

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

MA McDowell, A Green, CR Caughman, RR Briefel, CM Loria, CL Johnson

*Centers for Disease Control
National Center for Health Statistics*

The NHANES Program

Health examination surveys conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control are mandated by the National Health Survey Act of 1956. NCHS conducted six examination surveys between 1960-84. (Table 1) National Health Examination Survey (NHES) data provided some of the earliest prevalence estimates for specific diseases and health conditions in the U.S. population. Selected population subgroups and health conditions were targeted during the NHES; anthropometric, clinical, and laboratory data were collected using standardized examination and interview techniques.

A nutritional assessment component was added to examination survey program in 1970 and the name changed to the National Health and Nutrition Examination Survey or "NHANES". NHANES I, 1971-75 was conducted on persons 1-74 years of age; detailed examinations were conducted on a subsample of persons 25-74 years of age. NHANES II, 1976-80 included persons 6 months-74 years of age. NCHS conducted a special survey of three Hispanic subgroups from 1982-84. Hispanic HANES (HHANES) included Mexican Americans from five Southwest U.S. states, Cubans from Dade County, Florida, and Puerto Ricans from the New York City metropolitan area.

Data collection for NHANES III, a 6-year survey, began in 1988. The goals identified for NHANES III are to collect national health and nutrition data to estimate the prevalences of selected diseases and risk factors, to prepare reference data for a wide range of health parameters, to examine secular trends in the prevalences of disease and health risk factors, and to collect data which are needed to study the etiology of chronic diseases. More than 40,000 persons 2 months of age and older are expected to participate in the interview portion of the Survey; of these, approximately 30,000 persons will be examined in mobile examination centers (MEC).

The NHANES III respondent universe

The NHANES III sample includes the civilian, noninstitutionalized population of the United States 2+ months of age. The Survey's stratified, multistage probability sample design includes an oversampling of children, older persons,

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

Blacks, and Mexican Americans so that reliable estimates of health status indicators will be available for these population subgroups. The projected sample sizes for interviewed and examined persons are shown in Table 2.

NHANES III planning

Several methodologic improvements and planning considerations were incorporated into the design of the Survey to permit tracing and longitudinal follow-up of NHANES III respondents. (1,2) Information on nonrespondents is collected to evaluate potential sources of nonresponse bias. A home examination is offered to persons who are unable or unwilling to undergo an examination in the MEC. Examination and interview components from previous NHANES were included in NHANES III as well to permit comparisons over time; several new examination components, laboratory and performance tests and questionnaire items were added for NHANES III. Survey questionnaires and examination protocols were pretested during the pilot study phase of the Survey, 1987-88.

Data collection

The data collection contractor for the Survey is Westat Inc. of Rockville, MD. Westat makes advance arrangements for each survey (termed "Stand") location. Advance team work entails setting up field offices and the MEC, hiring and training MEC and field office staff, preparing training manuals, retraining staff, implementing required quality control procedures, and transmitting data to NCHS.

Letters are mailed to prospective Sample Persons (SPs) informing them that an interviewer will visit their home. If household members are eligible and willing to participate in the Survey, Family and Household Interview questionnaires are administered in the home; appointments for the examination component are scheduled at this time. The MEC schedules include weekends; morning, afternoon and evening appointments are available. SPs are compensated for participating in the examination component.

The NHANES III Nutritional Assessment Component

National surveys such as NHANES are the cornerstones of the National Nutrition Monitoring and Related Research Program (NNMRRP). The primary goal of the NNMRRP is to coordinate the collection and dissemination of timely data on the nutritional and health status of the U.S. population (3). The objectives of the NHANES III nutrition assessment component are consistent with this goal. NHANES III data will be used to estimate the prevalences of nutrition-related risk factors such as overweight and poor diet, to provide data to examine the relationship between diet, nutritional status, and health, and to provide baseline data to relate long-term dietary practices to chronic diseases. Anthropometric, biochemical and hematologic, dietary, and clinical data are collected.

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

The NHANES III nutrition component was planned with input from experts in the fields of nutrition, biostatistics, epidemiology, and public health. NCHS sponsored a Dietary Methodology Planning Workshop in 1986 to consider the strengths and limitations of alternative dietary data collection methods. (4) At that time, NCHS was advised to collect at least one 24-hour recall to provide quantitative dietary intake estimates, and to obtain food frequency data to describe qualitative aspects of the diet. A food frequency questionnaire, targeted to collect more detailed information on dietary sources of calcium, caffeine, and vitamins A and C is administered to SPs 12+ years of age; a separate infant food frequency questionnaire is administered to identify food patterns. Dietary recall interviews are obtained on all NHANES III examinees.

During the household interview, information on the use of food assistance and nutrition programs, dietary supplement and medication usage, and alcohol consumption is obtained. SPs 17+ years of age complete the food frequency interview during the household interview; adolescents 12-16 years of age complete the food frequency interview in the MEC. Dietary 24-hr recalls are collected in the MEC; questions on food sufficiency, table salt use, and usual water consumption are administered during the dietary recall interview.

NHANES III Dietary Recall Data Collection

During previous HANES, dietary interviewers were required to record 24-hr recalls on hard copy forms; the interviewers coded the recalls manually. After the 1986 dietary planning workshop was held, NCHS reviewed automated dietary data collection methods. The University of Minnesota's Nutrition Coordinating Center (NCC) demonstrated a prototype automated dietary interview and coding system which was developed with National Cancer Institute grant support. NCHS, National Heart, Lung and Blood Institute, and Food and Drug Administration funds were used to adapt this prototype system for use in NHANES III. The resulting product--the NHANES III Dietary Data Collection (DDC) System is used to collect all dietary recall data in NHANES III. The features of the DDC system include the capability to conduct open-ended interviews using structured probes to ensure standardized data collection. (5) Other features of the DDC system are listed in Table 3.

The DDC system was pretested during two NHANES III pilot tests. Updated versions of the DDC system are installed in the MECs during the Survey; the system incorporates new foods, including brand name and ethnic foods, new food amount options, and new options for specifying foods reported during the interviews.

The NHANES III Supplemental Nutrition Survey of Older Americans (SNS)

Data collection for a special dietary follow-up study of NHANES III-Phase I (1988-91) examinees 50+ years of age began in 1989. The National Institute on Aging provides funding for the NHANES III Supplemental Nutrition Survey of Older

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

Americans (SNS) through an interagency agreement with NCHS. Two independent replicate 24-hr dietary recalls are collected by trained telephone interviewers approximately eight and sixteen months after the baseline recall interview was obtained in the MEC. SNS interviews are collected at the Westat Telephone Center in Gaithersburg, MD using the NHANES III DDC system. Data collection for the SNS will be completed in the Spring of 1993.

Two advance letters are mailed to eligible SPs prior to each SNS interview. A Food Model Booklet containing two-dimensional drawings of the same food models, charts, and measurement aids which the SP used during the MEC interview is enclosed with the second advance letter.

NHANES III Response Data

Preliminary interview, examination and component response data are available for NHANES III-Phase I. The preliminary household interview response rate in Phase I was 86 percent; the overall MEC examination response rate was 77 percent. (Table 4) Approximately 98 percent of all examined persons completed the dietary interview component; more than 15,000 recalls were collected in Phase I. (Table 5)

Preliminary response rate data are available for the SNS. (Tables 6-7) Approximately 79 percent of eligible SPs from the first 34 Stands completed the first SNS interview. The nonresponse categories included lack of a home telephone (5%), refusals (6%), subject deceased at the time of the recontact (2%), and lack of a suitable proxy respondent. Seventy percent of eligible subjects from the first eighteen Stands completed both SNS interviews.

Quality control monitoring of dietary data collection

Quality control monitoring for the Main Survey and SNS includes direct observations of interviews in progress by NCHS, Westat, and supervisory staff, reviews of printed recall reports, reviews of taped recall and food frequency interviews, and a ten percent cross-check of printed recall reports by a second dietary interviewer. Communication with field staff is maintained by means of telephone calls to the interviewers, field memoranda, newsletters, interviewer training manual updates, and dietary interviewer retraining activities.

NHANES III dietary data review and editing activities

A two-stage process is used to review and process the NHANES III recall dataset. The first stage is the most time consuming and labor intensive because it involves reviews of detailed information from the field and preparation of updated data bases. NCHS, USDA, and NCC staff work together to prepare updated versions of the DDC system and USDA Survey Databases. A summary of the major data processing activities follows.

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

Each MEC team sends biweekly data transmittals to NCHS. Data transmittals include descriptions of new foods (termed "Missing Foods"), market check data, and DDC system screen change requests. Missing foods include new food products on the market, ethnic foods which are not in the DDC system, and variations on foods which are in the DDC system. Market information accompanies many of the Missing Foods reports for commercial products; this information is evaluated as part of the coding process. Some new foods can be coded using an existing USDA code. Foods that are unique by virtue of their nutrient or ingredient content are assigned new food codes. USDA and NCHS staff meet to discuss food code assignments.

Review File Reports are an important data review and editing tool used by NCHS staff. Reports are printed for each Stand location; Missing Foods requests, interviewer notes, and information pertaining to incomplete recalls are reviewed. The information compiled during this first stage of editing is used to update the DDC and USDA data bases. Final data edits are entered online using an updated version of the DDC system during the second stage of processing. After the recalls are completely edited, special computer programs are run to assign gram weights and nutrient values to the foods reported during the Survey.

A tremendous amount of work has been accomplished behind the scenes since the start of NHANES III to document editing and coding decisions needed to complete the recall data files. Joint NCHS-USDA working groups were organized to discuss survey data editing guidelines, food coding decisions, food volume-weight data, recipes, and nutrient data base maintenance for NCHS and USDA surveys. NCHS and USDA have exchanged information on data collection and processing procedures used in our respective survey programs. My NCHS colleague, Amy Green, organized a joint NCHS-USDA editing guidelines workshop which will be held during this Conference. The workshop will focus on the uses of editing guidelines in national surveys, and the approach taken to develop editing guidelines.

The long-range goal of the data collection, quality control, data review, and data editing activities described in this talk is to produce a high quality NHANES III data release file in a timely manner. NCHS has worked closely with USDA's Human Nutrition Information Service staff since the start of the Survey. On behalf of my NCHS colleagues, I would like to thank HNIS for their enthusiastic support and professionalism in helping meet our objectives. We have learned a great deal from one another. This exchange will improve the usefulness and overall quality of national survey data.

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

References

1. Woteki CE, Briefel R, Hitchcock D, et al. Selection of nutrition status indicators for field surveys: The NHANES III design. *J Nutr* 120(11S):1440-45. 1990.
2. Harris T, Woteki C, Briefel RR, Kleinman JC. NHANES III for older persons: Nutrition content and methodological considerations. *Am J Clin Nutr* 50:1145-49. 1989.
3. U.S. Department of Health and Human Services and the U.S. Department of Agriculture. Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program. *Federal Register* 56(209):55716-67. 1991.
4. Briefel, RB, Sempos CT, eds. Dietary methodology workshop for the third National Health and Nutrition Examination Survey. National Center for Health Statistics. *Vital Health Stat* 4(27). 1992.
5. McDowell, MA, Briefel RR, Warren RA, et al. The Dietary Data Collection (DDC) system: an automated interview and coding system for NHANES III. Paper presented at the Fourteenth National Nutrient Databank Conference. 1989.

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

Table 1
National Health and Nutrition Examination Surveys

<u>Survey</u>	<u>Dates</u>	<u>Ages</u>
NHES I	1960-62	18-79 years
NHES II	1963-65	6-11 years
NHES III	1966-70	12-17 years
NHANES I	1971-75	1-74 years
NHANES II	1976-80	6 mo.-74 years
HHANES	1982-84	6 mo.-74 years
NHANES III	1988-94	2+ months

Table 2
**Projected distribution of NHANES III sample
 by race and ethnicity (1988-94)**

<u>Sample</u>	<u>Total Sample</u>	<u>Expected # Interviewed</u>	<u>Expected # Examined</u>
Total sample	40,569	36,512	30,021
Mexican-American	11,897	10,707	9,042
Black American	11,919	10,727	9,058
White & Other	16,753	15,078	12,062

Update on the Third National Health and Nutrition Examination Survey (NHANES III)

Table 3
Preliminary NHANES III Phase I (1988-91) Interview
and MEC Examination Rates

Age within sex group	#SPs	%Interviewed	%Examined of total
Total Phase I	20,277	86.1	77.1
Males	10,130	85.3	76.4
Females	10,141	87.0	77.8
<u>Males</u>			
2-11 months	596	95.0	85.4
1-5 years	1,675	94.2	87.8
6-19 years	1,957	90.0	83.9
20-44 years	2,679	81.3	73.8
45-59 years	1,100	77.6	70.5
60-74 years	1,269	79.5	69.0
75+ years	841	82.0	58.3
<u>Females</u>			
2-11 months	575	96.5	89.7
1-5 years	1,795	94.7	87.6
6-19 years	2,005	90.6	85.3
20-44 years	2,519	87.0	80.5
45-59 years	978	81.4	73.7
60-74 years	1,274	77.2	64.4
75+ years	980	79.8	53.8

Table 4
Features of the NHANES III
Dietary Data Collection (DDC) System

- Automated data collection and coding
- Standardized interview format
- Structured interview probes
- Detailed information obtained on all foods and beverages reported

Table 5
Preliminary dietary interview component response rates,
by age: NHANES III-Phase I, 1988-91

Age	# Examined Persons	# Completed Interviews	% Completed Interviews
All ages	15,577	15,257	97.9
≤ 5 years	4,049	4,008	99.0
6-11 years	1,821	1,796	98.6
12-19 years	1,519	1,485	97.8
20-39 years	3,270	3,204	98.0
40-59 years	2,214	2,156	97.4
60-74 years	1,691	1,640	97.0
75+ years	1,013	968	95.6

Table 6
Preliminary response rates for first SNS
24-hr recall interviews (n=2,797)¹

<u>Final Status</u>	<u>Percent</u>
Completed interviews	79
Refusals	6
No telephone	5
Deceased	2
Other reasons (e.g. no proxy)	8

Table 7
Preliminary response rates for second SNS
24-hr recall interviews (n=1,479)²

<u>Final Status</u>	<u>Percent</u>
Completed interviews	70
Not attempted	13
Refusals	3
Deceased	2
Other reasons (e.g. no proxy)	2

¹ NHANES III Stand locations 1-34

² NHANES III Stand locations 1-18