
<tr>
<td>32. Thoracotomy</td>
</tr>
<tr>
<td>33. Neck calcification</td>
</tr>
<tr>
<td>34. Foreign body</td>
</tr>
<tr>
<td>35. Sutures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEDIASTINUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Borderline fullness</td>
</tr>
<tr>
<td>6. Calcification</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIAPHRAGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Elevated, left</td>
</tr>
<tr>
<td>8. Elevated, right</td>
</tr>
<tr>
<td>9. Bulge, left</td>
</tr>
<tr>
<td>10. Bulge, right</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LUNGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Arygos lobe</td>
</tr>
<tr>
<td>12. Apical lesion(s), left</td>
</tr>
<tr>
<td>13. Apical lesion(s), right</td>
</tr>
<tr>
<td>14. Calcification, slight</td>
</tr>
<tr>
<td>15. Calcification, diffuse</td>
</tr>
<tr>
<td>16. Calcified complex</td>
</tr>
<tr>
<td>17. Scar(s), left</td>
</tr>
<tr>
<td>18. Scar(s), right</td>
</tr>
<tr>
<td>19. Plate atelectasis</td>
</tr>
<tr>
<td>20. Septal thickening</td>
</tr>
<tr>
<td>21. Right cardiophrenic density</td>
</tr>
<tr>
<td>22. Suspect emphysema</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BONES</th>
</tr>
</thead>
<tbody>
<tr>
<td>36. Old rib fracture(s)</td>
</tr>
<tr>
<td>37. Cervical rib(s)</td>
</tr>
<tr>
<td>38. Old fracture clavicle</td>
</tr>
<tr>
<td>39. Osteoarthritis spine</td>
</tr>
<tr>
<td>40. Bone island</td>
</tr>
<tr>
<td>41. Rib surgery</td>
</tr>
<tr>
<td>42. Scoliosis</td>
</tr>
<tr>
<td>43. Bursal calc. shoulder</td>
</tr>
<tr>
<td>44. Rib anomaly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PLEURA</th>
</tr>
</thead>
<tbody>
<tr>
<td>45. Blunted angle, left</td>
</tr>
<tr>
<td>46. Blunted angle, right</td>
</tr>
<tr>
<td>47. Thickening apex, left</td>
</tr>
<tr>
<td>48. Thickening apex, right</td>
</tr>
<tr>
<td>49. Tenting</td>
</tr>
<tr>
<td>50. Adhesions</td>
</tr>
<tr>
<td>51. Calcification</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEART</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Unusual shape</td>
</tr>
<tr>
<td>24. Borderline size</td>
</tr>
<tr>
<td>25. Unusual position</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LUNG ROOTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>52. Borderline size, left</td>
</tr>
<tr>
<td>53. Borderline size, right</td>
</tr>
<tr>
<td>54. Calcification, left</td>
</tr>
<tr>
<td>55. Calcification, right</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AORTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. Elongation</td>
</tr>
<tr>
<td>27. Calcification</td>
</tr>
<tr>
<td>28. Widening</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LUNG DENSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>56. Right Lung Density</td>
</tr>
<tr>
<td>57. Left Lung Density</td>
</tr>
</tbody>
</table>
URINE CULTURES—POTENTIAL ORGANISMS CODES

Enrollment Examinations

10 Escherichia coli
21 Enterobacter cloacae
22 Enterobacter aerogenes
23 Enterobacter hafniae
24 Enterobacter agglomerans
30 Klebsiella pneumoniae
41 Proteus mirabilis
42 Proteus vulgaris
43 Proteus rettgeri
44 Proteus morganii
51 Serratia marcescens
52 Serratia liquefaciens
53 Serratia rubidae
61 Pseudomonas aeruginosa
62 Herellea
63 Vima polymorphans
64 Other gram-negative
71 Staphylococcus aureus
72 Streptococcus faecalis—Enterococcus (Group D)
73 Streptococcus pyogenes
74 Streptococcus (Group B)
75 Diplococcus pneumoniae
76 Other gram-positive

81 Candida albicans
91 Candida species—not albicans
92 Staphylococcus epidermidis
93 Diphtheroids
94 Streptococcus anhemolyticus
95 Lactobacillus
96 Micrococcus
97 Streptococcus viridans
98 Other contaminant
### Urine Culture Codes

**Exit Examinations**

<table>
<thead>
<tr>
<th>CODE</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Species not identified</td>
</tr>
<tr>
<td>1</td>
<td><em>Proteus Mirabilis</em></td>
</tr>
<tr>
<td>2</td>
<td><em>Escherichia Coli</em></td>
</tr>
<tr>
<td>3</td>
<td>Gram Positive Cocci</td>
</tr>
<tr>
<td>4</td>
<td><em>Staphylococcus Epidermidis</em></td>
</tr>
<tr>
<td>5</td>
<td>Group D Streptococcus</td>
</tr>
<tr>
<td>6</td>
<td><em>Staphylococcus Aureus</em></td>
</tr>
<tr>
<td>7</td>
<td>Klebsiella Pneumoniae</td>
</tr>
<tr>
<td>8</td>
<td>Yeast</td>
</tr>
<tr>
<td>9</td>
<td>Gram Negative Rods</td>
</tr>
</tbody>
</table>
### ELECTROCARDIOGRAM ABNORMALITY CODES

#### Enrollment Examinations

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>INTRAVENTRICULAR CONDUCTION</td>
<td>5200</td>
<td>MYOCARDIAL ISCHEMIA AND INJURY</td>
</tr>
<tr>
<td>2110</td>
<td>Right bundle branch block</td>
<td>5210</td>
<td>Myocardial ischemia</td>
</tr>
<tr>
<td>2120</td>
<td>Left bundle branch block</td>
<td>5220</td>
<td>Myocardial injury</td>
</tr>
<tr>
<td>2130</td>
<td>Peripheral right ventricular conduction defect</td>
<td>5300</td>
<td>INFARCION</td>
</tr>
<tr>
<td>2140</td>
<td>S1,S3,S8 syndrome</td>
<td>5310</td>
<td>Anterior-septal myocardial infarction</td>
</tr>
<tr>
<td>2150</td>
<td>Left anterior hemiblock</td>
<td>5311</td>
<td>Acute</td>
</tr>
<tr>
<td>2151</td>
<td>o Complete</td>
<td>5312</td>
<td>evolving</td>
</tr>
<tr>
<td>2152</td>
<td>o Incomplete</td>
<td>5313</td>
<td>Old</td>
</tr>
<tr>
<td>2160</td>
<td>Left posterior hemiblock</td>
<td>5314</td>
<td>Indeterminate age</td>
</tr>
<tr>
<td>2170</td>
<td>Intraventricular conduction defect, unclassified</td>
<td>5320</td>
<td>Inferior myocardial infarction</td>
</tr>
<tr>
<td>3000</td>
<td>AXIS DEVIATION</td>
<td>5321</td>
<td>Acute</td>
</tr>
<tr>
<td>3110</td>
<td>Left axis deviation</td>
<td>5322</td>
<td>evolving</td>
</tr>
<tr>
<td>3120</td>
<td>Right axis deviation</td>
<td>5323</td>
<td>Old</td>
</tr>
<tr>
<td>3130</td>
<td>Unplottable QRS axis</td>
<td>5324</td>
<td>Indeterminate age</td>
</tr>
<tr>
<td>4000</td>
<td>ECG COMPLEX ABNORMALITIES</td>
<td>5325</td>
<td>Inferior-lateral myocardial infarction</td>
</tr>
<tr>
<td>4110</td>
<td>Right atrial enlargement</td>
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<td>Intra-atrial conduction defect</td>
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<td>4140</td>
<td>QRS abnormalities—miscellaneous (describe)</td>
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<td>4150</td>
<td>ST segment changes</td>
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<tr>
<td>4151</td>
<td>o Non-specific</td>
<td>5331</td>
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<td>4152</td>
<td>o Subendocardial ischemia</td>
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<td>4160</td>
<td>T wave changes</td>
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<td>4162</td>
<td>o Consistent with left ventricular ischemia</td>
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<td>4170</td>
<td>Abnormal QT interval</td>
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<td>4172</td>
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<td>4180</td>
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<td>Inferior-lateral myocardial infarction</td>
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<td>Right ventricular enlargement (hypertrophy)</td>
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<td>5360</td>
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<td>Atrial infarction</td>
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Electrocardiogram Abnormality Codes (continued)

5400 CARDITIS, ANEURYSM
5410 Pericarditis
5411 Acute
5412 Evolving
5413 Old
5414 Indeterminate age
5420 Myocarditis
5430 Ventricular aneurysm

5500 LUNG DISEASE
5510 Compatible with chronic lung disease

5600 CHEMICAL EFFECTS
5610 Metabolic disturbance
5620 Electrolyte imbalance
5630 Hypokalemia
5640 Hyperkalemia
5650 Hypocalcemia
5660 Hypercalcemia
5670 Drug effect
5671 Digitalis effect
5672 Quinidine effect
5673 Other (specify)
5680 Compatible with digitalis intoxication

5700 OTHER ABNORMALITIES
5710 Juvenile T wave pattern
5720 Post extrasystolic T wave changes
5730 Mirrored T wave dextrocardia
5740 Wedensky phenomenon
5750 Supernormal conduction
5760 Reciprocal changes
5770 Early repolarization period

6000 MECHANICAL
6100 Technical difficulties
6110 60-cycle interference
6111 Lead reversal
6112 Parkinsonian tremor
6113 Somatic tremor
6114 Improperly standardized
6115 Paper speed 50 mm/sec
6116 Other (specify)
6120 Technically inadequate electrocardiogram

6200 Exercise electrocardiogram
6210 Artificial pacemaker
6211 Functioning properly
6212 Not functioning properly
6300 Normal
6310 Abnormal
# CARDIOLOGY REPORT CODES

## Exit Examinations

<table>
<thead>
<tr>
<th>Code</th>
<th>Criteria</th>
<th>Class</th>
<th>Interpretation</th>
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<tbody>
<tr>
<td>01</td>
<td>Sharp line spikes</td>
<td>AB</td>
<td>Pacemaker rhythm</td>
</tr>
<tr>
<td>02</td>
<td>Average rate above 100 and regular</td>
<td>N</td>
<td>Sinus tachycardia</td>
</tr>
<tr>
<td>03</td>
<td>Average rate 50 to 59 and regular</td>
<td>N</td>
<td>Sinus bradycardia</td>
</tr>
<tr>
<td>04</td>
<td>Rate variable</td>
<td>AB</td>
<td>Atrial fibrillation</td>
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<tr>
<td>05</td>
<td>Rate variable, P absent</td>
<td>AB</td>
<td>Atrial fibrillation</td>
</tr>
<tr>
<td>06</td>
<td>Rate variable</td>
<td>AB</td>
<td>Atrial fibrillation</td>
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<tr>
<td>07</td>
<td>P waves absent</td>
<td>AB-N</td>
<td>Junctional rhythm</td>
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<tr>
<td>08</td>
<td></td>
<td>AB</td>
<td>Partial bilateral bundle branch block</td>
</tr>
<tr>
<td>09</td>
<td>Negative T waves 3 V leads</td>
<td>N</td>
<td>Consider anterior wall ischemia</td>
</tr>
<tr>
<td>10</td>
<td>Abnormal P wave axis</td>
<td>N</td>
<td>Junctional rhythm</td>
</tr>
<tr>
<td>11</td>
<td>Abnormal P wave axis P negative in 1 or V6</td>
<td>N</td>
<td>Left atrial rhythm</td>
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<tr>
<td>12</td>
<td>Average rate above 100</td>
<td>N</td>
<td>Tachycardia</td>
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<tr>
<td>13</td>
<td>Average rate above 140</td>
<td>AB</td>
<td>Tachycardia</td>
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<tr>
<td>14</td>
<td>Average rate 50 to 59</td>
<td>N</td>
<td>Bradycardia</td>
</tr>
<tr>
<td>15</td>
<td>Average rate below 50</td>
<td>N</td>
<td>Bradycardia</td>
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<tr>
<td>16</td>
<td>Rate variable or artifact</td>
<td>B</td>
<td>Premature systole</td>
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<td>18</td>
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<tr>
<td>19</td>
<td>Short PR interval</td>
<td>N</td>
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<tr>
<td>20</td>
<td>Prolonged PR interval</td>
<td>AB-B</td>
<td>First degree A-V block</td>
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</table>
Cardiology Report Codes (continued)

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>21</td>
<td>P and QRS axis rightward, low voltage QRS V5-6</td>
<td>AB</td>
<td>Consistent with dextrocardia</td>
</tr>
<tr>
<td>22</td>
<td>P and QRS axis rightward</td>
<td>B</td>
<td>Exclude reversed arm leads</td>
</tr>
<tr>
<td>23</td>
<td>Low voltage P waves</td>
<td>N</td>
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</tr>
<tr>
<td>24</td>
<td>P exceeds .24 MV</td>
<td>AB-B</td>
<td>Right atrial abnormality</td>
</tr>
<tr>
<td>25</td>
<td>P exceeds .12 sec</td>
<td>AB-B</td>
<td>Left atrial abnormality</td>
</tr>
<tr>
<td>26</td>
<td>Terminal negative P V1</td>
<td>AB</td>
<td>Left atrial abnormality</td>
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<tr>
<td>27</td>
<td>Abnormal P wave axis</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>QRS axis -45 to -90 initial axis inferior and rightward</td>
<td>AB</td>
<td>Consistent with left anterior hemiblock</td>
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<tr>
<td>29</td>
<td>Absent R 2 leads V2-5</td>
<td>AB</td>
<td>Consistent with anterior infarct</td>
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<tr>
<td>30</td>
<td>QRS negative in AVF</td>
<td>B</td>
<td>L.A.D.</td>
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<tr>
<td>31</td>
<td>QRS axis range -30 to -90</td>
<td>AB</td>
<td>Abnormal left axis deviation</td>
</tr>
<tr>
<td>32</td>
<td>QRS axis -45 to -90</td>
<td>AB</td>
<td>Abnormal left axis deviation consider left anterior hemiblock</td>
</tr>
<tr>
<td>33</td>
<td>QRS axis range 91 to 109</td>
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<td>Right axis deviation</td>
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<tr>
<td>34</td>
<td>QRS axis range 110-269</td>
<td>AB</td>
<td>Abnormal rad, consider RVE or left posterior hemiblock</td>
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<tr>
<td>35</td>
<td>QRS negative in lead 2</td>
<td>AB</td>
<td>Abnormal L.A.D.</td>
</tr>
<tr>
<td>36</td>
<td>QRS axis -10 to -29</td>
<td>B</td>
<td>L.A.D.</td>
</tr>
<tr>
<td>37</td>
<td>Poor R progression V leads</td>
<td>B</td>
<td>Consider anteroseptal infarct or fibrosis</td>
</tr>
<tr>
<td>38</td>
<td>Decreasing R amplitude V1-3</td>
<td>AB-B</td>
<td>Consider anteroseptal infarct or fibrosis</td>
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</table>
Cardiology Report Codes (continued)

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>39</td>
<td>Atypical QR V2 or V3</td>
<td>AB-B</td>
<td>Consider anterior infarct or fibrosis</td>
</tr>
<tr>
<td>40</td>
<td>Small R 2 Leads V2-5</td>
<td>B</td>
<td>Possible anterior infarct or fibrosis</td>
</tr>
<tr>
<td>41</td>
<td>QS in V1-V2</td>
<td>B</td>
<td>Consider normal variant, anteroseptal infarct or fibrosis</td>
</tr>
<tr>
<td>42</td>
<td>Small or absent R and negative T2 leads V2-5</td>
<td>AB</td>
<td>Consistent with age undetermined anterior infarct</td>
</tr>
<tr>
<td>43</td>
<td>Small or absent R and elevated ST 2 leads V2-5</td>
<td>AB</td>
<td>Consistent with acute anterior infarct</td>
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<tr>
<td>44</td>
<td>Borderline Q or QS leads 1, AVL, V5-6</td>
<td>B</td>
<td>Possible old anterolateral infarct</td>
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<td>45</td>
<td>Abnormal Q or QS in 2 leads 1, AVL, V5-6</td>
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<td>46</td>
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<td>47</td>
<td>Abnormal Q and elevated ST 2 leads 1, AVL, V5-6</td>
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<td>Consistent with acute anterolateral infarct</td>
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<tr>
<td>48</td>
<td>Borderline Q or QS 2 leads 2, 3, AVF</td>
<td>B</td>
<td>Possible old inferior infarct</td>
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<td>Borderline Q or QS 4 leads V2-5 and 2, 3, AVF</td>
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<td>Possible old anterior and inferior infarct</td>
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<td>53</td>
<td>Borderline Q or QS 4 leads 1, AVF, V5-6 and 2, 3, AV</td>
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<td>Possible old anterior and inferior infarct</td>
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</table>
Cardiology Report Codes (continued)

<table>
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<td>Abnormal Q or QS 4 leads V2-5 and 2, 3, AVF</td>
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<td>Abnormal Q and negative T 1, AVL, V5-6 and 2, 3, AV</td>
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<td>Consistent with age undetermined anterior and inferior infarct</td>
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<td>Abnormal Q and elevated ST V2-5 and 2, 3, AVF</td>
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<td>Consistent with acute anterior and inferior infarct</td>
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<td>60</td>
<td>S1, 2, 3 syndrome</td>
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<td>May be normal but consider RVE, emphysema, myocardial infarct or normal variant</td>
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<td>61</td>
<td>Low voltage QRS limb and chest leads</td>
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<td>Nonspecific low voltage QRS abnormality</td>
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<td>62</td>
<td>QRS .14 sec</td>
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<td>Probable interventricular block</td>
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<tr>
<td>63</td>
<td>QRS .14 sec</td>
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<td>Interventricular block</td>
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<td>64</td>
<td>QRS .13 sec, terminal QRS leftward, broad R V5-6</td>
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<td>Left bundle branch block</td>
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<td>65</td>
<td>QRS .10 sec, terminal QRS rightward and anterior</td>
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<td>Incomplete right bundle branch block</td>
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<tr>
<td>66</td>
<td>QRS .12, terminal QRS rightward and anterior</td>
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<td>Right bundle branch block</td>
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<td>67</td>
<td>LVE by voltage criteria</td>
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<td>Possible LVE</td>
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<tr>
<td>68</td>
<td>LVE by voltage criteria</td>
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<td>Probable LVE</td>
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Cardiology Report Codes (continued)

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<tr>
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<td>LVE by voltage criteria</td>
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<td>Consistent with LVE</td>
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<td>70</td>
<td>LVE by voltage criteria</td>
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<td>May be normal for age</td>
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<td>71</td>
<td>LVE by voltage, abnormal left axis deviation</td>
<td>AB</td>
<td>Consistent with left ventricular enlargement</td>
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<tr>
<td>72</td>
<td>LVE by voltage, ST depression</td>
<td>AB</td>
<td>Consistent with left ventricular enlargement</td>
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<tr>
<td>73</td>
<td>LVE by voltage, left atrial abnormality</td>
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<td>74</td>
<td>High QRS voltage and right axis deviation</td>
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<td>75</td>
<td>Low voltage QRS V1, R amplitude exceeds S</td>
<td>B</td>
<td>Consider RVE or V1 electrode misplacement</td>
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<td>76</td>
<td>R amplitude exceeds 1.4 MV in lead V1</td>
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<td>Possible right ventricular enlargement</td>
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<tr>
<td>77</td>
<td>R amplitude exceeds S in V1</td>
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<td>Possible right ventricular enlargement or posterior infarct</td>
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<td>78</td>
<td>Prominent R V1, QRS axis to the right of 100°</td>
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<td>Consistent with right ventricular enlargement</td>
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<td>R amplitude exceeds S in V1 prominent S in V5 or V6</td>
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<td>Consistent with right ventricular enlargement</td>
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<td>80</td>
<td>Prominent R and R prime in lead V1</td>
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<td>Consistent with right ventricular enlargement</td>
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<td>Prominent R in V1-2 QRS to the left of 45°</td>
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<td>Consistent with posterior infarct</td>
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<tr>
<td>82</td>
<td>P axis rightward, low QRS voltage limb leads or V6</td>
<td>AB-B</td>
<td>Possible chronic lung disease</td>
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<tr>
<td>83</td>
<td>QRS axis posterior and superior</td>
<td>AB</td>
<td>Consistent with chronic lung disease</td>
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<tr>
<td>84</td>
<td>P axis rightward, low QRS voltage limb leads and V6</td>
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<td>Consistent with chronic lung disease</td>
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<tr>
<td>85</td>
<td>Chronic lung disease, right ventricular enlargement</td>
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<td>Consistent with Cor pulmonale</td>
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<td>86</td>
<td>ST elevation R T variant</td>
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<td>Probably normal for age</td>
</tr>
<tr>
<td>87</td>
<td>Upward sloping ST segment, -10 MV or more negative</td>
<td>N</td>
<td>Junctional ST depression</td>
</tr>
<tr>
<td>88</td>
<td>ST depression, -10 MV or more negative</td>
<td>AB</td>
<td>ST segment abnormality</td>
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<td>89</td>
<td>ST elevation R T variant</td>
<td>N</td>
<td>Early repolarization</td>
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<tr>
<td>90</td>
<td>ST elevation .10 MV or more</td>
<td>B</td>
<td>Possible subepicardial injury current</td>
</tr>
<tr>
<td>91</td>
<td>ST depression -.20 MV or more negative</td>
<td>AB-B</td>
<td>Nonspecific ST segment abnormality, subendocardial injury or digitalis</td>
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<tr>
<td>92</td>
<td>ST elevation .20 MV or more</td>
<td>AB</td>
<td>Subepicardial injury current</td>
</tr>
<tr>
<td>93</td>
<td>ST elevation .5 MV or more</td>
<td>AB</td>
<td>Subepicardial injury current</td>
</tr>
<tr>
<td>94</td>
<td>ST-T elevation</td>
<td>AB</td>
<td>Subepicardial injury current</td>
</tr>
<tr>
<td>95</td>
<td>ST depression -.10 MV or more, negative T waves</td>
<td>AB-B</td>
<td>Nonspecific ST-T segment abnormality</td>
</tr>
<tr>
<td>96</td>
<td>Low T waves</td>
<td>AB-B</td>
<td>Nonspecific T abnormality</td>
</tr>
<tr>
<td>97</td>
<td>Low voltage T waves</td>
<td>AB-B</td>
<td>Nonspecific T wave abnormality</td>
</tr>
<tr>
<td>98</td>
<td>Atypical T axis</td>
<td>AB-B</td>
<td>Nonspecific T wave abnormality</td>
</tr>
<tr>
<td>99</td>
<td>Negative T waves</td>
<td>AB</td>
<td>Consistent with ischemia</td>
</tr>
<tr>
<td>100</td>
<td>Negative T waves</td>
<td>AB</td>
<td>Subepicardial ischemia</td>
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Cardiology Report Codes (continued)

<table>
<thead>
<tr>
<th>Code</th>
<th>Criteria</th>
<th>Class</th>
<th>Interpretation</th>
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<tbody>
<tr>
<td>101</td>
<td>Tall T-waves in V leads</td>
<td>B</td>
<td>Consider hyperkalemia or posterior wall infarction</td>
</tr>
<tr>
<td>102</td>
<td>Negative T waves in V1-2</td>
<td>B</td>
<td>Atypical T waves, could be normal variant</td>
</tr>
<tr>
<td>103</td>
<td>Negative T waves leads 2, 3, AVF</td>
<td>AB-B</td>
<td>Consider inferior wall ischemia</td>
</tr>
<tr>
<td>104</td>
<td>Negative T waves 3 V leads and 2, 3, AVF</td>
<td>AB-B</td>
<td>Consider anterior and inferior wall ischemia</td>
</tr>
<tr>
<td>105</td>
<td>Negative T waves leads 1, AVL, V5-6</td>
<td>AB</td>
<td>Consider lateral wall ischemia</td>
</tr>
<tr>
<td>106</td>
<td>Negative T waves leads 2, 3, AVF and 1, AVL, V5-6</td>
<td>AB</td>
<td>Consider inferior and lateral wall ischemia</td>
</tr>
<tr>
<td>107</td>
<td>Negative T waves 3 V leads and 1, AVL, V5-6</td>
<td>AB</td>
<td>Consider anterior and lateral wall ischemia</td>
</tr>
<tr>
<td>108</td>
<td>Negative T waves in V2-3, age over 30</td>
<td>B</td>
<td>Consider anterior ischemia or right ventricular strain</td>
</tr>
<tr>
<td>109</td>
<td>Negative T waves in V2-3, age under 30</td>
<td>B</td>
<td>May be normal but consider right ventricular strain</td>
</tr>
<tr>
<td>110</td>
<td>Abnormal QRS-T angle range 100 to 269°</td>
<td>B</td>
<td>T wave abnormality</td>
</tr>
<tr>
<td>111</td>
<td>Prolonged QT Interval or QT-U fusion</td>
<td>B</td>
<td>Consider electrolyte imbalance or drug effects</td>
</tr>
<tr>
<td>112</td>
<td>Short QT interval</td>
<td>B</td>
<td>Consider digitalis effect or hypercalcemia</td>
</tr>
<tr>
<td>116</td>
<td>Technically unsatisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>Border ST depression</td>
<td>AB-B</td>
<td>Nonspecific ST abnormality</td>
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</tbody>
</table>

**MEDICAL SIGNIFICANCE**

<table>
<thead>
<tr>
<th>Code</th>
<th>Classification</th>
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<tbody>
<tr>
<td>113</td>
<td>Normal ECG</td>
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<tr>
<td>114</td>
<td>Borderline ECG</td>
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<tr>
<td>115</td>
<td>Abnormal ECG</td>
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### URINE DRUG SCREEN--CODE

#### Enrollment Examinations

<table>
<thead>
<tr>
<th>Drug</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>Barbiturates (includes phenobarbital, secobarbital, butabarbital, pentobarbital, etc.)</td>
<td>1</td>
</tr>
<tr>
<td>Librium</td>
<td>2</td>
</tr>
<tr>
<td>Meprobamate</td>
<td>3</td>
</tr>
<tr>
<td>Valium</td>
<td>4</td>
</tr>
<tr>
<td>Doriden</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
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ABNORMALITIES CODES FOLLOW-UP SHEET

**Enrollment Examinations**

<table>
<thead>
<tr>
<th>Code</th>
<th>Examination</th>
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<tbody>
<tr>
<td>01</td>
<td>Acne</td>
</tr>
<tr>
<td>05</td>
<td>Audiometry</td>
</tr>
<tr>
<td>10</td>
<td>Blood chemistry</td>
</tr>
<tr>
<td>15</td>
<td>Blood lead level</td>
</tr>
<tr>
<td>20</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>25</td>
<td>Chest x-ray</td>
</tr>
<tr>
<td>30</td>
<td>DDST</td>
</tr>
<tr>
<td>35</td>
<td>DMF</td>
</tr>
<tr>
<td>40</td>
<td>ECG</td>
</tr>
<tr>
<td>45</td>
<td>Hand/wrist x-ray</td>
</tr>
<tr>
<td>50</td>
<td>Hematology</td>
</tr>
<tr>
<td>55</td>
<td>Hernia</td>
</tr>
<tr>
<td>60</td>
<td>Ophthalmology</td>
</tr>
<tr>
<td>65</td>
<td>Pulmonary function</td>
</tr>
<tr>
<td>70</td>
<td>Tonometry</td>
</tr>
<tr>
<td>75</td>
<td>Tonsils</td>
</tr>
<tr>
<td>80</td>
<td>Urinalysis</td>
</tr>
<tr>
<td>85</td>
<td>Urine culture</td>
</tr>
<tr>
<td>90</td>
<td>Varicose veins</td>
</tr>
<tr>
<td>95</td>
<td>Tympanometry</td>
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</tbody>
</table>
Appendix E

ENROLLMENT EXAMINATION MEDICAL EDIT SPECIFICATIONS
### TEST

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATEMENT OF CONFIDENTIALITY</td>
<td>DO NOT XEROX; DO NOT EDIT.</td>
</tr>
<tr>
<td>MEDICAL HISTORY ABstractions</td>
<td>DO NOT XEROX; DO NOT EDIT.</td>
</tr>
<tr>
<td>HEIGHT</td>
<td>DO NOT EDIT.</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>DO NOT EDIT.</td>
</tr>
<tr>
<td>GLUCOSE</td>
<td>DO NOT EDIT.</td>
</tr>
<tr>
<td>BLOOD PRESSURE</td>
<td>CIRCLE IF ANY SYSTOLIC PRESSURE IS &gt;140 OR IF ANY DIASTOLIC PRESSURE IS &gt;90. ALERT IF &gt;160/95. CALL PHYSICIAN IF SYSTOLIC PRESSURE &gt;250 OR DIASTOLIC PRESSURE &gt;140.</td>
</tr>
<tr>
<td>SALIVA</td>
<td>DO NOT EDIT.</td>
</tr>
<tr>
<td>URINALYSIS</td>
<td>ONLY EDIT LABORATORY PAGE.</td>
</tr>
<tr>
<td>TONSILS</td>
<td>CIRCLE IF MODERATELY ENLARGED OR TOUCHING AT MIDLINE. ALERT IF TOUCHING AT MIDLINE.</td>
</tr>
<tr>
<td>VISUAL ACUITY</td>
<td>ONLY CORRECTED VISION (WITH GLASSES) SHOULD BE EDITED IF THE ENROLLEE WEARS GLASSES. CIRCLE IF VISUAL ACUITY IS WORSE THAN 20/20. ALERT IF 20/50 OR WORSE.</td>
</tr>
<tr>
<td>NEAR VISION</td>
<td>ONLY CORRECTED VISION (WITH GLASSES) SHOULD BE EDITED IF THE ENROLLEE WEARS GLASSES. CIRCLE IF WORSE THAN 20/20. ALERT IF 20/50 OR WORSE.</td>
</tr>
<tr>
<td>MOTILITY</td>
<td>CIRCLE A POSITIVE FINDING OF TROPIA. ALERT IF TROPIA.</td>
</tr>
<tr>
<td>TEST</td>
<td>EDIT SPECIFICATIONS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>AUDIOMETRY</strong></td>
<td>EDIT AIR CONDUCTION AND TYPANOMETRY ONLY.</td>
</tr>
<tr>
<td></td>
<td>TYPANOMETRY: ALERT IF RESULT IS 3.</td>
</tr>
<tr>
<td><strong>DECAYED-MISSING-FILLED INDEX</strong></td>
<td>DO NOT XEROX; DO NOT EDIT. XEROX AT REQUEST OF PATIENT OR DENTIST.</td>
</tr>
<tr>
<td><strong>GROSS DECAY INDEX</strong></td>
<td>ALERT IF 1 FOR ANY TOOTH.</td>
</tr>
<tr>
<td><strong>ORAL HYGIENE INDEX</strong></td>
<td>DO NOT XEROX; DO NOT EDIT.</td>
</tr>
<tr>
<td><strong>PERIODONTAL INDEX</strong></td>
<td>DO NOT XEROX; ALERT IF DENTAL HISTORY PERIODONTAL PROFILE IS A 3.</td>
</tr>
<tr>
<td><strong>DENTAL HISTORY</strong></td>
<td>DO NOT XEROX; SEE ABOVE.</td>
</tr>
<tr>
<td><strong>ECG</strong></td>
<td>AS WITH X-RAY. WNL IS NORMAL WNL WITH AN OBSERVATION IS NORMAL: CIRCLE IN BLACK.</td>
</tr>
<tr>
<td></td>
<td>CIRCLE (THE IMPRESSION) ECG AND CONFIDENTIAL, AND ALERT IF BORDERLINE OR ABNORMAL. CALL PHYSICIAN IF EVIDENCE OF ONGOING ACUTE MYOCARDIAL INFARCTION OR LIFE THREATENING ARRHYTHMIAS.</td>
</tr>
<tr>
<td><strong>HAND-WRIST X-RAY</strong></td>
<td>CIRCLE ANY NUMBER 2 OR GREATER. ALERT IF 3 OR GREATER.</td>
</tr>
<tr>
<td><strong>CHEST X-RAY</strong></td>
<td>IF RESULTS ARE WNL FOR ALL PARTS, TEST IS NORMAL. IF RESULTS ARE WNL FOR ALL PARTS, BUT SOME SORT OF COMMENT HAS BEEN NOTED, TEST IS NORMAL; CIRCLE COMMENT IN BLACK. ALERT IF ANY SECTION IS NOT WNL; THE ABNORMAL FINDINGS SHOULD BE CIRCLED IN RED. (EXCEPT, DO NOT ALERT FOR 3220, BONY ABNORMALITIES: 2510 AND 2520, CALCIFICATION OF VESSELS; 1510, FIBROSIS: 1520, PLEURAL THICKENING: 1430, LUNG CALCIFICATION.)</td>
</tr>
<tr>
<td><strong>ARTHРИTIS BATTERY</strong></td>
<td>DO NOT EDIT.</td>
</tr>
<tr>
<td><strong>PULMONARY FUNCTION</strong></td>
<td>CIRCLE IF PERCENT OF PREDICTED IS LESS THAN 80%, ALERT IF FVC OR FEV ARE LESS THAN 70%. NO ALERT FOR MMFR. CIRCLE ONLY.</td>
</tr>
<tr>
<td>TEST</td>
<td>EDIT SPECIFICATIONS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>VARICOSE VEINS</td>
<td>EDIT SECTION 2 ONLY. CIRCLE A RESULT OF 3, 4, 5. ALERT IF RESULT IS 5.</td>
</tr>
<tr>
<td>SKIN PHOTOGRAPH</td>
<td>CIRCLE PHYSICIAN'S INTERPRETATION IF ACNE IS PRESENT.</td>
</tr>
<tr>
<td>MEDICATIONS SHEET</td>
<td>DO NOT XEROX. DO NOT EDIT.</td>
</tr>
<tr>
<td>DDT</td>
<td>CIRCLE QUESTIONABLES. ALERT ABNORMALS.</td>
</tr>
<tr>
<td><strong>LABORATORY</strong></td>
<td></td>
</tr>
<tr>
<td>Urinalysis:</td>
<td></td>
</tr>
<tr>
<td>Dipstick Protein:</td>
<td>CIRCLE. ALERT IF SULFOSALICYLIC ACID TEST IS 2 OR GREATER.</td>
</tr>
<tr>
<td>Dipstick Blood:</td>
<td>CIRCLE. ALERT IF 1 (SMALL) OR GREATER (EXCEPT IF PATIENT IS MENSTRUATING).</td>
</tr>
<tr>
<td>Microscopic Analysis:</td>
<td></td>
</tr>
<tr>
<td>Red Cells:</td>
<td>CIRCLE A 1 (1-4) OR GREATER. ALERT IF 2 OR GREATER (EXCEPT IF PATIENT IS MENSTRUATING).</td>
</tr>
<tr>
<td>White Cells:</td>
<td>CIRCLE 1 OR GREATER. ALERT IF 2 OR GREATER.</td>
</tr>
<tr>
<td>Bacteria:</td>
<td>CIRCLE 2 OR GREATER. ALERT IF 4 OR GREATER (EXCEPTION: ONLY IF URINE CULTURE IS POSITIVE FOR WOMEN).</td>
</tr>
<tr>
<td>Casts:</td>
<td>CIRCLE ALL CASTS. ALERT IF RED OR WHITE BLOOD CELL CASTS PRESENT.</td>
</tr>
<tr>
<td>CRYSTALS</td>
<td>CIRCLE IF POSITIVE. NO ALERT.</td>
</tr>
<tr>
<td>EPITHELIAL CELLS</td>
<td>DO NOT EDIT.</td>
</tr>
<tr>
<td><strong>HEMATOLOGY:</strong></td>
<td></td>
</tr>
<tr>
<td>ADULTS</td>
<td>CIRCLE ALL COULTER COUNTER RESULTS OUTSIDE NORMAL RANGES. ALERT IF WBC &lt;3.0 OR &gt;12,500. CALL PHYSICIAN IF WBC &lt;1.5 OR &gt;25,000. ALERT IF HCT (males) &lt;37, &gt;56; (females) &lt;33, &gt;52. CALL PHYSICIAN IF HCT &lt;20.</td>
</tr>
<tr>
<td>TEST</td>
<td>EDIT SPECIFICATIONS</td>
</tr>
<tr>
<td>------</td>
<td>---------------------</td>
</tr>
<tr>
<td>HEMATOLOGY (Continued)</td>
<td></td>
</tr>
</tbody>
</table>
| PEDIATRIC (ages 9-13) | EDIT WBC AND HCT ONLY.  
WBC - CIRCLE IF OUTSIDE COULTER COUNTER NORMALS.  
ALERT IF WBC <3.0 OR >15,000.  
HCT - CIRCLE IF <34%.  
ALERT IF <30%. |
| PEDIATRIC, INFANT (ages 6 mos. to 6 yrs) | EDIT WBC AND HCT ONLY.  
WBC - USE PEDIATRIC RANGES ABOVE.  
HCT - CIRCLE IF <32%.  
ALERT IF <29%. |
| CHEMISTRY: | CIRCLE IF OUTSIDE PRINTED RANGES. |
| 2H-pp GLUCOSE | ALERT IF >160. |
| URIC ACID | ALERT IF >8.0 (never too low). |
| CHOLESTEROL | ALERT IF ABOVE PRINTED RANGES (never too low). |
| TOTAL BILIRUBIN | ALERT IF >1.8 (never too low). |
| SGOT | ALERT IF >55 (never too low). |
| BUN | ALERT IF >27 (never too low). |
| THYROXINE | IF ONLY T, DONE, ALERT IF OUTSIDE RANGES PRINTED FOR T4.  
IF T, DONE, ALERT IF OUTSIDE RANGES PRINTED FOR T7.  
(IF T, OUTSIDE NORMAL RANGE, BUT T7 NORMAL, DO NOT ALERT.) |
| BLOOD ALCOHOL | ALERT IF >100 mg%. |
| BLOOD LEAD | ALERT IF OUTSIDE PRINTED RANGES.  
CALL PHYSICIAN IMMEDIATELY IF >60. |
| URINE DRUG SCREEN | CIRCLE, NO ALERT. |
| LATEX FIXATION | CIRCLE 1:20 AND ABOVE: ALERT IF >1.80. |
| URINE CULTURE | ALERT IF >100,000 COLONIES |
| COMMENTS SECTION | WE DO NOT RECORD ALL SMA-12 DATA: HOWEVER, ANY SMA-12 TEST RESULT WHICH IS NOT RECORDED BY US BUT WHICH IS ABNORMAL WILL BE RECORDED HERE, AND SHOULD BE NOTED AS ABNORMAL. |
Appendix F

INSTRUCTION MANUALS FOR USE IN OPERATION OF EQUIPMENT

1. Polaroid Close-Up System, "How to Use the Polaroid CU-5 Camera", Industrial Marketing Department, Polaroid Corporation, Cambridge, Massachusetts

2. Operating Manual, ECG/Photo System 1514A, Hewlett Packard, Medical Electronics Division, Waltham, Massachusetts, 1970


4. Dental Examinations Training Manual, Vladimir Spolsky, University of California, Los Angeles, California, 1975

5. AO Non-Contact Tonometer Instruction Manual, American Optical Corporation, Buffalo, New York


7. The Infrasonde System Model 3000 Electronic Blood Pressure Monitor Instruction Manual, Marion Scientific Corporation


9. Instruction Manual, Model M10 Predictive Pulmonary Screener, Systems Research Laboratory, Inc., Medical Data Systems Division, Dayton, Ohio, 1974


REFERENCES


Frankenburg, William, Joseph B. Dodds, and Alma Fandal, Denver Developmental Screening Test Manual, University of Colorado Medical Center, 1970.


Pillsbury, D. M., W. B. Shelly, and A. M. Kligman, Dermatology, W. B. Saunders Co., Philadelphia, 1956, Ch. 35.


