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## 10 Years After NHANES I: Report of Initial Followup, 1982-84

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The NHANES I Epidemiologic Followup Study has been developed and funded by these agencies: National Institute on Aging; National Center for Health Statistics; National Cancer Institute; National Heart, Lung, and Blood Institute; National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases; National Institute of Mental Health; National Institute of Alcohol Abuse and Alcoholism; National Institute of Allergy and Infectious Diseases; and National Institute of Neurological and Communicative Disorders and Stroke. The field work was conducted by Westat, Inc., under contract No. 23380-2049.

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### Synopsis .....

*The NHANES I Epidemiologic Followup Study (NHEFS) was jointly initiated by the National Center for Health Statistics and the National Institute on Aging in collaboration with other National Institutes of Health and Public Health Service agencies. The goal of NHEFS is to examine the relationship of baseline clinical, nutritional, and behavioral factors assessed in the first National Health and Nutrition Examination Survey (NHANES I—1971-75) to subsequent morbidity and mortality. Data collection for the initial phase of followup took place between 1982 and 1984 and included tracing of all NHANES I participants, determining their vital status, conducting in-depth interviews with surviving participants or with proxies for those who were deceased or incapacitated, conducting selected physical measurements, obtaining facility records for stays in hospitals or nursing homes that occurred during the period of followup, and obtaining death certificates for decedents.*

*Ninety-three percent of the original cohort was successfully traced. Interviews were conducted for 93 percent of traced, surviving participants and 84 percent of traced, deceased subjects. Physical measurements were obtained for approximately 95 percent of surviving, interviewed subjects. Death certificates are available for more than 95 percent of the decedents, and 18,136 facility records were received for 6,477 subjects.*

*'The size and scope of the population in NHEFS provides a unique opportunity not only to replicate more limited studies but also to examine etiologic relationships in a large heterogeneous nationally representative population.'*

**T**HE FIRST NATIONAL HEALTH and Nutrition Examination Survey (NHANES I) collected data on a probability sample of the civilian noninstitutionalized U.S. population between the ages of 1 and 74 years. It included a standardized medical examination and questionnaires covering a variety of topics. The survey took place between 1971 and 1974 and was augmented by an additional national sample (1974-75) to increase the size of certain subpopulations who received a detailed physical examination. The NHANES I sample included 20,729 persons 25 to 74 years of age of whom 14,407 (70 percent) were examined (1-3).

Although NHANES I provides a wealth of information on prevalence of conditions and risk factors, the cross-sectional nature of the survey limits its usefulness for studying the effects of clinical, environmental, and behavioral factors and the natural history of disease. A followup study was needed to investigate the relationship between factors measured at baseline and the subsequent development of specific medical conditions. To obtain such information, the NHANES I Epidemiologic Followup Study (NHEFS) was jointly initiated by the National Center for Health Statistics (NCHS) and the National Institute on Aging, in collaboration with other National Institutes of Health (NIH) and Public Health Service agencies (4). The goal of NHEFS is to examine the relationship of baseline clinical, nutritional, and behavioral factors assessed in NHANES I to subsequent morbidity and mortality. The size and scope of the population in NHEFS provides a unique opportunity not only to replicate more limited studies but also to examine etiologic relationships in a large, heterogeneous nationally representative population.

Data collection for the initial phase of the followup took place between 1982 and 1984. Data collection for the 1985-86 Followup of the Elderly is now in progress. This report describes the results

of the initial phase of the followup in terms of the success of tracing and the completeness of data collection. Extensive analytic activities addressing substantive and methodological issues have been planned and are currently being conducted.

## Background

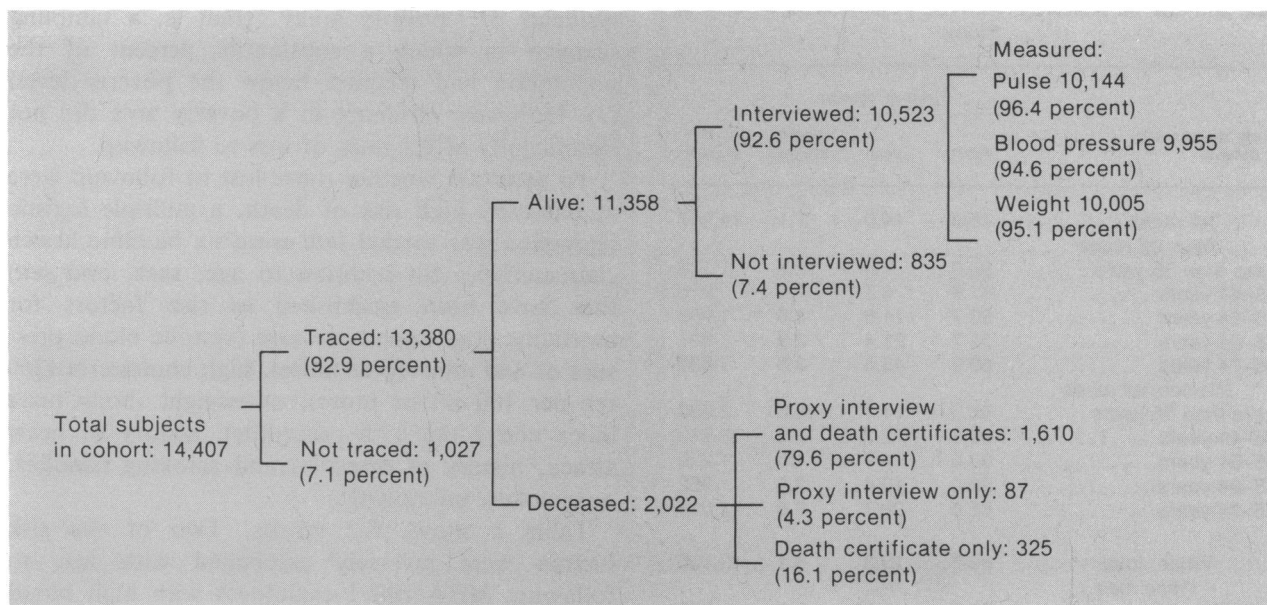
NHANES I was carried out in 1971-75 and was designed to collect extensive health-related information on a probability sample of the U.S. civilian noninstitutionalized population (see references 1-3 for a complete description of the NHANES I survey design). To increase sample size in selected population subgroups, there was oversampling of the elderly, of women of childbearing age, and of persons living in poverty areas.

The NHEFS builds on the baseline data collected in NHANES I. The objectives of the followup are to study (a) mortality, morbidity, and institutionalization associated with suspected risk factors; (b) changes in the participants' characteristics between NHANES I and the followup survey; and (c) the progression of chronic disease and functional impairments. The study population was the 14,407 examinees in NHANES I who were 25 to 74 years old at the time of that survey. An attempt was made to trace all these examinees to their current addresses. Personal interviews, which included weight, blood pressure, and pulse measurements, were conducted with survivors. Personal interviews were also conducted with suitable proxies for deceased or incapacitated participants.

In order to be accepted as a proxy respondent, the individual had to answer correctly the verification questions which were used to establish the identity of the deceased NHANES I participant. Persons who had lived with the subject were the preferred proxies. Thirty-seven percent of the proxy respondents were spouses of the subject, 39 percent were children, 10 percent were siblings, and the remaining 14 percent had various connections with the subject such as friend, neighbor, and other relative.

Death certificates for deceased persons were also obtained. Records of hospitalizations and nursing home stays were collected for both surviving and deceased participants. For a detailed account of the study design, see references 4 and 5.

The results of data collection activities in the NHEFS are summarized in the diagram. Ninety-three percent of the cohort was successfully traced—11,358 were alive at followup, and 2,022 were deceased. Interviews were successfully com-



pleted for 93 percent of the traced examinees who were alive at followup. Interviews with proxy respondents were completed for 84 percent of those deceased. Death certificates were obtained for 96 percent of decedents. Both a death certificate and a proxy interview were available for 1,610 participants (80 percent of all decedents). A proxy interview only was available for 87 decedents (4 percent), and a death certificate only was available for the remaining 325 decedents (16 percent). Each component of data collection is discussed in detail in the following sections.

## Tracing

Until the initiation of the NHEFS, the NHANES I examinees had not been contacted by the NCHS or any of the NIH collaborators. Since the validity of longitudinal studies is dependent on completeness of followup, extensive and varied efforts were made to trace and establish the vital status of all NHEFS participants. A person was considered successfully traced if the person or a proxy (in the case of those deceased or incapacitated) correctly responded to a set of verification questions establishing the participant's identity. All persons not traced were considered lost to followup. In addition, the fact of death had to be corroborated by either a death certificate or a proxy interview. In some cases, information about the death of a participant was obtained from neighbors or other tracing contacts. While this information was noted in the record, these persons

were considered lost to followup unless the information was confirmed by a proxy interview or by a death certificate.

As of August 1984, 93 percent of the study population was successfully located. However, the success of tracing efforts varied by age, race, and sex (table 1). To summarize how demographic factors were related to tracing success, a multiple logistic model (6) was fitted to the cross-classification of age, race, and sex with the proportion lost to followup as the dependent variable. Due to the few participants of "other" races (172), this analysis was limited to blacks and whites. Terms were deleted from the saturated model until the simplest model that fitted the data was obtained. The smallest *P* value for a deleted term was .30. The final model includes a main effect for age ( $P < .001$ ) and an interaction between sex and race ( $P < .001$ ). Loss to followup is highest for those under 35 at the time of NHANES I and then generally improves with each 10-year increase in age for all sex-race groups (odds ratios of 4.43, 1.97, 1.25, 0.91, relative to those 65 and older).

Within each age group, the effect of sex is dependent on race. Among whites, women had slightly higher rates of loss to followup, but among blacks, men had the higher loss rates. Odds ratios relative to white men were 1.27 for white women, 3.17 for black men, and 2.27 for black women. Thus, the lowest lost-to-followup rates were found among white men 55 and older, and the highest rates were for young, black men.

Table 1. Percent distribution of status at followup by race, sex, and age<sup>1</sup> at baseline, NHANES I Epidemiologic Followup Study

Race, sex, and age at baseline	Status at followup			Number
	Alive	Dead	Lost to followup	
All races.....	78.8	14.0	7.1	14,407
<i>Men, all races</i>				
Less than 35 years.....	86.0	1.4	12.6	1,128
35-44 years.....	87.9	4.7	7.3	928
45-54 years.....	83.7	11.6	4.6	1,058
55-64 years.....	75.7	21.4	2.9	861
65-74 years.....	50.9	45.5	3.6	1,836
<i>Women, all races</i>				
Less than 35 years.....	83.3	1.1	15.6	2,383
35-44 years.....	90.5	2.7	6.9	2,013
45-54 years.....	90.6	4.9	4.5	1,220
55-64 years.....	86.0	10.4	3.6	962
65-74 years.....	67.5	28.7	3.8	2,018
White, total.....	80.6	13.3	6.1	12,036
<i>White men</i>				
Less than 35 years.....	88.7	1.3	9.9	965
35-44 years.....	89.3	4.6	6.1	802
45-54 years.....	86.2	9.8	3.9	894
55-64 years.....	77.3	20.1	2.6	741
65-74 years.....	52.6	45.0	2.4	1,501
<i>White women</i>				
Less than 35 years.....	85.1	0.8	14.1	1,980
35-44 years.....	91.8	2.1	6.2	1,609
45-54 years.....	92.5	3.6	3.9	1,047
55-64 years.....	86.9	10.3	2.8	817
65-74 years.....	69.0	27.8	3.2	1,680
Black, total.....	69.7	18.3	12.0	2,199
<i>Black men</i>				
Less than 35 years.....	72.2	2.1	25.7	144
35-44 years.....	76.6	6.5	16.8	107
45-54 years.....	69.3	22.2	8.5	153
55-64 years.....	63.2	31.1	5.7	106
65-74 years.....	44.1	46.3	9.6	313
<i>Black women</i>				
Less than 35 years.....	75.4	3.2	21.4	370
35-44 years.....	84.7	5.8	9.6	365
45-54 years.....	79.6	13.2	7.2	167
55-64 years.....	81.0	11.3	7.7	142
65-74 years.....	59.9	33.1	6.9	332
Other, total.....	69.8	11.6	18.6	172
<i>Other men</i>				
Less than 35 years.....	52.6	...	47.4	19
35-44 years.....	94.7	...	5.3	19
45-54 years.....	81.8	9.1	9.1	11
55-64 years.....	85.7	14.3	...	14
65-74 years.....	27.3	68.2	4.5	22
<i>Other women</i>				
Less than 35 years.....	60.6	...	39.4	33
35-44 years.....	89.7	...	10.3	39
45-54 years.....	66.7	...	33.3	6
55-64 years.....	66.7	...	33.3	3
65-74 years.....	66.7	33.3	...	6

<sup>1</sup>The sampling frame for NHANES I includes persons aged 1-74 years at the time of the interview. Several subjects reached their 75th birthday between the interview and the examination. In addition, date of birth was incorrectly coded for several subjects. This was corrected in the followup. As a result, 1 subject is over 75 but has been retained in the analysis. Dot leaders ... indicate quantity zero.

The NHANES I design included oversampling of residents of "poverty areas" (that is, a sampling segment in which a substantial percent of the population had incomes below the poverty level) (1). However, residence in a poverty area did not significantly affect rates of loss to followup.

To ascertain whether those lost to followup were at relatively high risk of death, a multiple logistic regression was carried out using six baseline health characteristics (in addition to age, race, and sex) that have been established as risk factors for mortality: high blood pressure (systolic blood pressure of 140 mm Hg or more), high cholesterol (260 mg per 100 ml or more), overweight (body mass index above the 85th percentile), history of heart attack, history of diabetes, and smoking (smoker, nonsmoker, unknown).

Table 2 shows the results. Two of the risk factors were inversely associated with loss to followup: NHANES I examinees with high blood pressure were 19 percent less likely ( $P=.024$ ) and overweight examinees were 6 percent less likely to be lost to followup ( $P=.450$ ). High cholesterol had virtually no effect on tracing, and persons with a history of heart attack or diabetes were about 20 percent more likely to be untraced (none of these differences were statistically significant). Smoking had the strongest effect on loss to followup: smokers were 86 percent more likely than nonsmokers to be untraced ( $P < .001$ ). These results suggest that those lost to followup may be somewhat more likely to have died than those who were successfully traced. The strong association between smoking and loss to followup indicates that caution should be exercised in interpreting the effects of smoking on mortality, especially at younger ages. It should be noted, however, that the proportion lost to followup among those aged 55 and older is quite small relative to the proportion deceased. Thus, in these age groups, there should be relatively little bias in mortality findings as a result of loss to followup.

## Data Collection

The 1982-84 data collection for the NHEFS took several forms—personal interviewing of participant or proxy, collection of death certificates, and collection of hospital and nursing home records. Data were included in the followup files if the report of the event (for example, tracing report, completed questionnaire, hospital record, death certificate) was received at the home office by August 31, 1984. Events (for example, deaths,

hospitalizations) which occurred after the interview date were not included in this wave of data collection. On the basis of the data received, the "last date known alive" was determined for each participant. For deceased persons, this is the date of death; for surviving NHANES I participants who were successfully interviewed, it is the date of interview; for persons traced but not interviewed, it is the date of last tracing contact; and for those lost to followup, it is the date of the NHANES I examination.

Length of followup for those still alive is the period between the NHANES I examination date and the last date known alive. The average length of followup for live, traced participants was 9.5 years with a range of 5 to 12 years. Seven percent had less than 8 years of followup; 39 percent had 8 to 9 years; 28 percent had 10 years; and 26 percent had 11 to 12 years of followup. A brief summary of the results of the data collection activities follows.

**Interview data.** Interviews with the participant or a proxy were completed for 85 percent of the original cohort or 91 percent (12,220 persons) of those successfully traced. Of the 1,697 proxy interviews, 1,206 were completed by telephone. In 131 cases, interviews with surviving NHANES I participants were conducted by telephone rather than in person. Telephone interviews were used if the respondent lived in a remote area or the respondent was traced too late in the field period to conduct an in-person interview. Nonresponse rates for the interview by age, race, sex, and vital status are given in table 3. Seven percent of traced, surviving participants were not interviewed, and proxy interviews could not be obtained for 16 percent of the deceased. The lower interview success rate for deceased compared with surviving NHANES I participants was apparent in all age-sex-race groups. This difference is due in part to the fact that many of the deceased were located from vital statistics files, and no proxy could be identified.

To summarize how demographic factors related to interview status, multiple logistic models were fitted to the cross classification of age, race, and sex with the proportion not completing the interview as the dependent variable. Separate models were fitted for live and deceased persons. After deleting nonsignificant terms from the saturated model (the smallest *P* value for a deleted term was .12), the final model for deceased persons includes only a main effect for race (*P* < .001). Non-

Table 2. Effects of health characteristics on loss to followup based on multiple logistic regression with age, sex, and race included

Characteristic	Odds ratio	95 percent confidence interval	P-value
High blood pressure . . . .	0.81	0.68, 0.97	.024
High cholesterol . . . . .	1.03	0.86, 1.23	.754
Overweight . . . . .	0.94	0.80, 1.10	.450
Heart attack . . . . .	1.18	0.79, 1.77	.408
Diabetes . . . . .	1.21	0.84, 1.74	.310
Smoker . . . . .	1.86	1.52, 2.28	< .001

Table 3. Percent of traced NHANES I Epidemiologic Followup Study cohort without completed interview by race, sex, age, and subject status

Race, sex, and age at baseline	Percent without completed interview <sup>1</sup>	
	Alive	Deceased
All races . . . . .	7.4	16.1
<i>Men, all races</i>		
Less than 35 years . . . . .	9.3	12.5
35-44 years . . . . .	8.1	20.5
45-54 years . . . . .	7.6	14.6
55-64 years . . . . .	4.3	18.5
65-74 years . . . . .	8.8	14.6
<i>Women, all races</i>		
Less than 35 years . . . . .	7.6	33.3
35-44 years . . . . .	6.8	16.7
45-54 years . . . . .	7.2	23.3
55-64 years . . . . .	5.7	11.0
65-74 years . . . . .	7.5	16.8
White, total . . . . .	7.1	13.3
<i>White men</i>		
Less than 35 years . . . . .	8.9	15.4
35-44 years . . . . .	7.4	21.6
45-54 years . . . . .	7.5	11.4
55-64 years . . . . .	3.7	15.4
65-74 years . . . . .	8.5	12.7
<i>White women</i>		
Less than 35 years . . . . .	7.2	13.3
35-44 years . . . . .	6.6	12.1
45-54 years . . . . .	7.2	21.1
55-64 years . . . . .	5.9	6.0
65-74 years . . . . .	7.5	13.7
Black, total . . . . .	8.2	26.8
<i>Black men</i>		
Less than 35 years . . . . .	13.5	...
35-44 years . . . . .	12.2	14.3
45-54 years . . . . .	6.6	23.5
55-64 years . . . . .	7.5	33.3
65-74 years . . . . .	10.9	22.8
<i>Black women</i>		
Less than 35 years . . . . .	8.6	58.3
35-44 years . . . . .	7.1	23.8
45-54 years . . . . .	6.8	27.3
55-64 years . . . . .	4.3	37.5
65-74 years . . . . .	7.0	28.2

<sup>1</sup>Percentages are based on subjects who were successfully traced. Dot leaders . . . indicate quantity zero.

Table 4. Percent of Interviewed NHANES I Epidemiologic Followup Study cohort without successful completion of physical measurements by race, sex, and age

Race, sex, and age at baseline	Percent without successfully completed physical measurements <sup>1</sup>		
	Pulse	Blood pressure <sup>2</sup>	Weight <sup>3</sup>
All races.....	3.6	5.4	4.9
<i>Men, all races</i>			
Less than 35 years.....	2.7	3.3	3.5
35-44 years.....	2.3	2.9	2.9
45-54 years.....	1.8	3.3	2.9
55-64 years.....	5.0	6.1	5.8
65-74 years.....	6.5	9.3	8.8
<i>Women, all races</i>			
Less than 35 years.....	2.9	4.3	3.2
35-44 years.....	1.8	3.6	2.2
45-54 years.....	1.8	3.6	3.4
55-64 years.....	2.7	5.4	4.4
65-74 years.....	9.0	12.3	13.1
<i>White, total</i>			
<i>White men</i>			
Less than 35 years.....	2.6	3.1	3.1
35-44 years.....	2.3	2.9	2.6
45-54 years.....	1.8	3.4	2.7
55-64 years.....	5.1	6.2	6.2
65-74 years.....	6.1	8.3	7.7
<i>White women</i>			
Less than 35 years.....	3.0	4.4	3.3
35-44 years.....	1.7	3.2	2.2
45-54 years.....	1.8	3.5	3.2
55-64 years.....	2.4	5.2	3.9
65-74 years.....	8.4	11.4	12.3
<i>Black, total</i>			
<i>Black men</i>			
Less and 35 years.....	4.4	5.6	7.8
35-44 years.....	2.8	4.2	5.6
45-54 years.....	1.0	2.0	4.0
55-64 years.....	4.8	6.5	3.2
65-74 years.....	8.9	15.4	15.4
<i>Black women</i>			
Less than 35 years.....	2.7	3.5	2.7
35-44 years.....	2.1	5.9	2.1
45-54 years.....	1.6	4.8	4.8
55-64 years.....	4.5	6.4	7.3
65-74 years.....	13.0	17.8	17.8

<sup>1</sup>Percentages are based on the total number of traced, living subjects with a completed subject interview. They include 131 persons who were interviewed by telephone and on whom no measurements were attempted.

<sup>2</sup>Completed blood pressure measurement is defined as the successful completion of either the second or third measurement.

<sup>3</sup>Completed weight measurement is defined as a successful measurement taken on either of 2 attempts.

response rates for the proxies of black decedents are substantially higher than those for whites (odds ratio of 2.40). The final model for surviving NHANES I participants included a main effect for age ( $P = .003$ ) and a marginally significant interaction between sex and race ( $P = .12$ ). All other terms deleted from the model had  $P$ -values greater than 0.28. Noninterview rates were lowest for those 55-64 but similar to the rates for all other

age groups (odds ratios of 1.70 for those 25-34, 1.48 for those 35-44, 1.49 for those 45-54, and 1.65 for those 65-74 relative to the 55-64 age group). Black men had the poorest completion rates whereas the rates for the other race-sex groups are similar to each other. Odds ratios relative to white women were 1.09 for white men, 1.53 for black men, and 1.03 for black women.

**Physical measurements.** As part of the personal interview, pulse, blood pressure, and weight measurements were attempted for each participant. Interviewers underwent extensive training in making physical measurements and were reevaluated in the course of the field period. The physical measurements could not be attempted for the 131 persons interviewed by telephone nor for the 161 persons who were incapacitated and did not take part in the interview. (An additional 85 incapacitated persons did not act as respondents to the interview but did participate in the physical measurement section.) Another 11 respondents broke off the interview before the physical measurement section. Thus, no physical measurements were attempted for 303 of the 10,523 survivors who completed an interview.

In addition to these 303, pulse was not measured on another 76 participants. The measurement was not attempted on 66 of these persons as a result of refusals (8 persons), medical contraindications (32 persons), or other reasons (26 persons). No valid measure was obtained for the additional 10 persons. Thus, the overall failure rate for obtaining a pulse measurement was 3.6 percent. A multiple logistic model was used to summarize the age-sex-race-specific failure rates shown in table 4. The final model contains a significant age-sex interaction ( $P = .033$ ) and main effect for race ( $P = .041$ ). The major differences by age were concentrated in those 65 years of age and older. Relative to women under age 65, the odds ratios for pulse measurement failure was 1.24 for men under age 65, 4.18 for women 65 and older, and 2.92 for men age 65 and older. In addition, blacks were 32 percent more likely than whites to have no pulse measurement available.

Three blood pressure measurements were attempted. Failure to obtain a reading was considered an attempt and could not be repeated. Either the second or the third of the three blood pressure measurements had to be successful for the procedure to be considered complete. Blood pressure was not measured on 265 participants (in addition to the 303 noted previously). The blood pressure

procedure was not attempted on 185 of these participants (15 refusals, 117 medical contraindications, and 53 other reasons). The procedure was attempted but not successfully completed on another 80 participants.

Therefore, 5.4 percent of the survivors with a completed interview had no blood pressure measurement (table 4). Although there were no significant interactions involving age, race, or sex, the failure rate was associated with all these variables. The odds ratios for no blood pressure measurement relative to those under 55 years, was 1.64 for 55-64-year-olds and 3.32 for those 65 and older. Women were 20 percent more likely than men and blacks were 46 percent more likely than whites to have no blood pressure measurement available.

Weight was not measured for a total of 215 participants (in addition to the 303). The weight measurement was not attempted for 204 persons (34 refusals, 134 medical contraindications, and 36 others). Invalid measures were obtained in 11 instances. Although there was a slightly higher failure rate for weight than pulse (4.9 percent compared with 3.6 percent), the patterns were similar. There was a significant age-sex interaction ( $P=.022$ ) and a significant race effect ( $P<.001$ ). Relative to women under 65 years, the odds ratios were 1.21 for men under 65, 4.72 for women 65 and older, and 3.04 for men 65 and older. Blacks were 48 percent more likely than whites to have no weight measurement.

**Death certificates.** Tracing activities identified 2,022 deaths. An NHANES I participant was considered deceased only if a death certificate was received or a proxy interview verifying the death was completed. Death certificates have been obtained for almost 96 percent of all decedents. Table 5 presents the percentage of decedents by age, race, and sex for whom death certificates were available. There was little difference by age in the percentage of decedents for whom a death certificate was obtained. However, blacks were 77 percent more likely than whites and women 66 percent more likely than men to have no death certificate available.

**Facility records.** One objective of the NHEFS interview was to obtain a complete history of overnight stays in health care facilities such as hospitals and nursing homes. Respondents were asked to sign a form authorizing the facility to release records to the study. Any health care facility named in the interview that could be

Table 5. Number of deaths among NHANES I Epidemiologic Followup Study cohort members and percent of deceased without an available death certificate

<i>Race, sex, and age at baseline examination</i>	<i>Number of deaths</i>	<i>Percent of decedents without a death certificate</i>
All races.....	2,022	4.3
<i>Men, all races</i>		
Less than 35 years .....	16	6.3
35-44 years .....	44	2.3
45-54 years .....	123	1.6
55-64 years .....	184	2.2
65-74 years .....	835	3.8
<i>Women, all races</i>		
Less than 35 years .....	27	...
35-44 years .....	54	5.6
45-54 years .....	60	8.3
55-64 years .....	100	6.0
65-74 years .....	579	5.7
White, total .....	1,599	3.8
<i>White men</i>		
Less than 35 years .....	13	...
35-44 years .....	37	2.7
45-54 years .....	88	1.1
55-64 years .....	149	2.0
65-74 years .....	675	3.3
<i>White women</i>		
Less than 35 years .....	15	...
35-44 years .....	33	...
45-54 years .....	38	5.3
55-64 years .....	84	4.8
65-74 years .....	467	5.8
Black, total .....	403	6.7
<i>Black men</i>		
Less than 35 years .....	3	33.3
35-44 years .....	7	...
45-54 years .....	34	2.9
55-64 years .....	33	3.0
65-74 years .....	145	6.9
<i>Black women</i>		
Less than 35 years .....	12	...
35-44 years .....	21	14.3
45-54 years .....	22	13.6
55-64 years .....	16	12.5
65-74 years .....	110	5.5

Dot leaders ... indicate quantity zero.

located was contacted to obtain information on each stay that occurred between the date of the NHANES I examination and the date of followup interview for surviving NHANES I participants and, for decedents, between the date of examination and the date of death. Further contacts were attempted with other hospitals mentioned on death certificates or discharge abstracts.

Hospital records (17,703) and nursing home records (433) were received for 6,477 participants. Table 6 shows the results of the facility record collection. Among men, both the proportion of respondents with at least one facility report and

Table 6. Receipt of facility records, NHANES I Epidemiologic Followup Study cohort by race, age, and sex

Race, sex, and age at baseline examination	Persons with 1 or more episode report received		Number episode reports received	Average number of episode reports received	
	Number	Percent		For all traced subjects	For subjects with 1 or more reports
All races.....	6,477	48.4	18,136	1.36	2.8
Men, all races					
Less than 35 years.....	264	26.8	518	.53	2.0
35-44 years.....	330	38.4	800	.93	2.4
45-54 years.....	485	48.1	1,246	1.23	2.6
55-64 years.....	457	54.7	1,418	1.70	3.1
65-74 years.....	1,059	59.9	3,464	1.96	3.3
Women, all races					
Less than 35 years.....	984	48.9	2,299	1.14	2.3
35-44 years.....	844	45.0	1,935	1.03	2.3
45-54 years.....	498	42.7	1,334	1.15	2.7
55-64 years.....	445	48.0	1,235	1.33	2.8
65-74 years.....	1,111	57.2	3,887	2.00	3.5
White, total.....	5,572	49.3	15,694	1.39	2.8
White men					
Less than 35 years.....	226	26.0	446	.51	2.0
35-44 years.....	293	38.9	720	.96	2.5
45-54 years.....	413	48.1	1,054	1.23	2.6
55-64 years.....	402	55.7	1,268	1.76	3.2
65-74 years.....	892	60.9	2,975	2.03	3.3
White women					
Less than 35 years.....	853	50.2	1,986	1.17	2.3
35-44 years.....	693	45.9	1,575	1.04	2.3
45-54 years.....	433	43.0	1,143	1.14	2.6
55-64 years.....	393	49.5	1,095	1.38	2.8
65-74 years.....	974	59.9	3,432	2.11	3.5
Black, total.....	859	44.4	2,332	1.21	2.7
Black men					
Less than 35 years.....	38	35.5	72	.67	1.9
35-44 years.....	33	37.1	75	.84	2.3
45-54 years.....	70	50.0	190	1.36	2.7
55-64 years.....	49	49.0	139	1.39	2.8
65-74 years.....	158	55.8	473	1.67	3.0
Black women					
Less than 35 years.....	122	41.9	292	1.00	2.4
35-44 years.....	136	41.2	306	.93	2.3
45-54 years.....	65	41.9	191	1.23	2.9
55-64 years.....	52	39.7	140	1.07	2.7
65-74 years.....	136	44.0	454	1.47	3.3

*'Seven percent of traced, surviving participants were not interviewed, and proxy interviews could not be obtained for 16 percent of the deceased. The lower interview success rate for deceased compared with surviving NHANES I participants was apparent in all age-sex-race race groups.'*

the average number of facility reports received per person increased with age. Among women, the relationship is J-shaped because the under-35 age group has a high rate (primarily due to childbearing). These patterns are similar to what was expected based on national hospital discharge rates (7).

Although these patterns are encouraging, there are several indications that the hospital file is not complete. First, 190 of the 2,557 hospitals and 59 of the 409 nursing homes contacted for records refused to participate. Second, since several hospitals had closed and no information about the disposition of their records was obtained, these facilities were not contacted. Third, some facilities



did not return records either because the records were inaccessible or because the search for records was not successful. Finally, authorization forms were not obtained for 4 percent of surviving participants and 13 percent of decedents.

It is difficult to measure precisely the extent to which the facility record file is complete. To do so requires that reported stays and facility records be matched on the basis of date and reason for the stay. The accuracy of such a search is dependent on the respondent's ability to recall these events for the average followup period of 10 years. Since this kind of recall is prone to error, such a match was not attempted. It is possible, however, to identify one group of missing records. No hospital records were obtained for 1,774 persons who reported at least one hospitalization. In 48 percent of these cases the hospital refused or was not contacted for other reasons, and in 9 percent the respondents refused to sign the authorization. In the remaining cases, records were not found by the hospital. This failure may be a result of respondents' reporting errors. The name of a facility could have been misreported or the date of a hospitalization might have been reported as occurring after the examination when, in fact, it occurred prior to the baseline examination and, therefore, the stay would be excluded from consideration. A more extensive analysis is currently underway to evaluate the completeness of the record collection.

## Conclusion

The NHEFS is a multi-purpose, collaborative longitudinal study which uses several different data collection mechanisms to secure information to address significant epidemiologic and public health issues. It is unique in that a nationally representative probability sample of the U.S. population with extensive baseline clinical findings was followed longitudinally. The material presented in this paper shows that tracing, interviewing, physical measurements, and death certificate acquisition were quite successful.

The NHEFS is an ongoing project. Although data collection for the initial followup ended officially in 1984, records of hospitalizations and deaths that occurred during the initial followup period, but were missing from the file, are still being sought. Updates to the data files will be made periodically. An additional round of data collection for those age 55 and older at baseline was started in 1985 and will be completed in 1986.

*'As of August 1984, 93 percent of the study population was successfully located. However, the success of tracing efforts varied by age, race, and sex . . . . Loss to followup is highest for those under 35 at the time of NHANES I and then generally improves with each 10-year increase in age for all sex-race groups.'*

Another followup of the entire cohort is scheduled for 1986-87. Efforts will continue to locate those currently lost to followup. The cohort will continue to be matched against the National Death Index (8) to identify additional decedents.

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