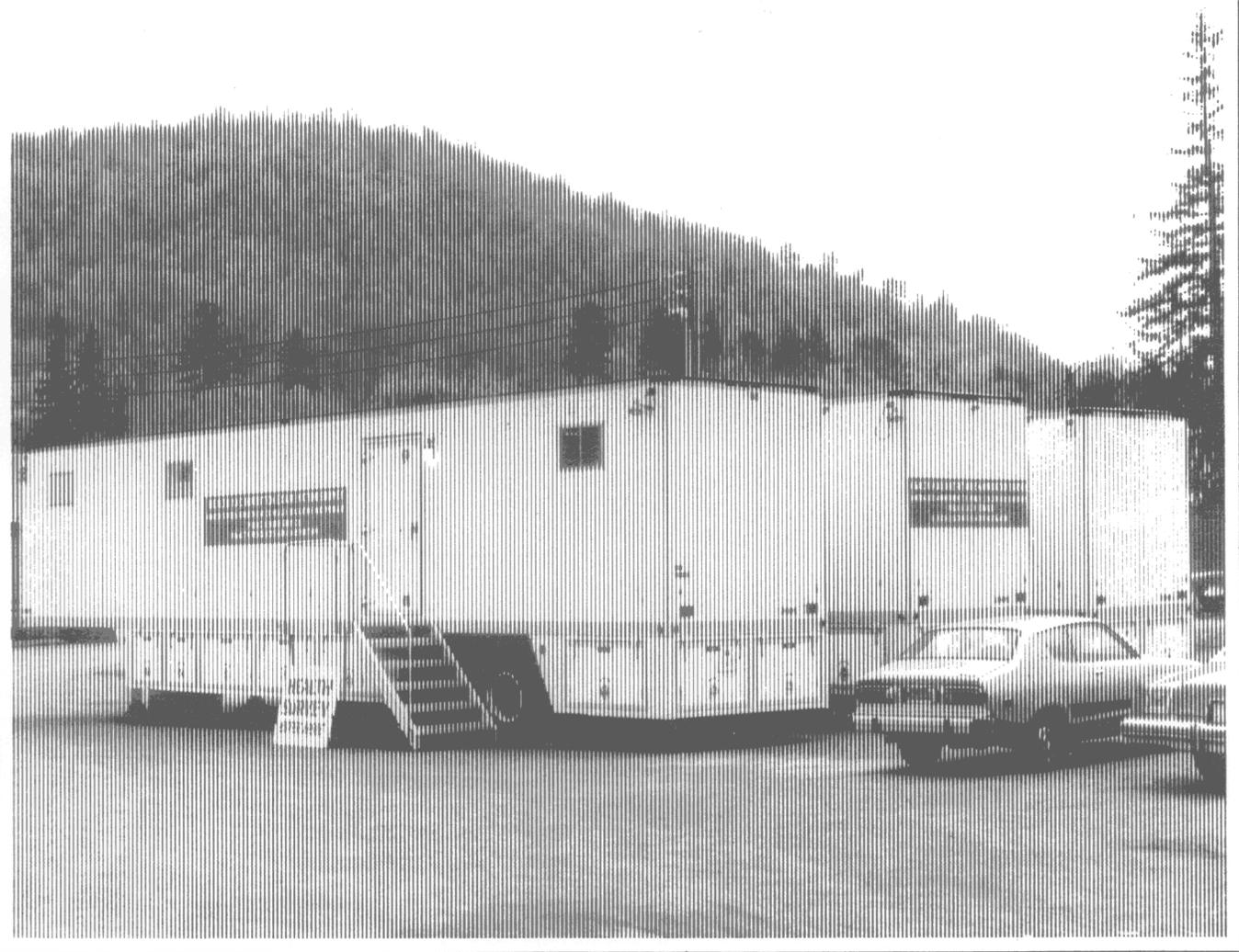




Improving the Health and Nutrition Examination Survey

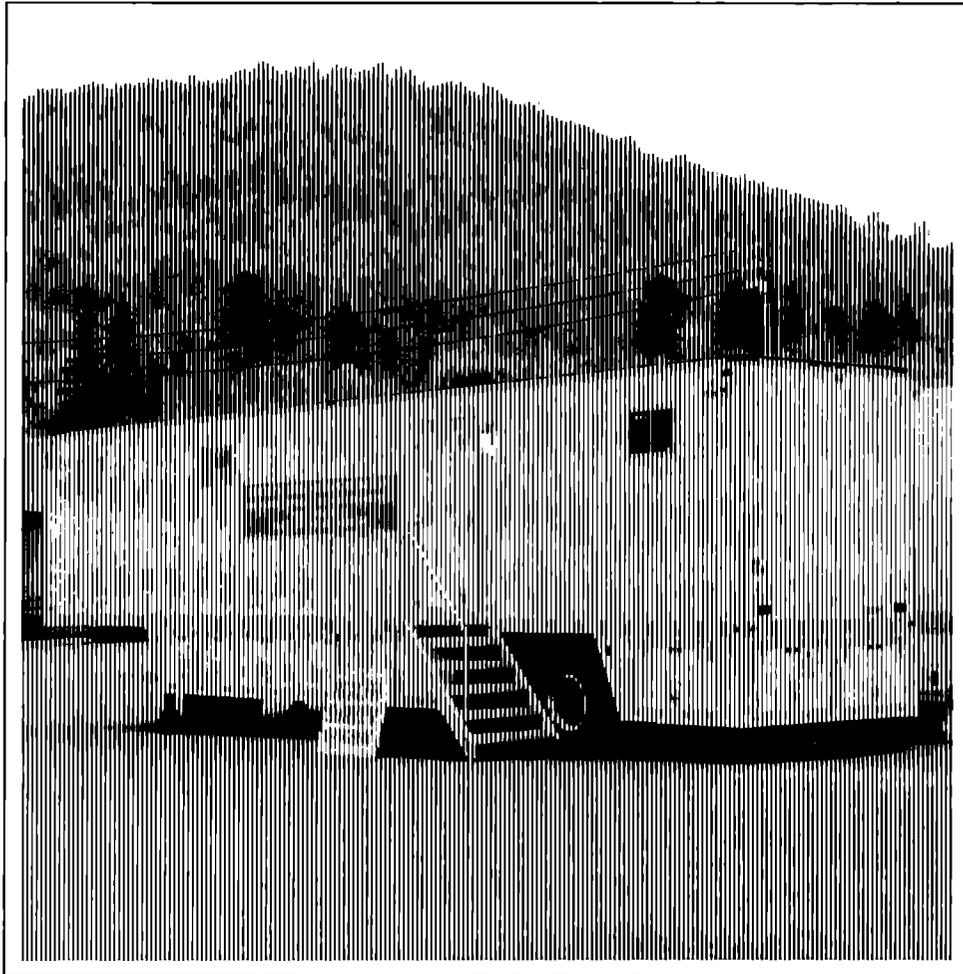
An Evaluation by a Panel of the National Academy of Public Administration

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



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Hyattsville, Maryland
June 1981

FOREWORD

Throughout the decade of the seventies political and scientific concerns about the scope and content of Federal nutrition activities were evidenced in congressional hearings, legislation, appropriation bills, and congressionally requested inquiries conducted by the Office of Technology Assessment and the General Accounting Office, U.S. Congress. The Office of Science and Technology Policy, Executive Office of the President, formed the Joint Subcommittee on Human Nutrition Research with broad Federal agency representation to better coordinate human nutrition research activities. The Congress and Executive Branch have indicated a desire to develop a coordinated national nutrition monitoring system of which the National Health and Nutrition Examination Survey (NHANES) and other National Center for Health Statistics (NCHS) activities would be integral parts.

To help clarify and define the role NHANES should play in the national nutrition monitoring activities, NCHS contracted with the National Academy of Public Administration (NAPA) to evaluate the nutrition component of the NHANES mechanism and its ability to provide information needed to answer major public policy questions about the nutritional status of the U.S. population and about how nutritional status relates to other measures of health or health risk. The evaluation covered all aspects of the survey from conceptual framework through the timeliness and quality of results available in published form or on microdata tape. The staff of the Division of Health Examination Statistics felt the evaluation would also focus on the strengths and limitations of cross-sectional national probability studies so that expectations of the NHANES would more nearly match its actual and potential contributions to knowledge about the Nation's nutritional status.

NAPA formed a panel of experts to review NHANES and other Federal nutrition activities, their objectives, their specific content and released data, the processes through which the activities were developed and implemented, and the relationship of the activities to each other; each was scrutinized from many points of view. The successful completion of the project and final report were ably managed by Dr. Harold Orlans, a staff member of NAPA. The thoughtful and sometimes provocative discussions and materials prepared during the course of the project by the panel members and by others who made their thoughts available to the panel are gratefully acknowledged and appreciated.

Each of the conclusions and recommendations of the panel will receive careful consideration for implementation by NCHS. In fact, some have already influenced the plans for the Hispanic Health and Nutrition Examination Survey to begin in July 1982. The funds for this evaluation project were provided through the Department of Health and Human Services' Evaluation Program.



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Director, DHES

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INTRODUCTION

This report has been prepared under the provisions of a September 1977 contract between the Academy and the Health Resources Administration of the Department of Health, Education, and Welfare, acting on behalf of the National Center for Health Statistics (NCHS). The contract called for the appointment of a panel to evaluate the Health and Nutrition Examination Survey (HANES) and recommend any changes which would make it more useful in addressing "health problems...related to nutrition" (my italics); the project was titled "Evaluation of the Utility of the HANES Mechanism in Answering Questions About Nutritional Public Health Problems."

It is important to stress this because some readers have criticized the panel's concentration on nutritional questions to the neglect of other health questions of larger public concern. The answer to this criticism is that the panel has taken as broad an approach as was consistent with its charge. Indeed, its report states, "Nutrition...is only a part of health; to single it, or one of a hundred other parts, out for equal attention with the whole is to exaggerate its importance." As noted in Chapter II, what is now the Health and Nutrition Examination Survey started as a Health Examination Survey. Under the National Health Survey Act of 1956 and subsequent statutes, NCHS has responsibilities for surveying the nation's health status which would continue even if the nutritional aspects of its work were terminated or transferred to another agency.

Panel members were selected for their experience with health and nutritional policy issues and with the uses of technical data for policy purposes, as well as for their technical competence in the fields of public health, nutrition, and epidemiology.

Once constituted, an Academy panel is a self-governing body that assumes responsibility for its reports and recommendations: that is, this is a panel report, not a report to which the Academy as a whole necessarily subscribes. Indeed, only three members of this panel—James Sundquist and Co-Chairmen Wilbur Cohen and William Stewart—are members of the Academy. In releasing a report, the Academy certifies only that it is a statement, worthy of public attention, by a broadly composed panel qualified to examine the issues addressed.

Panels normally make every effort to reach agreement, but occasionally, when judgment remains divided, the views of individual members may be reported. That has happened, in the present instance, on two points:

1. The periodicity with which HANES surveys of the national population should be conducted. Seven panel members recommend that they be conducted every 5 years. As detailed in the text (pp. 106-7), one member, Hamish Munro, believes that a national survey every 10 years is adequate.

2. The duration of each national survey. Seven members believe that

these should be completed in 24-30 months. One member, Jean-Pierre Habicht, recommends a novel arrangement in which the first national survey would take 5 years and, thereafter, revised national reports could be issued annually (see p. 107).

On a third point of special importance, one member, Sol Chafkin, expresses disappointment with, without dissenting from, the panel's conclusions about the policy uses of HANES. The panel has concentrated on defining the kinds of policies for which HANES data are useful, summarizing its views as follows:

The public policies affected by health monitoring and assessment are often those involved in the planning and allocating of personnel and financial resources for research into, and the prevention and care of, different health and nutritional conditions; the education of different health personnel; and the construction or manufacture of different health facilities and equipment. HANES normative data have been important to the establishment of regulatory policies and evaluating their effectiveness.

In working through its advice on the planning of the next HANES survey—it recommends a survey of the health and nutritional status of Hispanic Americans—the panel prepared a detailed list of policy questions and the specific methods and measures by which data on them can be obtained (see Chapter VII). For several reasons, including limited resources and a conviction that each survey is best planned directly before it is undertaken, the panel did not prepare a similar list of questions for the next HANES survey of the national population, which may start in 1982 or 1983. (However, it does provide, on p. 111, a suggested list of items for the repetitive core of all national surveys.)

Chafkin regrets this and writes that the panel should indicate, for example, if HANES "could cast important light on...the possibility of significant relationship between diet and certain killer diseases and infant mortality; and the significance of nutrition among teenage females (in light of public concern about teenage pregnancy and possible effects on offspring...); whether any basis exists for public concern about the effects, if any, of certain processed foods on health, etc., etc."

The foregoing summarizes the points on which individual members have expressed significant disagreement with their colleagues. In an area as contentious as that of the relation between nutrition and health and of the nutritional sciences to health policies, this testifies to the degree of accord reached by the panel in its evaluation of HANES and its recommendations for steps which should be taken to improve the usefulness of this unique examination survey.

HANES effectively monitors changes in the prevalence of health and nutritional conditions that can be reliably measured in, let us say, 2 percent or more of the general population. In the panel's view, that is its indispensable

and distinctive function. But the panel also stresses that HANES "is not designed to replace laboratory experiments, field trials, intensive longitudinal research, program evaluations, or the screening of individuals for medical or nutritional services." It is not a good means of scientific inquiry or program evaluation, which require, not the broad examination such as HANES conducts of a random sample of the population with strict attention to the comparability of samples and measures in successive surveys, but the intensive examination of carefully chosen experimental and control groups to clarify the relation between selected factors.

The full panel met six times for a total of eleven days between November 1977 and August 1979; several members also met with experts on the health of Hispanic Americans for three days in April and June 1979, met repeatedly for intensive working sessions with staff, and provided extensive advice and suggestions throughout the project. In short, panel members have worked long and hard, and, on behalf of the Academy, I want to thank them all for their efforts. Special thanks should be given to Jean-Pierre Habicht, Richard Remington, and William Stewart for their help in outlining and correcting the report and resolving questions which arose during its preparation.

I want also to thank the individuals named on p. 68 for their helpfulness in connection with the panel's exploration of a survey of the health and nutritional status of Hispanic Americans.

Over 200 scientists, officials responsible for federal and state health and nutrition programs and policies, and other prominent health and nutritional authorities responded to an inquiry conducted by the panel in 1978 (see Appendix A). Their views on HANES, summarized in Chapter VIII, were of great help to the panel.

The following individuals attended one or more panel meetings and helped to inform and advise the panel about HANES and/or related surveys, and their interests in health and nutritional survey data: Richard Brandon, Senate Budget Committee; Nicholas Mottern, Senate Select Committee on Nutrition and Human Needs; Jack Brock, General Accounting Office; Catherine Woteki, Office of Technology Assessment; Louis Blair, Office of Science and Technology Policy; Joseph Duncan, David Hirschberg, and Milo Sunderhauf, Office of Federal Statistical Policy and Standards, Department of Commerce; Ruth Hanft, Michael McGinnis, and James Scanlon, Office of the Assistant Secretary for Health, Department of Health, Education, and Welfare; J. Michael Lane, Center for Disease Control; Allan Forbes and J.E. Vanderveen, Food and Drug Administration; Artemis Simopoulos and Thomas Vogl, Office of the Director, National Institutes of Health; James Iacono and Robert Rizek, Department of Agriculture; Robert Nesheim, Quaker Oats Company; and Richard Allison, Federation of American Societies for Experimental Biology; National Center for Health Statistics Director Dorothy Rice and Deputy Director Robert Israel, Elijah White, Peter Hurley, Henry Miller, and Clinton Burnham; Arthur McDowell and Michael Hattwick, the two preceding Directors, and Robert Murphy, the present Director, of the Division of Health Examination Statistics, and DHES staff Sidney Abraham, Helen Barbano,

Arnold Engel, Frank Lowenstein, Kurt Maurer, Jean Roberts, and Robert Roberts.

Of course, none of the foregoing is responsible for the recommendations, conclusions, or any errors remaining in this report.

Harold Orlans of the Academy staff served as director of this project from September 1977-July 1978 and September 1979-July 1980, and Dale R. Lindsay, a science administrator with extensive experience in the Public Health Service and several universities, from August 1978-August 1979; Mary Bastian was project secretary.

George H. Esser, President
National Academy of Public Administration
July 1980

Definitions and Acronyms

assessment—comprehensive measurements at a given time

monitoring—the measurement of change over time by repeated, comparable assessments

prevalence—the proportion of a population or group with a particular condition

surveillance—selected brief measurements which are rapidly analyzed for possible use in treating or serving groups of individuals

CDC—Center for Disease Control, Atlanta; part of the Public Health Service, Department of Health and Human Services

DOE—Department of Energy

EPA—Environmental Protection Agency

EPSDT—Early and Periodic Screening, Diagnosis, and Treatment, a Department of Health and Human Services preventive health care program for children eligible for Medicaid

FDA—Food and Drug Administration, Department of Health and Human Services

FTC—Federal Trade Commission

GAO—U.S. General Accounting Office, the investigatory and auditing arm of Congress

HANES—Health and Nutrition Examination Survey, conducted in 1971-75 (HANES I) and 1976-80 (HANES II)

HES—Health Examination Survey, predecessor of the Health and Nutrition Examination Survey. HES I was conducted from 1959-62; HES II, from 1963-65; and HES III, from 1966-70. The detailed health component of HANES I may also be designated as HES IV (1971-75).

HEW—Department of Health, Education, and Welfare; since May 1980, the Department of Health and Human Services

HIS—Health Interview Survey, an interview survey conducted by the National Center for Health Statistics

NCHS—National Center for Health Statistics, the section of the Department of Health and Human Services responsible for HANES and other health statistical activities

NFCS—Nationwide Food Consumption Survey, conducted by the Department of Agriculture in 1977-78, 1965-66, and on four preceding occasions

NIAMDD—National Institute of Arthritis, Metabolism, and Digestive Diseases, National Institutes of Health

NIH—National Institutes of Health, Department of Health and Human Services

NINDS—National Institute of Neurological Diseases and Stroke, National Institutes of Health

NNSS—National Nutrition Surveillance Survey, initial name of the first Health and Nutrition Examination Survey (HANES I) minus the detailed health examination (HES IV)

NSMS—Nutritional Status Monitoring System, and elaborate comprehensive proposal to increase and improve information about nutritional and food practices, status, and programs, adopted by the Secretaries of Agriculture and HEW in 1978 in response to Congressional directives

OFSPS—Office of Federal Statistical Policy and Standards, Department of Commerce

OSTP—Office of Science and Technology Policy, Executive Office of the President

RDAs—Recommended Dietary Allowances published by a committee of the National Research Council

USDA—U.S. Department of Agriculture

WIC—Special Supplemental Food Program for Women, Infants, and children, Department of Agriculture

I CONCLUSIONS AND RECOMMENDATIONS

1. The Health and Nutrition Examination Survey (HANES) is a unique national resource: it is the only means by which strictly standardized physical examinations of a representative sample of the population are now conducted.

2. The highest priority in HANES surveys should be given to the collection of a core of constant measurements which monitor changes in the prevalence of health conditions over time. With the decline in mortality rates, and in the usefulness of mortality data for planning purposes, such morbidity data have assumed greater importance in planning health services and allocating public and private resources to health programs, facilities, and education. This core set of standardized measures, which should be repeated in every national population survey, may occupy about half of the average two-hour examination.

3. The remainder of the examination should assess selected conditions of special national interest, which may change from survey to survey.

4. The third national Health and Nutrition Examination Survey should begin around 1983 and be completed in 24 to 30 months.

5. Subsequent national population surveys should be repeated every five years, the midpoint coinciding, as closely as possible, with that of the Nationwide Food Consumption Survey.

6. In the interval between national population surveys, one or more surveys should be conducted of special population subgroups, such as ethnic, geographic, or age groups. Upon completion of the current national population survey in 1980, a survey of Hispanic Americans should be conducted.

7. HANES and the Department of Agriculture's Nationwide Food Consumption Survey (NFCS) are sources of important, interlocking data on the nation's health, nutrition, diet, and food utilization. Comparable planning, scheduling, sampling, field procedures, and coding should render HANES examination and NFCS interview data complementary for given socio-economic and demographic groups.

8. If such scrupulous comparability is achieved, responsibility for the 24-hour dietary recall and food frequency element of HANES, which is now largely duplicated by NFCS, can be assumed solely by NFCS in any quinquennium when both are conducted. While this would preclude the association of dietary data with health measures on the same individuals, the comparability of the two surveys would permit such an association for demographic and socioeconomic groups. The requisite comparability should be determined by a committee of experts designated by the Office of Science and Technology Policy or the Office of Federal Statistical Policy and Standards.

9. That office should ensure that NFCS and HANES cooperate effectively to provide the data needed by governmental and private bodies to assess and monitor the nutritional status of the population without jeopardizing the vital HANES function of monitoring the health status of the population.

10. The National Center for Health Statistics should take the following steps to improve HANES operations and reporting:

a. A committee should be established to advise the Center director on the kinds of health and morbidity data which should be collected by the Health and Nutrition Examination Survey.

b. A panel of experts, augmented by consultants in specialized areas of inquiry, should be convened to advise HANES staff on the repetitive core and additional measures to be obtained in each forthcoming survey. (For example, some members of our panel believe that measures of children's school performance should be obtained in the next national survey.)

The final product of their work should be a series of dummy tables with an explanation of their conceptual basis, purpose, and prospective analysis. A computer program to produce these tables should be ready before data collection ends. The proposed analysis should be practicable and meaningful within the limits of the data's reliability; in turn, the needs of analysis should indicate the necessary reliability of measurements.

Panel members and consultants should periodically monitor the adequacy of these standards during the course of examinations, receive preliminary compilations, and contribute to the subsequent analysis of data in their field.

c. The precision of individual measurements should be determined before a survey is begun; their reliability over time for the same individuals should be established by reexamining a small subsample of subjects. Procedures for checking the precision of measurements should be built into the examination so that questionable or inconsistent data can be identified and, if necessary, corrected before a subject leaves the site.

d. The coding and editing of data should be current with its recording so that a corrected tape with most data obtained during the examination should be available as the examinee leaves the site. With on-line computer technology in the examination centers, this objective is entirely practicable.

e. Examinations conducted by contract in mobile caravans or fixed sites should be employed to speed up data collection, provided that the quality and comparability of data and a high participation rate are maintained.

f. The examination rate of sampled persons has dropped from 87-96 percent in the first three Health Examination Surveys to 73-74 percent in HANES I and II. The latter rate is not ideal and, should it fall, could endanger the value of the survey. To guard against that danger, methods of increasing the participation rate should be investigated.

g. A plan for tabulating, analyzing, and reporting all data should be prepared before examinations are begun, including the following components:

i. Preliminary high priority data should be released before fieldwork is concluded. The provision of such data can be facilitated by scheduling examinations so that a representative national or regional sample is obtained at one or more interim stages.

ii. Within 12-15 months of the conclusion of examinations, complete data tapes should be released to the public.

iii. These tapes should be accompanied by a complete set of tables reporting all data by appropriate, predetermined, basic socioeconomic and demographic factors.

iv. Subsequent, more detailed analyses should be prepared by HANES staff, consultants, and other government agencies.

v. Increased emphasis should be given to analyses by scientists who are not on the HANES staff, which will never be large or expert enough to analyze adequately the full range of survey data. Outside data analyses and discussion of their scientific and policy significance should be encouraged by various means including the assignment of HANES staff to facilitate the use of tapes, discussions at scientific meetings, and the award of consultantships, contracts, and/or grants for designated analyses. Consultants and members of the advisory panel for each survey should also help to analyze and foster the analysis and discussion of its findings.

II BACKGROUND OF NATIONAL HEALTH SURVEYS

A comprehensive appraisal of the population's health status—of the distribution of health conditions and disabilities among various segments of the population—is necessary for the intelligent allocation of health resources and planning of health services. The national collection of annual birth and death statistics began in 1900, but only in 1933 were all states finally included. These vital statistics were supplemented by statistics of "notifiable" communicable diseases which many states required doctors to report. However, the gradual decline of mortality rates and the conquest of many communicable diseases rendered both sets of statistics less useful for public health planning purposes. The statistics of notifiable diseases also became less complete as doctors grew laxer in their reporting as epidemics waned and quarantine measures slackened. Hence, better measures were sought of the prevalence of chronic diseases, which began to constitute the main illness burden of society and a major factor inhibiting the quality of life.

Interview surveys of the prevalence of sickness in South Carolina cotton-mill towns and Hagerstown, Maryland were initiated by Edgar Sydenstricker in 1916 and 1921, respectively. 1 During the next three decades, similar and improved surveys were conducted in other cities (including New York, Baltimore, Pittsburgh, Kansas City, and San Jose) and the State of California by local, state, and U.S. public health authorities, university schools of public health, and health insurance agencies. The first surveys to add medical examinations to interviews were evidently those in Baltimore and in Hunterdon County, New Jersey, sponsored by the Commission on Chronic Illness in the early 1950s. 2

The step from local to national surveys was taken in 1935-36, when a massive national health survey financed by the Works Project Administration obtained interview information on the prevalence of disabling illnesses, chronic diseases, and impairments in 737,000 urban households. Questions and supplements on morbidity were periodically incorporated in the monthly interviews of a national sample of households begun by the Bureau of Census in 1943 to gain information on the labor force; in 1953, the private National Opinion Research Center began a series of surveys on the use of and expenditures for medical care.

In 1950, the National Committee on Vital and Health Statistics (established the previous year by the Surgeon General pursuant to a recommendation of the First World Health Assembly) formed a National Morbidity Survey subcommittee to review the needs for morbidity statistics and prepare a program for meeting them. The subcommittee's 1953 report, Proposal for Collection of Data on Illness and Impairments: United States, found that morbidity statistics were needed for "administrative planning and evaluation of health programs; determining current health needs for medical and dental service, facilities and personnel; suggesting hypotheses and providing other aids to medical research; determining manpower needs; estimating

markets for manufacturers of drugs and appliances; supplying statistics for public health education programs." The statistics available to meet these needs were inadequate and often dated; for many purposes, reliance was still placed on the national health survey of the mid 1930s. A "minimal adequate program" to secure more timely data "would necessitate collection of data of national scope on incidence, prevalence and the duration of disability for the major categories of disease and impairment. The data should allow subclassification by sex, by several age groups, and by employment, educational, income and occupational status...." To collect these data, two continuing national sample surveys were recommended: an interview survey "adequate to provide regional estimates at intervals of two years and estimates for the nation...at quarterly intervals," and an examination survey employing "mobile examination units" to "obtain data on undiagnosed and nonmanifest disease, by means of laboratory screening, detection, and physical examinations of subsamples drawn from the general [interview] surveys." 3

These recommendations were endorsed and implemented by the National Health Survey Act of 1956 (Public Law 84-652), which declared:

Sec. 2. (a) The Congress hereby finds and declares—

(1) that the latest information on the number and relevant characteristics of persons in the country suffering from heart disease, cancer, diabetes, arthritis and rheumatism, and other diseases, injuries, and handicapping conditions is now seriously out of date; and

(2) that periodic inventories providing reasonably current information on these matters are urgently needed for purposes such as (A) appraisal of the true state of health of our population (including both adults and children), (B) adequate planning of any programs to improve their health, (C) research in the field of chronic diseases, and (D) measurement of the numbers of persons in the working ages so disabled as to be unable to perform gainful work.

(b) It is, therefore, the purpose of this Act to provide (1) for a continuing survey and special studies to secure on a non-compulsory basis accurate and current statistical information on the amount, distribution, and effects of illness and disability in the United States and the services received for or because of such conditions; and (2) for studying methods and survey techniques for securing such statistical information, with a view toward their continuing improvement....

Sec. 305. (a) The Surgeon General is authorized (1) to make, by sampling or other appropriate means, surveys and special studies of the population of the United States to determine the extent of illness and disability and related information such as: (A) the number, age, sex, ability to work or engage in other activities, and occupation or activities of persons afflicted with chronic or other

disease or injury or handicapping condition; (B) the type of disease or injury or handicapping condition of each person so afflicted; (C) the length of time that each such person has been prevented from carrying on his occupation or activities; (D) the amounts and types of services received for or because of such conditions; and (E) the economic and other impacts of such conditions; and (2) in connection therewith, to develop and test new or improved methods for obtaining current data on illness and disability and related information.

(b) The Surgeon General is authorized, at appropriate intervals, to make available, through publications and otherwise, to any interested governmental or other public or private agencies, organizations, or groups, or to the public, the results of surveys or studies made pursuant to subsection (a)....

Under this act, the two ongoing sample surveys of the population envisaged by the National Morbidity Survey subcommittee were instituted: the Health Interview Survey and the Health Examination Survey, which began operations in 1957 and 1959, respectively.

The Health Interview Surveys

Since fieldwork began in July 1957, the Health Interview Survey (HIS) has interviewed 690 to 810 households a week or 36,000 to 42,000 a year. Information is usually obtained on all household members; some 111,000 persons (2.7 per household) were surveyed in 1977, 95 percent of those sampled. Interviewing has been conducted by 110 part-time interviewers, civil service employees of the Bureau of the Census, under contract with the National Center for Health Statistics. The contract for sampling and interviewing comprised \$3.7 million of the \$4.5 million HIS 1978 budget.

Each week's sample is representative of the national civilian noninstitutional population, permitting the monitoring of seasonal prevalence changes and the preparation of quarterly estimates, although these have been issued only for acute conditions. In emergencies such as flu epidemics, estimates have been issued two weeks after a week of interviewing. An even more rapid telephone survey capability is being tested.

The average household interview time has been 50 minutes and the range, 20 to 180 minutes, depending on the number of household members and health conditions.

About 60-70 percent of the questionnaire is devoted to a stable core of items including basic demographic information, the number of disability days and physician and dental visits during the preceding two weeks and the conditions responsible for them, long-term disability and chronic conditions, all hospital episodes during the preceding 12 months, and the interval since the last visit to a doctor or dentist.

Each year's survey also contains a set of items on the chronic conditions of a different body system, which is repeated every six years. Thus, in 1968, digestive conditions were investigated; in 1969, conditions of the bones, joints, muscles, and skin; in 1970, the respiratory system; 1971, impairments; 1972, the cardiovascular system; and 1973, the nervous system, glandular disorders, and the genitourinary system. After a pause in 1974, the cycle was resumed in 1975 with questions on the digestive system; in 1976, the skin and musculoskeletal system; 1977, impairments; and so forth.

In addition, supplementary questions may be repeated periodically or asked only in one year or a portion of the year.

For 1975 there were supplements on accidents and injuries, health maintenance organizations, physical fitness, and, for the first quarter of 1975 sample only, expenditures for health services and health insurance....The 1976 supplements were on diabetes, health habits, influenza, and health insurance coverage. The 1977 topics include disability, stroke, a hearing scale for persons reporting hearing problems and...health habit questions. 4

Five to six tapes containing all of one year's HIS data are available for purchase in July of the following year; the same computer program for the core items can be used from year to year. Estimates for all questionnaire items are published by September or November; for example, the Current Estimates for the 1976 survey is dated November 1977, and that for the 1977 survey, September 1978. Some 10 to 15 other publications on each year's survey follow, the last about 5 years after data collection. "Since not all possible cross-tabulations can be analyzed and published..., many unpublished tabulations are routinely made available upon request. In addition, within budgetary and other limitations, special tabulations are prepared upon request." 5

Despite the large sample size, estimates have been prepared for only four regions and the eight largest metropolitan areas. The response to requests for state and county estimates has been limited. However, HIS has published synthetic estimates for all 50 states and will help a state or community to conduct its own survey (see also p. 92).

HIS has also cooperated with the National Center for Health Services Research in a survey which utilized a national panel of 11,500 households to obtain information on expenditures for the utilization of medical services and health insurance.

The Health Examination Surveys

Whereas the Health Interview Survey began fieldwork a year after passage of the National Health Survey Act, it took another two years and four months for the Health Examination Survey to do so. Mobile examination caravans had to be designed and equipped, the inventory of measurements and questions had to be planned, the necessary equipment installed and carefully standardized, professional and support personnel recruited and trained, and the

entire ensemble of equipment, personnel, and procedures repeatedly tested and readjusted. The sampling units and sites had to be selected and the caravan routes and schedules arranged. Finally, in November 1959, the first set of caravans began examinations in Philadelphia; a second set was added the following year. The survey began slowly "because of a lack of equipment and staff"; full-scale data collection started in April 1961. 6

The first Health Examination Survey (HES I) sought to examine a representative stratified sample of the noninstitutionalized civilian population 18 through 79 years old in the 48 contiguous states. Of the 7,710 persons sampled, 6,672 or 86.5 percent were examined in the 37 months from November 1959 through December 1962, an average of 159 in each of the 42 locations across the country where the caravans were located for three- or four-week periods.

The next survey initially aimed to examine persons 6 through 17 years old, but differences between the younger and older age segments in ability to answer a written questionnaire and in size and, hence, instrumentation requirements, and a concern that a program of "children's" examinations might reduce the participation of teenagers led to a decision to split the age group. (However, the Health and Nutrition Examination Survey subsequently demonstrated the feasibility of examining a wider age spectrum.) Hence, the second survey (HES II) focused on children 6-11 and the third (HES III), on youngsters 12-17. The sampling frame for both surveys was enlarged to include Alaska and Hawaii, although, as it happened, the random sampling procedure designated no examinations in either state.

HES II examined 7,119 children in the 29 months from July 1963 through December 1965, an average of 178 in each of the 40 sampling sites; on a normal day, a dozen children might be examined. Fully 96 percent of the children sampled were examined, a phenomenal achievement for a two-phase survey involving an initial household visit and subsequent examination. In two sampling sites 100 percent participation was achieved and in none did it fall below 90 percent. HES III examined 6,773 youngsters, 90 percent of those sampled in the same 40 sites, including 2,271 who had been examined in HES II. However, budgetary cuts reduced operations from two sets to one set of caravans for a time, the number of monthly examinations fell to 141 from the 245 in HES II, and it took four years, from March 1966, to March 1970, to examine 346 fewer persons.

Table 1 summarizes the duration, age range, sample size, and the number and rate of examinations in each of the three Health Examination Surveys as well as the two succeeding Health and Nutrition Examination Surveys (which will be discussed in Chapter IV).

Table 1
Examination Surveys, 1959-80

Survey	Duration	Ages	Sampled	Number			Percent Examined
				Total	Per Year*	Per Month*	
HES I	11/59-12/62	18-79	7,710	6,672	2,160	180	86.5
HES II	7/63-12/65	6-11	7,417	7,119	2,940	245	96.0
HES III	3/66-3/70	12-17	7,518	6,773	1,690	141	90.1
<u>HANES I**</u>	<u>4/71-10/75</u>	<u>1-74</u>	<u>32,331</u>	<u>23,808</u>	<u>5,064</u>	<u>422</u>	<u>73.6</u>
HES IV	4/71-10/75	25-74	9,881	6,913	1,536	128	70.0
NNSS	4/71- 6/74	1-74	28,043	20,749	6,552	546	74.0
<u>HANES II</u>	<u>2/76-2/80</u>	<u>6mo.-74</u>	<u>27,805</u>	<u>20,325</u>	<u>5,081</u>	<u>423</u>	<u>73.1</u>
	1976		5,931	4,452	5,088	424	75.1
	1977		6,900*	5,000*	5,000*	417*	72.5*
	1978		6,429	4,719	4,719	393	73.4
	1979		6,900*	5,100*	5,100*	425*	73.9*
	1980		1,645*	1,054*			64.1*

*Approximately

**The entries for HES IV and NNSS do not add to those for HANES I because HES IV examinees included 3,854 persons who were, and 3,059 who were not, also examined in NNSS.

HES: Health Examination Survey

HANES: Health and Nutrition Examination Survey

NNSS: National Nutrition Surveillance Survey

All HES samples were drawn by the Bureau of the Census under contract. The 40 or 42 sample sites in each survey divided randomly into three rounds, each representative of the appropriate age range of the national population. This was done to permit interim reporting and pilot analyses before completion of a survey, and as a safeguard should costs rise sharply above expectations and appropriations be cut or terminated. "The three part design would make it possible to salvage something from the undertaking if it had to be curtailed at the point of one third or two thirds of completion." 7

Census staff visited the sampled households, conducted a 20-minute interview, and, in HES I, arranged an examination appointment for every other household member of an eligible age. The interview, repeating pertinent questions of the Health Interview Survey, obtained information on age, sex, and race; the type and length of illnesses, impairments, and injuries; length of hospitalization during the past 12 months; the health status of each prospective examinee, the name of his or her doctor and dentist, and when they were last seen. An HES representative paid a second visit to encourage participation by any person who did not make or keep an examination appointment. In HES II and III, HES representatives visited households with eligible persons and arranged for appointments. In all three surveys, transportation to and from the caravans was provided—in the second survey, the HES representative herself brought the children to the site and, in the third, an adult escort was provided, which undoubtedly contributed to the extraordinary participation rates obtained.

In HES I, the examination conducted in the caravan took about two hours; in HES II and III, it took three hours, largely because of the addition of an extensive battery of psychological tests. All three surveys included a core of common data as well as distinctive information obtained only for specified age groups (Table 2). The common core included information on household composition and demography, individual medical history, hand and chest x-rays, blood pressures, electrocardiogram, visual and auditory acuity, numerous body measures, and medical and dental examinations.

HES I, devoted to the adult population, concentrated on cardiovascular conditions, arthritis, rheumatism, and diabetes. One hour after a glucose drink, a venous blood specimen was taken and 1.5 to 2 hours after, a urine specimen. The blood was later examined for glucose, serum cholesterol, serum bentonite flocculation for rheumatoid factor, syphilis, and microhematocrit, and the urine, for the presence of sugar and (in males) albumin. Information was obtained on acute and chronic conditions and the number of days of restricted activity, bed-disability, and hospitalization resulting from each condition.

In HES II, devoted to children 6-11 years old, no blood or urine specimens were taken. However, many body measurements (30, compared to 16 in HES I), grip strength, a bicycle exercise test, and a host of psychological and educational measures were added. The psychological tests, prepared in consultation with staff of the National Institute of Mental Health and administered by a psychologist with at least a master's degree, included

Table 2

Content of First Three Health Examination Surveys

All three health examination surveys included medical and dental examinations; obtained hand-wrist and chest x-rays, blood pressures, and an electrocardiogram; and measured visual and auditory acuity, weight, height, girth, and skinfold thickness. All obtained a medical and health history and information on household composition and demography. In addition, individual surveys obtained information on the following topics:

	<u>Survey</u>		
	I	II	III
<u>By examination</u>			
arthritis and rheumatism	x		
cardiovascular diseases	x		
diabetes	x		
foot x-ray	x		
blood analysis	x		x
urine analysis	x		x
saliva test			x
color vision		x	x
respiration (spirometry)		x	x
grip strength		x	x
exercise tolerance		x	x
healthy growth and development (special attention in physical examination)		x	x
<u>By interview, questionnaire, and document</u>			
disability and hospitalization days	x		
psychological tests		x	x
marital history of parents		x	x
health habits		x	x
eating habits		x	x
academic and social achievement		x	x
birth certificate		x	x
menstrual information			x

vocabulary and block design portions of the Wechsler Intelligence Scale, a human figure drawing, several cards from the Thematic Apperception Test, and tests of arithmetic and reading achievement. A questionnaire completed by school officials and teachers supplied information on the child's grade, conduct, and academic performance; the medical history included questions on eating habits and the food eaten during the preceding day.

The inventory of data collected in the HES III survey of youths 12-17 resembled that in HES II, with a few modifications. Blood and urine samples were restored, and determinations made of total serum cholesterol, uric acid, protein-bound iodine, hemoglobin content, and blood type; saliva was taken for a blood group antigen test; genital hair, male genitalia, and female breasts were assessed for maturation; a nurse asked females a number of questions about menstruation; and a reading and writing literacy test was added, lengthening the psychometric battery to 70 minutes.

The philosophy of the health examination survey was to obtain a broad and balanced picture of the health of the population, the growth and development of its younger age segment, and the prevalence of such impairments, conditions, and diseases as could readily and reliably be identified in a single examination of some 7,000 persons. It was designed to provide useful information for a broad range of purposes rather than more detailed information for specialized purposes.

...the National Health Survey is not designed to serve any single health-program interest nor to meet the needs for detailed local data. Its task is to provide general background data which present the overall health situation and which show various components of the health problem in proportionate relation to each other and in relation to important population variables....

The absence from the survey of subject matter interests of its own is consonant with the policy of providing service...to those responsible for health research or operating programs....The program must not be unduly weighted in the direction of selected subject matter interests, even though these may be the most demanding at the particular moment. 8

Some 37 substantive (as against methodological) reports were issued on HES I, 32 on HES II, 32 on HES III, and 2 reporting data on youngsters 6-17, drawn from both HES II and III. Each report dealt with a particular health, developmental, or educational condition; none has attempted to present or summarize the full range of measures; many of the data collected have, of course, never been published. The goal of publications has been modest, "consisting primarily of exposition and illustrative uses of the data." Policy analysis was explicitly eschewed:

...the function of the Survey is to provide objective and accurate facts but not to interpret these facts so as to indicate any particular course of action or to support any particular health policy or

program. Policy implications of the statistical data are the responsibility of the legislator and the administrator. 9

Notes

1. See George W. Comstock, "Commentary," in Richard V. Kasius, ed., The Challenge of Facts, Prodist, New York, 1974, pp. 163, 165.

2. See Origin, Program, and Operation of the U.S. National Health Survey, National Center for Health Statistics, Vital and Health Statistics, Series 1, No. 1, August 1963, pp. 3-4, 26-7.

3. This account of the work of the subcommittee on the National Morbidity Survey and extracts from its 1953 report are drawn from History of the United States National Committee on Vital and Health Statistics 1949-1964, U.S Public Health Service, June 1966, pp. 7-8.

4. Health Interview Survey, 6-page offset briefing paper, undated but evidently prepared in 1977.

5. Ibid.

6. Origin, Program, and Operation..., p. 8.

7. Plan and Initial Program of the Health Examination Survey, National Center for Health Statistics, Vital and Health Statistics, Series 1, No. 4, 1974, p. 16.

8. Origin, Program, and Operation..., pp. 6-7.

9. Ibid., p. 7.

III NATIONAL DIETARY AND NUTRITIONAL SURVEYS

Food Consumption Surveys

The Department of Agriculture has sponsored national household food consumption surveys at initial intervals of about six, and subsequently over ten, years. Surveys were conducted in 1935-36, 1942, 1948 (urban households only), 1955, 1965-66, and 1977-78. Only the last two surveyed the food intake of individuals. In April-June 1965, information on the intake of food and beverage during the preceding day was obtained by interviews with 14,519 household members. An 85 percent household participation rate was achieved and 95 percent participation by those individuals from whom intake information was sought. About 18 publications were issued on the 1965-66 survey, the first in 1968 and the last in 1974; data tapes became available from 1970-72. The survey found that the dietary intake of significant proportions of the sampled population was "deficient" in vitamins A, B6, C, thiamine, riboflavin, iron, and calcium. However, the findings were based upon a comparison with Recommended Dietary Allowances, which are set at deliberately high levels "to exceed the requirements of most individuals and thereby ensure that the needs of nearly all are met." 1

The food intake portion of the April 1977-March 1978 Nationwide Food Consumption Survey (NFCS) overlapped sufficiently with that of the Health and Nutrition Examination Survey which we will later review to evoke criticisms of duplication and lack of coordination. NFCS was conducted by National Analysts of Philadelphia, an experienced market research firm, under a \$9 million contract with the Department of Agriculture's Consumer and Food Economics Institute. Some of the funds were contributed by agencies in the Departments of Health, Education, and Welfare and Commerce, which participated in the survey planning and had a special interest in particular findings.

The basic sample comprised some 15,000 households in 114 sampling sites representative of the population of the contiguous 48 states; however, the addition of a "bridging" sample to establish comparability with 1965-66 data and additional samples of low-income households, those with one or more members over 64 years, and households in Alaska, Hawaii, and Puerto Rico brought the total to over 30,000 households. A response rate of approximately 75 percent was achieved. Information was gathered on all foods consumed from household food supplies, including discards, during a 7-day period, by source, quantity, money value, and the form in which items entered the kitchen. Participants in the Food Stamp and Child Nutrition Programs were identified.

Information on food intake was obtained from over 70,000 individuals, 34,000 drawn from households in the basic national sample and the remainder, from the other household samples enumerated above. The large number of persons surveyed by interviewers operating at a uniform rate throughout the twelve month period enabled a representative national sample to be compiled

at quarterly intervals and seasonal dietary changes to be determined.

When an appointment was made for the household interview, the person responsible for preparing meals was asked to keep notes on food consumption. In the 1.5 hour interview, information was requested on the household's food consumption during the seven previous days. Thereupon

...the interviewer begins the 3-day food intake record for individuals, which includes a 1-day recall (yesterday) and a 2-day diary (today and tomorrow). The interviewer obtains 1-day recalls of food intake from all eligible household members present—or from the homemaker for young children. Concurrently, she trains the homemaker and others in completing the intake diaries. She leaves the food intake schedules with the household for completion.

An appointment is made for the interviewer to return 2 or 3 days later to pick up the schedules. 2

Information was obtained on each food and beverage consumed, its source, the form and quantity ingested, and the eating and drinking occasion. Limited data were also obtained on the usage of vitamins, minerals, and other supplements, special diets, health, and other factors affecting food use. Information is converted by computer into estimates of the caloric and nutrient content of individual intakes and of household foods consumed; comparisons are made between Recommended Dietary Allowances and the estimated intake for 14 nutrients.

An oral account of the April-June 1977 data was first given in May 1979; several preliminary reports were issued in November 1979; tapes on the spring quarter should be available in 1980. A private organization under contract with the department will process requests for tapes and make them available at cost.

Initial NFCS findings "agree reasonably well with average values reported by HANES [the Health and Nutrition Examination Survey]...." 3 One surprising finding was a 10 percent reduction in average caloric intake between the spring of 1965 and the spring of 1977. 4 The average 1977 individual daily consumption of 1800-1900 calories, Mark Hegsted, Administrator of the Department of Agriculture's Human Nutrition Center, observes, "is not greatly different from that reported in many of the developing countries where undernutrition and malnutrition are common." This startling fact may be partly explained by the larger portion of elderly persons in the American population, and of infants in the population of underdeveloped nations. Nonetheless, Hegsted adds, "a major problem" of the American diet remains "excessive consumption of fat, cholesterol, sugar, salt, and alcohol, as well as total calories." 5

Several governmental bodies have criticized the duplication, inadequate coordination, and other methodological and substantive aspects of NFCS and HANES. For example, the General Accounting Office has suggested that

HANES should examine a subsample of the population sampled by NFCS. Section 1428 of the 1977 Food and Agriculture Act provided that:

(a) The Secretary [of Agriculture] and the Secretary of Health, Education, and Welfare shall formulate and submit to Congress within ninety days...a proposal for a comprehensive nutritional status monitoring system to include:

(1) an assessment system consisting of periodic surveys and continuous monitoring to determine: the extent of risk of nutrition-related health problems in the United States, which population groups or areas of the country face greatest risk; and the likely causes of risk and changes in the above risk factors over time;

(2) a surveillance system to identify remediable nutrition-related risks to individuals or for local areas, in such a manner as to tie detection to direct intervention and treatment. Such system should draw on screening and other information from other health programs....; and

(3) program evaluations to determine the adequacy, efficiency, effectiveness, and side effects of nutrition-related programs in reducing health risks to individuals and populations.

(b) The proposal shall provide for coordination of activities under existing authorities and contain recommendations for any additional authorities necessary to achieve a comprehensive monitoring system.

The nutritional monitoring system proposed by the two Secretaries will be discussed subsequently.

The Ten-State Survey

April 27, 1967

The President
The White House
Washington, D.C.

Dear Mr. President: The subcommittee on Employment, Manpower and Poverty of the Senate Committee on Labor and Public Welfare...conducted a public hearing and field inspection trip in Mississippi on April 10 and 11. The committee heard testimony and observed, first-hand, conditions of malnutrition and wide-spread hunger in the Delta counties of Mississippi that can only be described as shocking and which we believe constitute an emergency....

The findings acquire more meaning, perhaps, when just one

family which the committee saw and interviewed is used as an example. This family had thirteen children. They told us that they had had grits and molasses for breakfast, no lunch, and would have beans for supper. Some of the children could not go to school because they had...distended stomachs, chronic sores of the upper lip, and were extremely lethargic—all of which are the tragic evidence of serious malnutrition....

In the judgment of the subcommittee, the situation has reached emergency proportions, due to the steeply rising level of unemployment produced by the mechanization of agriculture....we have been informed...that similar conditions have been found in other states. We trust, therefore, that whatever action is taken will be addressed to these conditions wherever they exist.

Respectfully submitted....

Joseph S. Clark, Chairman.... 6

The foregoing letter from the chairman and eight members of the Senate Subcommittee on Employment, Manpower and Poverty to President Lyndon Johnson was one of the first of many events in the late 1960s that drew national attention to the existence of hunger and malnutrition among impoverished persons in widely scattered parts of the nation.

In June 1967, six doctors issued a dismaying report on Mississippi children "whose nutritional and medical condition we can only describe as shocking....the boys and girls we saw were hungry—weak, in pain, sick....They were suffering from hunger and disease and...they were dying from them—which is exactly what 'starvation' means." 7 In April 1968, a Citizens Board of Inquiry into Hunger and Malnutrition released a report on Hunger—U.S.A. stating that many infants were dying of malnutrition; that nutritional anemia abounded among poor children; that there was "chronic hunger and malnutrition in every part of the United States"; that 256 "hunger counties" required "immediate and emergency attention"; and that hunger and malnutrition affected at least 10 million Americans. However, the Board acknowledged the lack of knowledge about the extent of malnutrition.

If this report is marred by any single element, it is the anomaly of asserting that a phenomenon exists, and that it is widespread, without being able to ascertain its exact magnitude or severity....

The Public Health Service has no knowledge of the extent of malnutrition in the United States, although it concedes that a serious problem exists. 8

The anomaly the Citizens Board cited, which U.S. Surgeon General William Stewart had confirmed in Congressional testimony, was addressed by the Congress in Section 14, Public Law 90-174, December 5, 1967:

The Secretary of Health, Education, and Welfare, in consultation and cooperation with other officials of the federal government and of the states, shall make a comprehensive survey of the incidence and location of serious hunger and malnutrition and health problems incident thereto in the United States and shall report his findings and recommendations for dealing with these conditions to the Congress within six months from the date of this section.

This directive led to the National Nutrition Survey, otherwise known as the Ten-State Nutrition Survey, "the first comprehensive survey ever developed to assess the nutritional status of a large segment of the population of the United States...." 9 Responsibility for the survey was assigned to the Public Health Service's Nutrition Program, directed by Arnold Schaefer, with an advisory committee representing key agencies in the Department of Health, Education, and Welfare, Department of Agriculture, Office of Economic Opportunity, Bureau of the Census, and Bureau of the Budget.

The severe time pressure, limited budget, and the Congressional directive to locate areas of malnutrition all militated against the examination of a random sample of the national population. Instead, it was decided to sample areas with a high proportion of poor persons, especially migrant workers, Spanish-speaking people in the Southwest, and inner-city residents. The following ten states were "judgmentally selected to provide a population representative of the target groups assumed to have a large number of poverty families and a high prevalence of malnutrition" 10: California, Kentucky, Louisiana, Massachusetts, Michigan, New York (including New York City), South Carolina, Texas, Washington, and West Virginia.

Within each state, the survey sought to select at random 20 to 30 households from each of the 100 Census enumeration districts with the largest proportion of poor families in the 1960 Census. Partly because of the subsequent changes in residential patterns, many families above the poverty level were also sampled. Of the 13,232 families ultimately examined, 4,634 or 35 percent were below the poverty line. 11

The survey was conducted by contract with state health departments in seven states and with university medical schools in Louisiana, Texas, and Washington. After May 1968 pretests in Texas and Louisiana, fieldwork began in these states in June and July, respectively, and, in other states, from October 1968 to January 1970, concluding in July 1970. Data collection took from 4 to 9 months in nine states and 19 months in New York, where work in New York City started only after the survey was completed in the rest of the state. Due to the Congressional pressure, preliminary findings from Texas and Louisiana were reported to the Senate Select Committee on Nutrition and Human Needs in January 1969, a month after the survey was concluded in Texas and while it was still continuing in Louisiana. The principal publication of findings appeared in five volumes in 1972, but many data have never been fully analyzed or reported.

Each state established several staff units: a) "mappers" who visited enumeration districts two weeks in advance, selected sample households, and obtained permission to use suitable facilities as examination sites; b) interviewers, who visited and designated households four or five days before the arrival of the c) clinical team, including a doctor, dentist, anthropometrist, dietician, and x-ray technician, who set up and operated the examination center; and d) a headquarters unit with administrative, statistical, and laboratory staff. All states received standardized training in the use of common questionnaires, forms, and guidelines developed by the Nutrition Program from the 1963 Manual for Nutrition Surveys of the Interdepartmental Committee on Nutrition for National Defense.

Of an estimated 34,067 families sampled, 23,846 or about 70 percent were interviewed. 12 Demographic information was thus obtained on 86,352 persons, of whom 40,847—47 percent of those interviewed and about 33 percent of those sampled—were examined by clinical teams. This low examination rate and the inclusion of many volunteers, not part of the sample, among those interviewed and examined detracted from the representativeness of the findings. 13 Disproportionate numbers of females, children and youth, and nonwhites were also examined as shown below:

Group	Percent	
	In 1970 Census	Of Survey Examinees
Females	51	55
Blacks	13	35
Persons aged		
19 or less	38	56
20 or more	62	44

The examination consisted of a medical history; a clinical evaluation "directed toward nutritional lesions"; a dental examination; body measurements, including height, weight, fat-fold thickness, and skeletal size; and a hand-wrist x-ray. On site, a urine specimen was analysed for protein, blood, glucose, and ketone bodies, and a blood sample, for hemoglobin and hematocrit determinations. The samples were then sent to laboratories for fuller biochemical evaluation of hemoglobin, hematocrit, serum, vitamin A and carotene, total serum protein and albumin, vitamin C, serum folate, red cell folate and urinary creatine, riboflavin, thiamine, and iodine. 14

For half of the households represented in clinical examinations, information was sought on all food consumed by the household (not individual members) during the preceding 24 hours, the frequency of use of major food groups, food sources, total monthly food expenditure, and participation in the

food stamp and surplus food programs. In addition, 24-hour dietary intake information was obtained for all persons under 3, 10-16 years, and pregnant or lactating women, and for 50 percent of persons over 60.

The survey lent little credence to earlier assertions of widespread, severe malnutrition. "...there was little clinical evidence of severe malnutrition in the children examined....[and] adults demonstrated...no evidence of widespread, severe clinically evident malnutrition...." 15.

Higher income groups tended to be taller, heavier, and fatter, have a larger head circumference, and earlier skeletal maturation and tooth eruption. 16 However, "despite lower income levels, black children generally were taller than white children and were more advanced in skeletal and dental development...." 17 Obesity was most common among adult women, especially blacks. The groups with the poorest teeth were older Spanish-American children and adults, and black adults. Among adolescents, a relationship was observed "between the prevalence of caries...and the intake of foods containing sugar." 18

A high prevalence of "deficient" and "low" hemoglobin levels, "probably related to inadequate dietary iron intake," was found in all population subgroups, particularly blacks; "deficient" and "low" were put in quotes because of disagreement about "the levels of hemoglobin at which a diagnosis of anemia should be made." 19 Nonetheless, it was concluded that "iron deficiency anemia...is a widespread problem within the population surveyed." 20

A high proportion of poor Spanish-American of Mexican descent, especially those under 17, had "low" vitamin A values, indicating that their vitamin A nutriture was "a major public health concern." 21 No major problem was found with vitamin C, thiamine, or iodine nutriture, but "a potential problem" in riboflavin status was noted "among young persons of all ethnic groups." 22

Analyses of group dietary intake were conducted for the four groups for which 24-hour recall information was obtained. The resultant findings can be no more conclusive than the degree to which these data accurately represent the average daily intake of a designated group and a comparison can reasonably be drawn between the resultant values and those regarded as "standard," good, or safe. Judged against standards developed by an ad hoc committee from the Recommended Dietary Allowances, the mean dietary intake of infants up to 3 years of age was "sufficient...for all nutrients except iron"; 23 a large percentage of 10-16 year olds "had intakes below the standards for calcium, iron, and vitamin A"; 24 the diets of the 650 pregnant or lactating women examined were also below standard for the foregoing and protein; 25 persons 60 years or older "consumed far less food than needed to meet the nutrient standards for their age....No subgroup met the caloric adequacy standard. Other limiting nutrients were protein, iron, and vitamin A." 26

The Ten-State Survey demonstrated the difficulty and complexity of diagnosing nutritional problems; the inadequacy or ambiguousness of many

nutritional measures; the gap between, and the dangers of equating, group and individual norms; and the importance and difficulty of obtaining meticulously comparable information about a representative sample of any group (other than the specific individuals examined) whose nutritional status is to be assessed. Thus, the assertions of widespread, severe malnutrition which had precipitated the survey were replaced at its conclusion by more restrained and narrower statements about specific, apparent, or possible nutrient deficiencies in the diet of specific groups.

The Health and Nutrition Examination Survey

The inability of the Ten-State Survey to determine the number of malnourished persons in the population or in designated age, ethnic, and income groups was clear at an early date.

In the course of a May 6, 1969 message to Congress on food, hunger, and malnutrition, President Richard Nixon stated, "I am asking the Secretary of HEW to....expand the national [Ten-State] nutrition survey...to provide us with our first detailed description of the extent of hunger and malnutrition in our country." The next day, HEW Secretary Robert Finch informed the Senate Select Committee on Nutrition that he would use the authority of the 1956 National Health Survey Act to institute a continuing program of national nutritional surveillance.

Instructed to design the program, Director Theodore Woolsey of the National Center for Health Statistics formed a Task Force on Surveillance of Nutrition and Health. Their charge was:

1. The development and implementation of a survey design which will permit the use of health data as an objective test of programs to improve nutritional status.
2. A continuing monitoring of national nutritional status and related health problems so that the evaluation of trends and progress over time will be possible and so that we will have a better basis for allocation of scarce program resources. 27

The group consulted a number of nutrition experts and an informal interagency committee, posing basic questions about the design, operation, and methodology of nutritional surveys, including three persistent questions which we have also investigated and pondered:

1. How does one measure nutritional status? What data should be collected to provide the most useful and necessary information to program planners and practitioners?
2. Should nutritional status be measured for the entire population or limited to those groups which are considered to have the highest risk of poor nutrition?

3. How much change must occur in nutrition levels to have practical significance and over what time period?

On the first question, the nine-member task force concluded that "nutritional status can not be measured and interpreted by a few simple indices;...[it] is a complex interrelationship of clinical observations, biochemical assessments, anthropometric measurements, sociological and psychological evaluations, and dietary intake or patterns." A range of accurate, standardized measures, taken by highly trained professionals, was needed.

On the second question, it was concluded that measurement of the national population should receive first priority, to identify the nature and magnitude of its nutritional problems and establish a base of comparison for evaluating the status of particular groups. However, attention should also be "focused on high risk groups such as preschool and young school children, women of childbearing ages, pregnant and lactating women, and the low income group in general."

To the first part of the third question, a statistical rather than substantive answer was given. "If during the first cycle..., 5% of the poverty level population are estimated to have a particular nutritional characteristic, then the estimate of the following cycle would have to differ from 5% by at least 0.6% to be labeled a significant difference in level." The second part was not answered explicitly, but the urgent need for nutritional statistics was stressed; it should be met by annual rounds of data collection, the first round to be completed "in the spring of 1972" with initial reports "available by the end of 1972."

With the foregoing approach, the task force outlined A Program to Measure the Nutritional Status of the American People. In March 1970, it was accepted and the Division of Health Examination Statistics, which was responsible for conducting the Health Examination Survey, was directed to implement it.

The plan dealt with the choice between assessing the status of the national population or of high-risk groups by proposing that, insofar as possible, both be done. The new survey—designated A National Nutrition Surveillance Survey (NNSS)—should examine a probability sample of the national noninstitutionalized population 2 years and older, oversampling the poverty population and, "consistent with resources and sample design limitations, women of child-bearing ages, pre-school and young school children, and the aged." These groups were sufficiently numerous so that, by oversampling, a probability survey of the entire population could, without excessive expense or special sampling procedures, examine a sufficient number for useful analyses.

However, oversampling would not suffice for smaller or localized high-risk groups such as pregnant women, children under 2, and residents of Appalachia, for whom special sampling and/or examination procedures were

necessary that could not be readily incorporated into a national sample survey. Nor could a national survey evaluate "specific nutritional programs in a given geographical area...which can be accomplished only through proper experimental design techniques...." The foregoing kinds of studies were the responsibility of other agencies, not the National Center for Health Statistics. However, "appropriate" (unidentified) agencies conducting them should use "the same measurement procedures, definitions, and controls where applicable" as those of NNSS. All nutrition surveys "should cooperate with each other...as much as possible to ensure...comparability of data and a minimum amount of program duplication."

NNSS should be conducted by attaching it to the Health Examination Survey, which had a decade of experience with standardized field health examinations and laboratory testing, an 86-96 percent examination participation record, and qualified staff who could provide the core personnel for the nutritional survey. However, to accommodate the NNSS objectives, "the time to complete a [normal HES] cycle must be reduced, [and] the sample size increased" from 7,500 to 30,000.

NNSS and HES would not be merged, but conducted as two separate surveys in the same sampling sites with the same mobile examination caravans. NNSS would give a 30-45 minute examination to 30,000 persons, of whom 7,500 aged 25-84 would also receive the 2-3 hour examination in the fourth HES cycle, which had already been projected to identify the health conditions of adults and the elderly, their health care needs and perceptions, and the care actually received.

NNSS would interview and examine a representative sample of the national population aged 2-84, with oversamples of those living in poverty, young children, women of childbearing age, and the aged, to determine their food intake and nutritional status. Its household interviews would collect information on demographic characteristics, medical history, health conditions related to malnutrition, participation in food programs, and the frequency of consumption of different kinds of food, but not a "time-consuming and expensive" 24-hour dietary recall. The examination would include a clinical assessment, anthropometric measures, and the taking of blood and urine samples of laboratory analyses, all similar to those of the Ten-State Survey.

The sense of urgency about obtaining a reliable assessment of the nation's nutritional status remained fueled by Congressional hearings, the media, nutritionists, and the December 1969 White House Conference on Food, Nutrition and Health; hunger and malnutrition became a focus of political crossfire between the Democratic Congress and the new Republican Administration installed in January 1969. Hence, each annual round of 15,000 NNSS examinees (3,750 of whom would also receive the HES examination) was designed as a probability sample of the national population (for HES, of the population aged 25-84), permitting annual reports of the nation's nutritional status and more reliable biennial reports of the status of various subgroups. To maintain such an ambitious schedule, two new mobile examination centers would have to be added to the two already in operation, each staffed with a full

complement of doctors, nurses, dentists, nutritionists, and technicians. Each center would conduct about 20 examinations a day (15, of the shorter NNSS version and 5, of the combined NNSS-HES inventory) or 375 in a four week period at each of 10 sampling sites, or 3,750 a year; the four centers would complete 80 examinations a day and 15,000 a year at 40 sampling sites or 30,000 at 80 sites in a full two-year cycle.

Notes

1. Recommended Dietary Allowances, Eighth Revised Edition, National Academy of Sciences, Washington, D.C., 1974, p. 3.

2. The 1977-78 Nationwide Food Consumption Survey, Consumer and Food Economics Institute, Agricultural Research Service, July 14, 1977, p. 8.

3. D. Mark Hegsted, "Nationwide Food Consumption Survey—Implications," talk at the National Agricultural Outlook Conference, Washington, D.C., November 6, 1979.

4. "Food energy (calories) available declined about 10 percent, reflecting decreases in dietary fat, in carbohydrate, and in protein. At the same time the levels of all vitamins and minerals except calcium were similar to or higher than those found in 1965....The concurrent decrease in food energy and the increase in the amount of vitamins and iron indicate that food used by households in 1977 has a higher nutrient density than food used in 1965" (Frances J. Cronin, "Changes in Nutrient Levels and Food Used by Households in the United States, Spring 1965 and 1977," talk at the Agricultural Outlook conference, Washington, D.C., November 6, 1979).

5. Hegsted, op. cit.

6. The other Senators signing were Jennings Randolph, Claiborne Pell, Edward M. Kennedy, Gaylord Nelson, Robert F. Kennedy, Winston L. Prouty, Jacob K. Javits, and George Murphy (Legislative History of the Select Committee on Nutrition and Human Needs, prepared by the Staff of the Select Committee on Nutrition and Human Needs, United States Senate, October 1976, pp. 5-6).

7. Legislative History..., op. cit., pp. 10-11; the six doctors were Joseph Brenner, Robert Coles, Alan Mermann, Milton Senn, Cyril Walwyn, and Raymond Wheeler.

8. Ibid., pp. 14-18.

9. Ten-State Nutrition Survey 1968-1970, U.S Department of Health, Education, and Welfare, Center for Disease Control, Atlanta, Georgia, 1972, p. I-9.

10. Ibid., p. I-2.

11. Calculated from data in ibid., Table 3, Appendix, p. II-29.

12. The published account states that 23,846 or 80 percent of 29,935 sampled families were interviewed; however, in four states and New York City, the number of sampled families was not reported. Our estimate of 34,067 sampled families was derived by assuming that the proportion interviewed in these locations was the same as the 70 percent average in the six states for which both the number sampled and interviewed was reported (see ibid., p. II-1).

13. "Of the 86,352 individuals interviewed, 13,858 were in the volunteer category; of the 40,847 individuals examined in the clinics, 8,441 were not in the initial sample" (ibid., p. II-2).

14. These analyses were conducted for all persons under 3 years, 10-16 years, and all pregnant women, for 50 percent of persons over 60, and 25 percent of other age groups.

15. Ten-State Nutrition Survey 1968-1970, p. III-2.

16. Ibid., p. III-7.

17. Ten-State Nutrition Survey 1968-1970, Highlights, p. 11.

18. Ten-State Nutrition Survey 1968-1970, p. III-87.

19. Ibid., pp. IV-3-4.

20. ...Highlights, p. 11.

21. Ten-State Nutrition Survey 1968-1970, p. IV-137.

22. P. IV-217.

23. P. V-7.

24. P. V-81.

25. P. V-233.

26. P. V-259.

27. This quotation and other quotations in this section are drawn from the National Center for Health Statistics Task Force on Nutritional Surveillance, "A Program to Measure the Nutritional Status of the American People," 18 pages, offset, undated (early 1970).

IV THE HEALTH AND NUTRITION EXAMINATION SURVEYS

The initial 1970 plan for a fourth Health Examination Survey (HES IV) of persons aged 25-84, linked to an expedited two-year National Nutrition Surveillance Survey (NNSS) of the population aged 2-84, was outlined in the preceding chapter. The present chapter will describe the content, methodology, and reporting of these surveys, which became known as the Health and Nutrition Examination Survey or HANES I, and the similar, but more integrated survey, HANES II, which followed.

HANES I, 1971-75

HES-NNSS examinations were supposed to start in February 1971 and be completed by May 1973. In fact, they started in April 1971 and continued until October 1975. When Vietnam War budget cuts forced a reduction from three to two examinations centers in January 1973, the survey was already far advanced. To reduce the length or number of subsequent examinations was judged more damaging to the ultimate value of the data than to prolong the data collection period.

The target sample was early modified from persons aged 2-84 to those 1-74 (25-74 for HES IV), because of the response problems anticipated among the older group and the great interest in, and importance of, the nutrition of the young child. Eventually, some 32,331 persons were sampled and 23,808 or 74 percent were examined: 16,895 in the 2.5 hour nutrition inventory, 3,854 in the joint 4.2 hour nutrition and health examination, and 3,059 in a 4 hour examination devoted solely to health, or a total of 20,749 in NNSS and 6,913 in what can be designated HES IV.

NNSS required examinations in 65 sampling sites for a full national sample of 28,043 and a yield of 20,749 examinees. However, the sites were divided into two representative rounds so that preliminary findings could be tallied after completion of the first round, consisting of the first 35 sampling sites. This was accomplished in October 1972, 18 months after the survey's start. The 10,126 persons aged 1-74 who had then been examined constituted 71.6 percent of the 14,147 persons sampled. The disappointing examination rate led to the introduction of a \$10 payment to each examinee after the 20th sampling site, which raised participation to 74 percent for the complete survey.

As initially planned, HES IV would require two full NNSS cycles in 130 sampling sites to obtain its projected 7-8,000 examinees. However, upon completion of the nutrition examinations in June 1974, the two mobile centers were devoted solely to health examinations and a third national round of 35 sites sufficed to complete the HES IV examinations.

Six months intervened between HES I and II and three months, between HES II and III (and also between HANES I and II). However, 12 months of preparation and testing were required following HES III before the first

complex and lengthy Health and Nutrition Survey began. Five field trials were undertaken (one in Delaware, three in North Carolina, and the last in Baltimore) and 1,345 pilot examinations were conducted before the final set of questionnaires, examinations, and procedures was adopted.

The Fourth Health Examination Survey (HES IV)

As planning for the fourth Health Examination Survey (HES IV) had been largely completed before the nutrition survey was added, HES IV maintained its own clear identity throughout the first cycle of the joint Health and Nutrition Examination Survey. After the examination period was extended, the scheduling, especially of the health examinations, had to be reconsidered. By June 1974, 20,749 persons had received the nutrition examination, a number deemed adequate to assess the nutritional status of the population aged 1-74 and the major oversampled subgroups (though the initial goal had been 24,000 examinees, on the assumption that 80 percent of a sample of 30,000 persons would be examined).

However, only 3,854 persons (18.6 percent) had received health examinations. 1 Faced with the choice of starting a second health and nutrition survey and waiting 39 months to complete HES IV, or suspending nutrition examinations and conducting only health examinations for a period, the latter alternative was adopted. 2 It had the further advantage of providing more time for planning the next Health and Nutrition Examination Survey (HANES II) "so as to take greater advantage of information and experience gained from HANES I." 3

During the 15 months from July 1974 through September 1975 devoted to this "Augmentation Survey," another 3,059 health examinations were secured. The total of 6,913 persons examined in 100 sites represented a probability sample of the noninstitutionalized population aged 25-74 in the contiguous United States, excluding Indian reservations.

HES IV was designed to assess the health care needs, perceptions, and use, and the prevalence of chronic—especially arthritic, respiratory, and cardiovascular—diseases in the adult population. Certain measurements taken in HES I, which also surveyed the adult population, were to be repeated; others were to be added, modified, or elaborated; additional changes were made during the augmentation phase.

A central purpose was to compare health needs, as determined by an examination, with health needs and the care actually received, as determined by interview and questionnaire. Subjects were queried about the following "index conditions"... that could be related to...[both] symptoms and individually felt health needs": shortness of breath; joint and chest pain; skin, dental, hearing, and visual problems. They were also asked about any other health "symptoms, complaints, or...troubles" they might have. The examination identified the presence of: chronic pulmonary disease; disabling arthritis of the hip, knees, and other joints; dermatological disease; dental and oral conditions; cardiovascular (including peripheral vascular) disease; thyroid abnormality;

auditory acuity; correctable visual acuity, ocular hypertension, and other ocular conditions. The ultimate objective was to conduct the kind of analysis outlined in Chart 1. 4

Chart 1

HANES I Approach to Assessing Unmet Health Needs

Self-perceived needs and action	Health needs from HANES examination and test		
	a No pathology found	b Pathology noted but no treatment needed	c Pathology found, treatment indicated
1. No problem or relevant complaint	✓	✓	X
2. Condition not seen as needing any medical attention	✓	✓	X
3. Condition seen as needing medical attention but not under treatment			X
4. Condition under treatment by M.D., D.D.S., etc.		✓	✓

NOTE: Index conditions for the matrix.—Cardiovascular disease; chronic respiratory disease; disabling arthritis of hip, back, knees; dental and oral conditions; dermatological disease; ophthalmologic conditions (including visual acuity); hearing loss; psychological problem.

KEY:
✓ = No unmet need
X = Unmet need

To accommodate the nutrition portion of a combined examination that ran over four hours, many health measures originally intended for HES IV, such as an extensive battery of psychological tests, had to be dropped or shortened; contrariwise, certain health measures related to nutrition, which will subsequently be detailed, were added.

Census staff again conducted the initial household interviews, obtaining information on the composition, living quarters, work status, and income of household members. Thereafter, a HANES representative interviewed all persons included in the sample, completing a detailed medical history for those assigned a full health examination. Information was sought on the subject's health condition; recent colds or flu; broken bones and back injury; the length of, and reason for, recent hospitalizations; tobacco use; hearing problems and treatment; the previously enumerated "index conditions"; diabetes, goiter, and thyroid conditions and treatment; and skin and teeth conditions and care.

The interviewer fixed an examination appointment and arranged for transportation by taxi or car; if necessary, she might arrange to take the subject in her own car.

Four health and 16 shorter nutrition examinations were usually scheduled per day. During the health examinations, at least two other questionnaires were completed.

One, on Health Care Needs, dealt with the time, location, and reason for the last visit to a doctor and dentist, the waiting period before and during an appointment; the nature of the last general checkup; any shots received; and how medical and dental costs were paid.

The second, a brief General Well-Being questionnaire, all that remained of the many psychological tests, was intended to assess general adjustment, emotional mood, concern about health, and need for and use of psychological services.

Supplementary questionnaires obtained detailed information on the history, precise conditions, and treatment of subjects with arthritic, respiratory, and cardiovascular problems.

Chart 2 lists the elements of the health examination and Chart 3, those of the nutrition examination (which were both given to all subjects in the National Nutrition Surveillance Survey).

Chart 2

Elements of the Health Examination, HANES I

Extended medical examination
X-rays of chest, hand-wrist, knee, hip
Air and bone audiometry (hearing acuity)
Electrocardiography (heart beat)
Goniometry (hip and knee angles)
Spirometry (volume of inhaled and exhaled air)
Pulmonary diffusion (single-breath carbon monoxide test)
Tuberculin test
Laboratory determinations in blood and serum:
 Total differential leucocyte count
 Sedimentation rate
 Serological tests for amebiasis, measles, tetanus,
 diphtheria, rubella, polio
 Concentrations of:
 Bilirubin, SGOT, alkaline phosphatase, uric acid,
 calcium, thyroid hormones (T-3, T-4), phosphorus
Laboratory determinations in urine:
 Glucose qualitative, albumin qualitative, occult blood

The examination measurements, instruments, and procedures were developed after repeated consultation with leading scientists and professional associations in each specialized area. Sometimes, this led to the abandonment of a given procedure as too complex, unreliable, or time consuming for a multi-purpose, standardized, mobile examination. For example:

Considerable interest in further national and regional information on hearing sensitivity to pure tone and to speech among adults had been indicated by the staffs of the National Institute of Neurological Diseases and Stroke (NINDS)...and by other experts....Data were needed in the development of standards for bone conduction thresholds and for more precise determination of the relationship of bone to air-conduction thresholds and to speech discrimination. These would provide a more valid base or normal standard than is now available for use in the diagnosis of specific conditions and for assessing the functional implication of hearing impairment. It was later decided, however, that the speech-testing portion be postponed until the second HANES program because of the difficulties in preparing a reliable, valid test on tape that could be administered within certain allowable time limits...and because necessary pretesting requirements could not be satisfactorily completed in time for... the first HANES program. 5

The General Well-Being questionnaire was developed in cooperation with the the National Institute of Mental Health; the audiometry hearing tests, with staff of NINDS, the National Bureau of Standards, and a number of universities; the vision examination, with ophthalmologists at the National Eye Institute; the dermatology protocol, with members of the National Program for Dermatology; the cardiovascular examination, with representatives of the National Heart and Lung Institute and the American Heart Association; and so forth. Laboratory determinations of blood and urine samples for both the health and nutrition examinations were conducted under contract by the Center for Disease Control.

During the 15-month augmentation period in which HES IV was completed, the dental, dermatological, and ophthalmological examinations were dropped because of the difficulty of recruiting qualified examiners. Several new tests were added. In response to a request by the Environmental Protection Agency, household and public water samples were examined for minerals and questions were asked about household water consumption. In an effort to relate Health Interview Survey data to Health Examination Survey clinical findings, 1975 HIS questions on hearing, vision, and hypertension were repeated. And various tests were piloted for HANES II: the ability to repeat sentences presented at different decibel levels; near and distant vision measures; a 20-question depression scale; and laboratory tests for syphilis, hemoglobinopathies, and kidney impairment.

The First National Nutrition Survey (1971-74)

The nutrition phase of HANES I, conducted from April 1971 to June 1974, examined 20,749 individuals representing a sample of the national, noninstitutionalized population aged 1-74 in the 48 contiguous states, excluding Indian reservations.

Because of pressure for early findings, the sample was divided into two

rounds, each representative of the national population, permitting preliminary findings to be tabulated and reported after completion of the first round. The nutrition inventory was developed in consultation with, among others, staff of the Ten-State Survey, the Department of Agriculture, the Maternal and Child Health and Indian Health Services of the Public Health Service, Office of Economic Opportunity, Food and Drug Administration, and Office of Education.

The household interview obtained information about participation in food stamp and school food programs. The medical history questionnaire for children included questions on breast feeding and milk consumption, eating of clay or starch, and the use of iodized salt; individuals aged 12-74 were asked about their ability to bite and chew, foods which they avoid, peculiarities in their urine and bowels, anemia, alcohol consumption, special diets, and exercise.

In addition to a set of questions on the frequency of consumption of thirteen major food groups, a 24-hour dietary recall was taken during the examination, despite the planning group's recommendation against doing so. In explanation, it was stated that

food consumption data...help to interpret clinical and biochemical findings...[and are] useful also for such purposes as characterizing food preparation practices, identifying sources of nutrients, and determining the types of food consumed at different seasons and in different geographic locations....

Because of the large sample size (30,000), it is anticipated that subgroups, such as age, sex, income, education, family size, health status, and geographic area, will be large enough for analysis to indicate groups of persons where it is obvious that steps need to be taken to improve their diets. 6

During the clinical examination, the physician inspected and palpated the neck for any enlargement of the thyroid, the stomach was examined, liver size was determined by percussion, deep tendon reflexes were checked, the musculoskeletature was examined for deformities suggesting rickets, and the skin, for marks of nutritional problems. The examination concentrated on lesions and stigmata associated with deficiencies of vitamins, minerals, thiamine, or fatty acids.

Anthropometric measures included height and weight, triceps and subscapular skinfolds as a measure of obesity, triceps skinfold and upper arm girth as a measure of muscle mass, elbow and bitrochanteric breadth as an indicator of body build, sitting height, and head and chest circumferences of children age 1 to 7 "as possible indicators of early protein-calorie deficiency."

The dental examination included special attention to the gums "for manifestations of systemic nutritional deficiencies and diseases, and a series of questions about chewing foods to determine the relationship between dietary

intake and dental conditions." The need for dental care was assessed and a microscopic layer of enamel was taken for laboratory analysis of fluoride.

The hematological determinations by the Center for Disease Control included hematocrit, hemoglobin, red and white cell counts, and sedimentation rate. The nutritional biochemistry included determinations for vitamins A and C, magnesium, serum iron, iron-binding capacity, serum folates, total protein and albumin, and cholesterol. 7

A summary of the examination elements of the nutrition survey is given in Chart 3.

Chart 3

Elements of the Nutrition Examination, HANES I

General medical, dental, dermatological, and ophthalmic examinations	
Anthropometric measurements	
Hand-wrist x-rays (ages 1-17)	
Laboratory determinations	
Hemoglobin	Serum iron
Hematocrit	Iron binding capacity
Red cell count	Serum folates
MCV	Cholesterol
MCH	Urine determinations
MCHC	Creatinine
Vitamins A and C	Thiamine
Total protein	Riboflavin
Albumin	Iodine

The first two preliminary reports of HANES I data, based on the first round examinations of 10,126 persons aged 1-74 from April 1971-October 1972, appeared in January 1974 and April 1975, respectively. They reported dietary intake and biochemical levels of various nutrients in the population, anthropometric measurements of children aged 1-17, obesity in persons aged 20-74, and clinical signs of nine possible nutrient deficiencies in persons 1-74. Reports on all 20,749 nutrition examinees began to appear in 1976. One reason for the delay was that qualified staff had to be taken off data preparation to plan HANES II.

By September 1979, 12 brief "advance data" reports (generally 8 or 12 pages) and 12 lengthier statistical reports had been issued. Most dealt with nutritional and related health conditions; the purely health data have appeared somewhat later. They are often complex, and it requires more time, money, and special expertise to reduce the measurements to meaningful and

presentable form and to analyze and interpret them. Some of the early health reports, like the initial nutrition reports, were also based on the first round of 35 sampling sites, though only 1,892 adults received health examinations in this round.

As of January 1978, 167 HANES I reports had been proposed by HANES staff; about two-fifths appeared to be on nutritional and health-related subjects and three-fifths, on more strictly health topics—the distinction is not always easy to make. Undoubtedly, a much smaller number will eventually be prepared. In December 1979, it was hoped to complete the nutrition reports in 1980 and the health reports in 1981 (not allowing for the lag time between completion and publication). Contracts have been let for the analysis of dietary intake and food pattern data with respect to anemia, dental health, cardiovascular disease and risk factors, and general measures of health and nutritional status.

In addition, 20 tapes containing all HANES I data were to be released. Eight were available by January 1978 and another 8 in 1979, but the last 4 (on the spirometry, computer analyses of electrocardiograms, lung pathology and chest measures, and analyses of water consumption of trace elements), all based on health examinations concluded in October 1975, will not be released before 1980 (if then, for the water analyses) due to the technical difficulties of preparing and analyzing the data.

HANES II, 1976-80

The second Health and Nutrition Examination Survey (HANES II) was, in fact, the first in which the health and nutritional elements were integrated in the planning and examination stages.

The extensive period required for planning and testing HANES I was due, in part, to an awareness that, as the nutritional measures would be repeated in the succeeding survey, they should be carefully chosen for their significance and comparability. Formal planning for HANES II began in mid-1974, some 18 months before the survey was to start. A wide consultation process was undertaken and letters inviting suggestions were sent to some 800 persons, including members of the National Center for Health Statistics Panel of Advisers, directors of medical research institutes and private health associations, chairmen of departments of pediatrics and medicine, and officials at the National Institutes of Health, the Health Services Administration, Center for Disease Control, Food and Drug Administration, Department of Agriculture, and other pertinent government and private programs. About 200 replies were received. A further discussion of this planning process is given on pp. 57-8.

After the HES IV augmentation examinations were completed in October 1975, the HANES II inventory was tested from November 1975-February 1976 in two Atlanta locations before regular examinations began in Miami on February 19, 1976.

The sample was designed to represent the civilian, noninstitutionalized population six months to 74 years old in all states, including Alaska, Hawaii, and Indian reservations which had been excluded from the sampling frame of previous surveys. Members of families with income below the poverty level, children six months to five years old, and persons 60-74 years old were oversampled. The 64 sampling sites were defined so as to reduce travel time to the examination center and thereby promote a higher examination rate. For the same reason, the \$10 payment to examinees was continued.

However, the examination rate has not increased but has hovered around the 74 percent rate of HANES I. In the request for approval submitted to the Office of Management and Budget early in 1975, it was hoped that 80 percent or 21,000 of a sample of about 27,000 persons would be examined between January 1976 and November 1978, an examination rate of 600 a month or 7,200 a year. In fact, the examination rate has been slightly over 400 a month and 5,000 a year, lengthening the duration of the survey from the 35 months once projected to 50 months. When HANES II data collection was completed in February 1980, 20,325 persons, or 73.1 percent of the 27,805 in the sample, had been examined.

The HANES II inventory was leaner than that of HANES I, reducing the examination time from an average of 3.0 to 2.1 hours. 8

Census staff again undertook the household interviews, obtaining demographic data; and (in contrast to HANES I, when such information was obtained by HANES staff) information on participation in the food stamp, school lunch, and other food programs; and one of two medical histories for sample persons aged 6 months-11 years or 12-74. The former included questions on birth weight, prematurity, development, congenital and neurological conditions, diarrhea, and pica. The latter obtained information on current medicine; recent hospital stays; an array of 30 ailments and chronic conditions; anemia; disagreeable foods; use of tobacco, coffee, tea, and aspirin; loss of appetite; physical activity; weight and height; visual, hearing, and speech problems; diabetes; respiratory, liver, gall bladder, kidney, bladder, and urinary conditions; allergies and itching; hypertension; cardiovascular conditions; stroke; back and neck problems; and arthritis.

In the health examination, special attention was given to tests for: diabetes, including a glucose tolerance test on half of examinees 20-74; kidney pathology, via serum creatinine tests; liver disease, by an assessment of bile acids in a blood sample taken from half of examinees aged 35-74 two hours after an egg-nog drink; allergies, via the administration of eight allergen extracts (for housedust, alternaria fungi, cat, dog, ragweed, oats, rye, and Bermuda grass) by pinprick on the forearm; osteoarthritis and disc degeneration by x-rays of the lumbar and cervical spine of males 25-74 and females 50-74; speech pathology by recording 15 short sentences repeated by children 4-6; and

cardiovascular conditions, by electrocardiogram, blood pressure readings, and a questionnaire on behavior possibly related to coronary heart disease. Spirometry tests of pulmonary function and pure tone audiometry tests were given to examinees 6-24 to extend the HES IV measures of examinees 25-74.

In the nutrition examination, the 24-hour dietary recall and food frequency inquiries of HANES I were repeated; the recent use of vitamins and minerals and any special diets were noted. Body measurements, the same as in HANES I, included standing and sitting height, weight, bitrochanteric and elbow breadth, upper arm girth, head circumference, and tricep and subscapular skinfolds. The examining physician looked for signs of malnutrition, anemia, obesity, as well as allergies, liver, and heart disease, arthritis, and other conditions. The dental and ophthalmic examinations of HANES I were dropped, as were the hand and wrist x-rays.

The laboratory determinations on blood and urine samples were more extensive than in HANES I, in part to make a more detailed investigation of the nature of the widespread anemia indicated in HANES I as well as the Ten-State Survey; in part because of additional health conditions investigated such as diabetes, kidney, and liver disease; and in part because of the interest and financial support of other agencies in special inquiries. For all subjects, determinations were made of serum protein, vitamin C, hematocrit, hemoglobin, and complete cell count, serum iron, iron binding capacity, and protoporphyrin; for children under 12, vitamin A; for persons with anemia and in a control subsample, ferritin, B₁₂, copper, zinc, serum and red cell folates, and peripheral blood smear; and, for various subjects, serum cholesterol and triglycerides, alkaline phosphatase, and serum albumin.

Carbon monoxide levels in the blood, resulting from automobile exhaust and other sources of pollution, were assessed in tests financed by the Energy Research and Development Administration; blood lead levels, which may reflect food contaminants, automobile exhausts, and paint particles, were determined with funds provided by the Food and Drug Administration; pesticide levels in blood and urine were determined with aid from the Environmental Protection Agency's National Human Monitoring Program for Pesticides.

HANES II data collection was completed at the end of February 1980 and "reports will begin coming out early in 1981 and rather rapidly thereafter." 9 If all goes according to plan, reporting will be completed by the end of 1983. A considerable effort has been made to facilitate this by editing the data as collection proceeds so that tapes can be available for analysis and public release more quickly than was the case for HANES I.

Our previous procedure was to allot a certain number of years after completion of a survey for HANES analytical staff to publish designated series reports on the subject matter in the examination. After that, a set of computer tapes containing the edited data was prepared for the use of outside investigators....The present procedure is to release for outside use all completely edited and documented tapes, whether NCHS has or has not published data

based on the tape contents.

It is planned to have a series of edited tapes containing the HANES II data available for purchase from one to two years after completion of the HANES II survey. 10

By June 1979, HANES II data had been the basis of at least three papers, all reflecting interagency interests. The first, on pesticide residues, reported laboratory analyses of 302 to 418 urine samples collected in 1976; II the last reported lead concentrations in blood specimens of 4,635 subjects examined at 32 sites from February 1976-February 1978 (however, individual tabular entries reported data on as few as three individuals). 12

These papers are noteworthy because of the frequent contention that survey findings should not be reported until data collection for a representative national sample has been completed and the number of observations in each cell is large enough to be statistically reliable.

Notes

1. Not 5,100 which would have occurred if, as originally anticipated, 25 percent of nutrition examinees had also received the full health examination. However, in that event, the 39 months required to give nutrition or combined nutrition and health examinations to 20,749 persons would have been correspondingly extended.

2. It took 39 months to give examinations to the 3,854 persons aged 25-74 drawn from the 20,749 nutrition examinees. However, for 17 months, three examination centers were used; about 40 health examinations per month were conducted by each center. Hence, it would take two caravans another 39 months to reach the target of 7,000 examinations.

A February 1973 publication put the expected sample size of HES IV at 6,000 (Plan and Operation of the Health and Nutrition Examination Survey, United States-1971-1973, National Center for Health Statistics, Vital and Health Statistics, Series 1, No. 10a, p. 20). But 7100-6800 persons were examined in HES II and III and 6,672 in HES I, whose 18-79 age range was closest to that of HES IV, and a target around 7,000 seems later to have been adopted.

3. Plan and Operation of the HANES I Augmentation Survey of Adults 25-74 Years, United States, 1974-1975, National Center for Health Statistics, Vital and Health Statistics, Series 1, No. 14, June 1978, p. 1.

4. Figure 1 and the quotations in the foregoing paragraph are taken from Plan and Operation of the Health and Nutrition Examination Survey, op. cit., p. 6.

5. Ibid., p. 7.

6. Ibid., p. 11.

7. This summary and the quotations in the preceding paragraphs come from ibid., pp. 9-12.

8. The 3.0 hour figure for HANES I represents a weighted average of 2.5 hours for the nutrition examination (NNSS), 4.2 hours for the combined nutrition and health examinations (NNSS-HES), and 4.0 hours for the augmentation health examinations. During the 1971-74 period when both nutrition and nutrition-and-health examinations were conducted, the average examination time was about 2.8 hours.

Examination length also varies with age. In HANES II, it has averaged 1.5 hours for children 6 months-5 years, 2.1 hours for youngsters 6-19, and 2.3 hours for adults 20-74.

9. December 5, 1979 letter from Robert Murphy, Director, Division of Health Examination Statistics.

10. "Plan and Operation of the Second Health and Nutrition Examination Survey, 1976-1979," National Center for Health Statistics, April 10, 1979 draft.

11. Frederick W. Kutz, Robert S. Murphy, and Sandra C. Strassman, "Survey of Pesticide Residues and Their Metabolites in Urine from the General Population," in K. Ranga Rao, ed., Pentachlorophenol, Plenum Publishing Corp., New York, 1978, pp. 363-9.

12. K.R. Mahaffey, J.L. Annet, H.E. Barbano, and R.S. Murphy, "Preliminary Analysis of Blood-Lead Concentrations for Children and Adults: HANES II, 1976-1978," presented at Trace Element Meeting, St. Louis, June 1979.

V DEMANDS FOR NUTRITIONAL SURVEY DATA

The demand for accurate, comprehensive, and current knowledge of the population's nutritional and health status has varied causes. The outcry about hunger and malnutrition that precipitated the Ten-State Survey and led to the inclusion of nutrition in the Health Examination Survey has been recounted. But a poor diet can result from many other causes than poverty. Ignorance, customs, fads, addictions or habits such as excessive consumption of coffee, salt, soft drinks, candy, snacks, rich and fatty foods or alcohol, not to mention drugs and vitamins, may be as injurious as too little food. Too little exercise or too much tobacco can offset the benefits of a good diet. Some fertilizers, pesticides, additives, and preservatives that have contributed to the efficiency with which our foods are produced, processed, and marketed may pose health hazards. Since Americans are an affluent, industrial people, their nutritional status reflects the problems as well as the benefits of affluence and industrialization.

Historically, infectious diseases—plague, smallpox, tuberculosis, scarlet fever, diphtheria, malaria, influenza, whooping cough, measles, polio—and septic conditions arising from wounds and childbirth were terrible scourges. Gradually, they have been conquered or contained by science, medicine, public health measures, and improved sanitation, living conditions, and diet. As infant mortality has been reduced and life expectancy increased, chronic and degenerative conditions—heart disease, cancer, stroke, arteriosclerosis, diabetes, bronchitis, cirrhosis—have in large measure replaced infectious diseases as the major health burden of society, especially among the middle and older age groups.

The victories over infectious diseases have fueled hopes for similar victories over chronic diseases, but the success of extensive programs of research, prevention, and treatment has been mixed. The age-adjusted death rate from heart diseases has declined 30 percent from 1950 to 1976.¹ Nonetheless, many chronic conditions have complex, intertwined causes that have eluded conclusive correction. They may arise from a mixture of genetic and environmental factors, aging, life style, and personal habits.

Nothing can be done about genetic factors or aging, though some of their deleterious effects may be mitigated; prevention and treatment must employ manipulable factors. Among these, much attention has focused on the role of diet in causing, preventing, or alleviating ill health. Dietary factors have been associated with "six of the ten leading causes of death: Heart disease, cancer, cerebrovascular disease, diabetes, arteriosclerosis and cirrhosis of the liver."² However, debate rages about the precise etiological significance of nutrition in chronic degenerative diseases with complex causes.³

The responsibility of nutrient deficiencies for pellagra, beriberi, kwashiorkor, sprue, rickets, and scurvy has long been known,⁴ as has the importance of nutrition in the management of diabetes and many other clinical illnesses. The causal relationships between diet and diabetes, cardiovascular

diseases, and cancer have been receiving concentrated attention. Laboratory and epidemiological studies such as the Framingham Study have confirmed the association of obesity, cigarette smoking, high blood pressure, and a diet high in fat, saturated fat, cholesterol, and/or calories with cardiovascular disease. Rachel Carson's Silent Spring (1962) increased concern about the possible health hazards of chemicals widely used by agriculture, industry, and health services. The hazards of certain fertilizers, pesticides, food additives, and drugs have received much scientific and public attention.

Congressional Concerns

In hearings, reports, and legislation, the Congress has shown a persistent interest in, and dissatisfaction with the failure to obtain, certain kinds of information on food, nutrition, and health.

It has sought to obtain as expeditiously as possible current information on the nutritional status of the population. P.L. 90-174, December 1967, required the HEW Secretary to "make a comprehensive survey of the incidence and location of serious hunger and malnutrition and health problems incident thereto...[and] report his findings and recommendations for dealing with these conditions to the Congress within six months"—that is, by June 5, 1968. In fact, data collection in the resultant Ten-State Survey did not start before June 1968, did not conclude before July 1970, and was not reported, for the most part, before 1972.

Congressmen have sought clear and definitive measures of nutritional and health status. Thus, in a letter to our panel, Congressman Fred Richmond, Chairman of the House Subcommittee on Domestic Marketing, Consumer Relations, and Nutrition, cited numerous nutrition surveys which the government has sponsored and remarked, "with all this, we are still unable to say with certainty, the extent to which Americans suffer from diet-related diseases...and which trends in the behavior of the public are associated with disease trends nationwide." 5 Unfortunately, "nutritional and health status" are complex conditions that are often not measurable clearly and unambiguously, let alone by a single, overarching measure like height or weight. Both the Ten-State Survey and HANES have taken a great variety of nutritional measures by four different approaches: body measurements, a doctor's assessment, laboratory determinations, and food intake information.

Not one of these measures is, in itself, sufficient to characterize nutritional status. Theoretically, some synthesis of the several separate sightings would provide the best measurement, and hopefully, a method for such synthesis ultimately may be developed. At present, however, in the absence of a definitive method of combining the separate measures, it is necessary to present the findings separately from each methodology. 6

Nutritional deficiencies are fundamentally different from other health problems in that their manifestation and cure are not as clear nor finite. Malnutrition is not an infection that emerges with explicit, highly visible symptoms....Malnutrition is more a chronic condition suffered in wide degrees of severity....

Measuring changes in nutritional status via biochemical, clinical anthropometric, or dietary procedures is technically feasible. However, the degree of precision and accuracy of the measuring instruments make one less than entirely comfortable. Important changes in the population's well-being may occur, but our evaluative tools may not be able to pick those out....Furthermore, the meaning of the results is not fully understood because of a lack of knowledge about underlying functional relationships....Thus, the nature of malnutrition, the imperfections in the measuring instruments,...and the ambiguity of the data collected, have all combined to raise a technical barrier to evaluation. 7

Congressmen, representing given states, localities, and constituents, have sought information on the nutritional status of designated states, areas, groups, and individuals so that remedial measures can be undertaken, if needed. This was an important reason for the state-by state approach of the Ten-State Survey and for the effort of HANES to assess the nutritional status of different regions. At one point in a Senate discussion of the work of the Select Committee on Nutrition and Human Health, a senator stated that "the charge of great undernourishment in this country is so grave" there should be "a massive survey that goes block by block throughout the United States." 8 HANES has been repeatedly criticized for failing to provide information on the status of state and local populations. As a Senate staff report stated, "HANES...does not fill the important gap in our knowledge about the nutritional status in all areas of the country, particularly among high-risk groups..." 9

As a policy-making body, Congress has sought information to help it formulate effective nutrition and health policies and programs, and it has been repeatedly frustrated by the difficulty of extracting such information from surveys and other sources. But nutritional, medical, and scientific facts are, of themselves, neutral and entirely compatible with diverse policies. These policies may, of course, change with changes of national or state administrations without any necessary change in the health or nutritional status of their population. Since policy-making is a matter of political judgment, it is properly the responsibility of politically elected and appointed officials, not civil service survey statisticians and scientists. Even the proper placement of statistical agencies and the precise degree of responsiveness which they should and should not show to their political superiors is a subject of perennial debate between the protagonists and the antagonists of each administration. In December 1977, the National Center for Health Statistics was transferred from the Health Resources Administration to the Office of the Assistant Secretary for Health. Statistical agencies move periodically closer to and away from policy officials in an effort to make them more "useful" (i.e., politically sensitive) or to protect them from undue "usefulness" (i.e., political influence).

As a body responsible for overseeing the effectiveness and efficiency of federal programs, the Congress seeks information which can help it to evaluate the consequences of health and nutritional programs, the quality of their administration, and the degree to which different executive programs and policies are consistent and coordinated. One recurrent theme in Congressional examinations of nutrition surveys has been their usefulness or uselessness in evaluating the effectiveness of federal food, nutrition, and health programs costing many billions of dollars, in monitoring the quality and safety of food products and practices and the adequacy of government food regulations, nutritional research, and education. Another theme, which will be discussed subsequently, has been the adequacy of the coordination between the nutritional surveys of the Departments of Agriculture and Health, Education, and Welfare. Responding in part to the demand for information useful for program evaluation purposes, the Nationwide Food Consumption Survey, Ten-State Survey, and HANES have all secured data on their subjects' participation in federal food programs. However, the pressure of other demands, the limited food program information obtained, and the inadequacy of samples designed for other purposes have all reduced the value of these national surveys for the evaluation of specific food programs.

Finally, Congress has sought the foregoing, and additional, information parsimoniously or in short bursts of interest and funds. The Ten-State Survey and HANES were both launched with a sense of urgency which subsequently gave way to budgetary cuts and an accompanying loss of priority, which has been replaced, in the last couple of years, by a renewal of Congressional interest and a new sense of urgency.

Views of the Health and Nutrition Community

In the spring of 1978, we sent a letter of inquiry (see Appendix A) to over 700 individuals who have used or might use the kinds of data produced by HANES: state health officials; staff of Congressional committees active in the area of health, food, and nutrition; federal food and health policy officials and program administrators; directors of each institute in the National Institutes of Health; staff of the National Center for Health Statistics; representatives of private medical, health and allied health agencies and professional associations; major health providers and insurers; officers of food industry companies and their research divisions; private scholars and authorities on health and nutrition affairs; biomedical research scientists; professors of epidemiology, biometrics, preventive medicine, public health, and nutrition; demographers, statisticians, and survey specialists.

Following a brief statement of the panel's mission and the nature of HANES, we asked:

After the present national survey is completed in 1979, a third survey of the population can be begun or it can be postponed for a period of years and the resources devoted to the examination of selected groups whose health and nutritional status warrants special

attention.

1. Which would you favor, and why: a third national survey, the examination of designated groups, or both?

a. Regardless of your answer to the foregoing, which of the following groups would you single out as most warranting study to identify their health and nutritional status? (This list of groups with few or no representatives in the current national survey is not exhaustive; please add any others you believe should be studied.)

Children 2 and under
Ethnic groups: Hispanic, Indian, other _____
Institutionalized aged
Migrant workers
Persons below the poverty line
Persons over 74
Pregnant and lactating women
Recipients of food stamps, AFDC _____
Other groups _____

2. What special information should the next survey obtain?

3. What special use(s) should be made of this information?

We welcome any further comments you may wish to offer about the past or future work of the Health and Nutrition Examination Survey, how it might be made more useful, and the health and nutrition issues it should address.

The quality of the response was high; many responsible officials and nationally prominent figures gave thoughtful and informed attention to the questions. Their responses tended to fall into five groups: those who favored 1. another survey of the national population, perhaps with some additional questions; 2. both a survey of the population and of one or more special groups, conducted simultaneously or in sequence; 3. only surveys of special groups; 4. postponing all surveys until HANES I and II data are reported and can be used to determine the kinds of future surveys that are most needed; 5. the termination of all surveys. A statistical analysis of responses is not warranted, since the inquiry was not a survey of a defined population but a canvas of diverse constituencies of different sizes; however, the largest numbers of respondents favored the examination of special groups, of the national population, or of both, in that order.

Those who favored a third national survey considered the examination of, and the establishment of standards, distributions, and prevalence levels for, a representative sample of the population the uniquely valuable function of HANES (although, as has been noted, the four Health Examination Surveys sampled restricted age groups: persons 18-79, 6-11, 12-17, and 25-74, respectively). They stated or assumed that health conditions and dietary

patterns were changing rapidly and feared that if HANES began to examine selected groups it might not resume its distinctive function. They were inclined (like the task force which outlined HANES I) to delegate the study of groups to other agencies, like the Indian Health Service or the National Institutes of Health; the detection and redress of hazardous conditions, to the Center for Disease Control, public and private health professions, and health care organizations; and the evaluation of the effectiveness of food programs, to the agencies administering them.

Some rebuked the panel for noting, in its inquiry, that "a national survey may fail to disclose conditions that affect groups comprising a small proportion of the population...." Why, they countered, criticize a survey for what it is not designed to do? Some stated that "HANES is not well-suited" to examine groups "such as ethnic, migrants, pregnant women, low economic, or institutionalized." 10 Some, like Irwin Wolkstein of the American Hospital Association, did not see why such groups should be studied at all: "...surveys of designated groups should be done if and where there are reasonable hypotheses which, if verified, would lead up to possible remedies for identified conditions. If the only issue is the identification of the incidence of conditions in smaller groups, I would forego the designated group review...." 11

Those who stated that HANES should next examine one or more groups included scientists interested in basic knowledge as well as respondents (such as government officials, spokesmen for the food industry and private health agencies, and health service providers) interested in practical knowledge helpful in identifying, assessing, and meeting health and nutritional needs. They reasoned that two national surveys were enough for a while, that health and nutritional habits and conditions do not change rapidly, and that a national survey every ten or five years should suffice. In their view the examination of designated groups was more likely to yield useful new (basic or practical) knowledge.

Those who stated that both the national population and special groups should be surveyed believed that the volume and variety of nutrition surveys, and expenditures therefore, should be markedly increased. Thus, William Darby, President of The Nutrition Foundation, declared that "one should not make a choice between a third national survey...and examination of designated groups, but do both...in addition to some other well considered monitoring efforts," and he submitted a proposal, first advanced in 1969, which would greatly enlarge the scale of nutrition surveillance and monitoring activities. 12 Johanna Dwyer, Director of the Frances Stern Nutrition Center in Boston, stated, "we need information from some source on both....Either HANES does it or some other groups should...the richest country in the world should be able to monitor everybody and not pit babies vs. the elderly!"

A frequent suggestion as to how both special groups and the national population could be surveyed economically at the same time was to oversample the former, as HANES has done for persons below the poverty line. However, this alternative is limited to groups, like the poor or elderly, encountered with sufficient frequency in a national sample so that oversampling by a factor or

two or four can yield enough examinees for useful analyses. It is not adequate for geographically or socially isolated groups, such as residents of Appalachia or institutionalized persons, or for groups, such as pregnant women, comprising a small fraction of the population.

Several respondents also suggested that the number and kinds of persons examined be enlarged to include older and younger age groups, institutionalized persons, or members of the armed forces, now excluded from the sample; if necessary for financial reasons, a compensating reduction in the length of the examination might be made.

A tally of responses to the question about the specific groups which should be examined has little meaning, especially as many—almost all possible—kinds of additional combinations and permutations were suggested: not just persons below the poverty line but those approaching it and up to 150 or 200 percent of poverty; not just those over 74 but those 60, 65, or 84 and older. Pregnant and lactating women were most, and migrant workers least, frequently cited, with all the other listed groups receiving numerous mentions. The following additional groups may indicate the variety of suggestions: Mexican-Americans in the Southwest, Pima Indians, blacks, rural blacks, Chicanos, Puerto Ricans, Cubans, Asian-Americans, displaced Asians, children of minorities, school-children, teenagers or adolescents, urban teenagers, preadolescents, teenage girls, children and teenagers in single parent homes, institutionalized handicapped children, institutionalized persons of all ages, food faddists, persons on special diets, those whose diets can be controlled, mentally retarded, problem families, persons with little education and their children, diabetics, groups targeted in national health programs, persons with a high level of physical labor, "workers in the workplace," persons 21-45, 30-50, 50-65, and so on and on.

Responses to the question about "What special information should the next survey obtain?" were, again, highly varied and, of course, often related to the specific kind of survey which was recommended. We will not attempt to list them all, but merely to indicate their general nature and variety.

Respondents shared many of the views we have already identified, with an understandably greater concern with technical and scientific issues of special interest to their particular profession, discipline, or agency.

A number called for the development of better measures of food and nutrient intake than what Hamish Munro called the "faulty" 24-hour dietary recall. It was suggested, for example, that "one day aliquots of food and drink consumed by a subsample" be collected, analysed for nutrient content, and compared with the dietary recall findings; and that dietary histories be obtained, since they are "far more useful than 24-hour dietary recalls in identifying diet-health relationships." 13 Better measures of food intake—i.e., measures that are more reliable than dietary recall, more representative of intake over a protracted period, and no more time consuming or expensive to administer to randomly selected subjects—would certainly be widely welcomed. However, they have yet to be devised.

Information was sought on the prevalence of numerous conditions (e.g., obesity, chronic diseases, allergies, blood pressure, cholesterol and triglyceride levels, caries, birth defects), nutrients, and contaminants, on food intake including the extremes of intake, eating habits and attitudes, knowledge of nutrition, the use of nutritional labels, special diets, the use of fast-food places, convenience foods, and snacks, and the storage and preservation of food. Likewise, information about health status, health-related behavior, perceptions, and care, including preventive efforts and physical activity, and how and where health care was obtained and financed. Information was sought about factors that might influence health and nutritional habits or status, such as education, intelligence measures, income, family eating and housing arrangements, whether pets are kept, the effects of rising food prices, appetite, the use of pills, drugs, alcohol, and tobacco.

Much of this information has, in fact, been obtained by HANES, although not always in the detail sought by specialists; some can be obtained only by sacrificing data that are now collected, at least on a periodic or rotational basis; some might be judged more germane to the Nationwide Food Consumption Survey.

Information was sought in the form of national prevalence distributions, trends, and a vast number of interrelations, the search for which often motivated the selection of special groups for study, e.g.: the relation of candy eating to caries, of eating butter and margarine to previous strokes and coronaries, of salt intake to blood pressure, and, more broadly, of diet to disease; the relation of food preferences to age, social status, and life-style; of maternal nutrition to obstetric complications; of health and nutritional deficiencies and toxic agents to developmental defects; of health and nutritional status to participation in various programs; and so forth.

To the question "What special use(s) should be made of this information?" one respondent replied that the uses were limited only by one's imagination. While that is undoubtedly true, the proposed uses fall into several broad categories: to stimulate research, corroborate hypotheses, or advance understanding; to establish desirable national norms and standards; to monitor undesirable or dangerous trends and conditions, thereby facilitating corrective and preventive intervention and regulation; to plan, evaluate, redirect, and improve health and nutritional programs and services (including the services of private providers and the food products and marketing or "targeting" of industry); to improve the nutrition and health education and behavior of the public and the professions.

A Nutritional Status Monitoring System

No one source can (or if it could, should) provide all the information necessary for public policy decisions and effective nutritional program design and administration. However, because of gaps in current food and nutrition information systems, the slowness with which data have been reported, excessive expectations for survey and other findings, and concerns about the

duplication and lack of coordination of dietary intake surveys, pressures have arisen for closer coordination between, or even the amalgamation of, the Nationwide Food Consumption Survey and HANES.

In July 30, 1971 letters, A.T. Samuelson, Director of the Civil Division of the General Accounting Office, advised the Secretaries of Agriculture and Health, Education, and Welfare that GAO was examining NFCS and HANES because of "our concern for the highest possible degree of coordination among Government programs and activities."

Although there are differences in the technical aspects of each survey program, we believe that...there are sufficient similarities to warrant consideration for their coordination and combination. The purposes of the Federal Reports Act of 1942 (5 U.S.C. 139) make the reasons clear for considering such consolidation.

This Act requires the coordination of Federal reporting services with the expressed intent of minimizing both the burden on persons required to furnish information, and the cost to the Government by eliminating duplication of effort in collecting information and maximizing the usefulness of the information to other users.

We would like your comments on the feasibility of consolidating the two surveys...A combined approach may be of particular benefit to the Food Consumption Survey since many of its nutrition-related uses would be improved if data on food intake could be combined with information on nutritional status in appraising the dietary levels of the Nation's families.

Responding for Agriculture Secretary Clifford Hardin, Ned Bayley, Director of Science and Education, agreed that "the two programs are sufficiently similar to warrant consideration of their combination"; if that were not feasible, "coordination is certainly in order." Changes in prices and food supplies, both affected by seasonality, were of central importance to NFCS; it had to collect seasonal data within at most three months, while prices and supplies were relatively constant. To stretch out data collection to two years (as was then projected for HANES I) "would severely limit the usefulness of the [NFCS] data and...make impossible comparison of the results with those of previous surveys." However, the possibility of NFCS collecting food intake information for HANES "should be explored." HANES 24-hour dietary recall data "can be correlated meaningfully with health status data only on the basis of subgroup means." Hence, NFCS intake information on one random sample of the population might be useful for comparison with HANES health information on another random sample, even if the reference periods differed. 14

HEW Secretary Elliot Richardson replied that consolidation of the two surveys "is not desirable or even feasible" and would require "a very great increase in the total cost." NFCS was an intermittent survey completed in one

year; in 1965-66, it utilized 144 sampling locations, which was desirable to increase reliability and feasible for an interview survey at little increase in cost. In contrast, HANES utilized only 64 sampling locations, because of the need to bring subjects to central examination facilities. To economize on the specialized staff and equipment required both for the examinations and the biochemical analyses, HANES "needs to be limited to a scale which permits continuing operation...." If a lengthy health examination were added to household interviews and food diary records, the heavy burden imposed on subjects would reduce HANES's 95 percent participation rate in interviews and 75 percent participation in examinations, seriously jeopardizing the validity of the survey. 15

The General Accounting Office is a creature of the Congress, and the Congress is often exercised over the failure of Executive agencies to coordinate their policies and programs (while the Executive is often exercised over the comparable failure of Congressional committees).

In July 1977, a subcommittee of the House Committee on Science and Technology held three days of hearings on nutrition surveillance and monitoring, exploring a broad range of issues including the nature and extent of malnutrition, the role of surveillance in developing, implementing, managing, and evaluating federal nutrition policies and programs, and whether the nutrition surveys of Agriculture and HEW should be combined or better coordinated. 16 The interest manifested in these hearings and related activities of other House and Senate committees was reflected in Sec. 1428 of the Food and Agriculture Act of 1977 (P.L. 95-113, Sept. 8, 1977) which stated:

(a) The Secretary [of Agriculture] and the Secretary of Health, Education, and Welfare shall formulate and submit to Congress, within ninety days after the date of enactment of this title, a proposal for a comprehensive nutritional status monitoring system, to include:

(1) An assessment system consisting of periodic surveys and continuous monitoring to determine: the extent of risk of nutrition-related health problems in the United States; which population groups or areas of the country face greatest risk; and the likely causes of risk and changes in the above risk factors over time;

(2) a surveillance system to identify remediable nutrition-related health risks to individuals or for local areas, in such a manner as to tie detection to direct intervention and treatment. Such system should draw on screening and other information from other health programs....; and

(3) program evaluations to determine the adequacy, efficiency, effectiveness, and side effects of nutrition-related programs in reducing health risks to individuals and populations.

(b) The proposal shall provide for coordination of activities under existing authorities and contain recommendations for any additional authorities necessary to achieve a comprehensive monitoring system.

The Subcommittee on Labor, Health, Education, and Welfare of the Senate Committee on Appropriations also directed the Assistant Secretary for Health to submit to it a proposal for a comprehensive nutritional status monitoring system.

Even before enactment of these provisions, Agriculture and HEW staff were discussing means by which NFCS and HANES could be more closely meshed so that food consumption data of the former and health status data of the latter could be interrelated and needless duplication eliminated. 17 The requirement to develop a more comprehensive nutrition information system embracing many other government data collection programs put this effort into a broader context and give it the force of a Congressional mandate.

The resultant Agriculture-HEW proposal has evolved through a series of drafts, Congressional responses, GAO critiques, and implementation measures and plans. The proposal is multifaceted, involves the cooperation of many government and private agencies, and projects actions over a five year period. Nothing that complex is likely to be implemented precisely as envisaged.

As set forth in March 1978, the proposal enumerated a series of information objectives, gaps in knowledge, and measures which would or might help to provide the missing knowledge. The four major kinds of information dealt with would seek to determine: 1. nutritional status and its relation to health; 2. the nutrient content and quality of foods; 3. dietary practices and knowledge; and 4. the effectiveness of food and nutrition programs. The overall goals of the proposal were:

To enhance the health of the American people by establishing a national system which will monitor the nutritional status, nutritional quality of the food supply, dietary practices, nutrition knowledge and attitudes, and effectiveness of food and nutrition programs for purposes of establishing public policy, determining research priorities, program planning, and assuring effective and efficient use of national resources. 18

Before detailing the proposal's position on HANES and its relation to NFCS, we will briefly summarize the other elements of the system so that the place of HANES in the large and diverse spectrum of nutritional data collection activities can be better appreciated. In doing so, it will be helpful to note the definition of four terms employed in the proposal and our own interim report.

Nutritional assessment involves the comprehensive measurement and description of factors or parameters which affect nutritional health at a given time.

Nutritional monitoring is the measurement of changes over time. Monitoring requires repeated, comparable measurements at regular intervals.

Nutritional surveillance activities are directed to the continuous measurement of selected indicators or specific nutritional problems in a community so that changes can be detected early and appropriate action taken. Surveillance can be based on information collected routinely in service delivery systems...and includes rapid analyses and feedback of the information to the service delivery source for immediate use.

Nutritional program evaluation is the assessment of the dietary, biochemical or anthropometric changes in program participants that can be attributed to participation in a given food assistance program. 19

The key distinction is between assessment and monitoring, on the one hand, which HANES does, and surveillance and program evaluation, on the other, which it does not do.²⁰ Assessment and monitoring require comprehensive examinations, usually of a representative sample; assessment is a one-time evaluation whereas monitoring is merely two or more comparable assessments which, being repeated at periodic intervals, can detect trends and changes. Surveillance utilizes a brief inspection—often height, weight, hemoglobin or hematocrit, and perhaps dietary intake data to decide if a fuller examination and therapy is warranted for a group or individual (the latter activity is usually termed "screening"). Evaluation, which may employ either a brief or comprehensive examination, is essentially an administrative and public health tool to determine if a food program is nutritionally effective or should be modified.

The proposal noted that existing surveillance systems, such as those of the Health Services Administration, the Early and Periodic Screening, Diagnosis, and Treatment Program, and the Center for Disease Control, had inadequate resources, personnel, training, coverage, and technical quality; "ineffective quality control measures and...equipment...adversely affect the validity and reliability of the data collected." Technical assistance to local programs should be expanded and surveillance should be extended to high risk groups (such as "prenatal, the elderly, minorities, hospital patients, migrant workers, etc.") in all states.

Though the National Institutes of Health supported much, and the Center for Disease Control and the Food and Drug Administration some, epidemiological research, it was insufficient and should be expanded "to determine relationships between diet and disease," identify populations at risk from environmental factors or unusual diets, or study emergency problems such as the hazards of a liquid protein diet.

An enlarged HEW-Agriculture program of methodological research into improved measures of nutritional status was needed. Many existing measures "are inadequate and outdated," alternative dietary survey methods "must be examined," and common reference materials should be more widely available.

Better and more complete analyses of the nutrient content of foods, especially fresh fruits, vegetables, and processed foods, were needed. The Food and Drug Administration should expand its analyses of the nutrient content of the average diet; more analyses should be conducted of prepackaged, restaurant, and institutional meals; automated nutrient analyses should be improved.

Food distribution, market research, food disappearance, and other information should be integrated into new systems to monitor the population's food consumption and food fads. Surveys should determine the dietary concerns, knowledge, and habits of the population, monitor new food practices, and "determine the influence of family, social, and lifestyle factors on food selection and preparation." The surveillance of nutrition labeling and advertising should be expanded and the effectiveness of such nutritional information evaluated.

Evaluations of the nutritional effects of federal food programs should be undertaken and expanded, including an annual evaluation of the Food Stamp Program. Surveillance and monitoring of the nutritional status of food program participants should also be expanded and improved. And methodological research was needed to improve nutritional status measures.

With respect to the assessment and monitoring activity of HANES and NFCS, it was observed that neither provides adequate data on high-risk groups such as infants or pregnant women, or special geographic areas such as Appalachia.

As food consumption patterns "are changing at a more rapid rate than in the past," the NFCS dietary data became obsolete between surveys. "HANES data are not released on an acceptable schedule, and the nutritional status data...are not available in timely fashion or in sufficient detail....Accelerating the collection, processing, and dissemination of the NFCS and HANES data is vitally needed...."

Comparisons of individual intake information...between HANES and NFCS are hampered by differences in survey methodology and in the data bases used to calculate nutrient intakes....it is currently impossible to relate differences in household or individual food intake collected in NFCS with differences in levels of physiological indicators of nutritional status collected in HANES.

During the 8 or 9 years between national nutritional assessments, assessments should be conducted (by HANES) of "infants and preschool children, pregnant and lactating women, the elderly, and special area and minority groups." Between NFCS surveys, dietary status surveys of high-risk groups should be conducted (by Agriculture). "Priority will be given to survey efforts aimed at determining impacts of nutritional intervention through food and nutrition programs." (The preceding parenthetical references to HANES and Agriculture are ours; the proposal did not identify either.)

Reviewing the proposed Nutritional Status Monitoring System, Gregory Ahart, Director of the GAO Human Resources Division, judged it "a good first step" with four weaknesses: "(1) lack of specificity and agreement between HEW and USDA, (2) lack of agreement on the collaborative, decennial survey, (3) role of the system in program evaluation, and (4) inadequacy of the coordination mechanism." GAO called for:

- A detailed implementation plan showing when and how the proposal will be implemented and how much it will cost.
- An elaborated discussion on all elements of the proposal, especially those sections dealing with the decennial survey and program evaluation.
- Procedures for dealing with areas of disagreement on how the proposal is to be implemented.
- Regular, institutionalized communication between and within the Departments.

Ahart repeated the GAO's 1970 suggestion, which HEW Secretary Richardson had rejected as impracticable, that HANES and NFCS could best be coordinated if HANES examined a subsample of NFCS subjects. "Gathering the information for one sample could greatly ease the problem of correlating the two sets of data....The problems of respondent burden and differing data needs are real, but ones which we believe can be worked out." He recommended a pilot study "during the next NFCS [1982-83?]" to determine the feasibility of combining both the NFCS and HANES surveys into one joint survey."

Ahart also criticized the "tenuous" interdepartmental coordination arrangements. "There is no clearly defined procedure as to how disagreements over the proposal would be settled. One official told us that the best thinking would prevail. In view of the split of opinion on nutrition matters between the two Departments...it would seem that each agency feels that it has the 'best thinking.'" If "appropriate congressional committees" find that "serious efforts have not been undertaken to make this an effective system, the Congress should designate either the Department of Agriculture or HEW as a lead agency having primary responsibility in nutrition intelligence gathering." 21

A fuller November 1978 GAO report, Future Of The National Nutrition Intelligence System, elaborated the foregoing points. The 10-year frequency of

NFCS and the slowness of NFCS and HANES data collection and reporting were, it observed, serious shortcomings.

Timely data is vital to decisionmakers, and researchers in the field of maintaining and improving nutritional health....

...the pace of changes in the availability of processed foods, household social patterns and the cost of food are causing food consumption patterns to vary more rapidly than in the past. As a result, NFCS 10-year interval data becomes obsolete before a new survey is conducted....

HANES data likewise has not been released in a timely manner. A long data collection period, the process by which the data has been analyzed and released and lack of resources have contributed to this....it will be mid-1980 [more likely, the end of 1981 for health data] before all HANES I basic data is analyzed and published....Therefore, about 9 years will have been required to complete the HANES I program. 22

A condition set by the Office of Management and Budget for approving HANES II, GAO noted, was that a test be conducted of examinations in fixed sites to augment those in mobile caravans and thus speed up data collection. In February 1978, a contract was let for such a test; it called for sampling, interviewing, and examining up to 600 persons aged 6 months to 74 years in a large city, following detailed HANES protocols, and obtaining the highest possible participation rate.

The cost of the entire Nutritional Status Monitoring System was estimated at \$60 million annually after 5 years (\$32.5 million for HEW and \$27.4 million for Agriculture). "While this is a lot of money..., it includes many already existing activities. Further, the amount pales in comparison to the \$40 billion spent annually on various Federal programs to assure good nutrition." 23 (Often, these food programs have been estimated to cost \$9 billion or, at times, \$13 billion; it is not clear what other programs GAO staff included in this large sum.) Good nutrition "could achieve a 25 percent reduction in lives lost to heart disease, an 80 percent reduction in obesity, a 20 percent reduction in the incidence of cancer, and a 50 percent reduction in the infant mortality rate." 24 (That would be possible, at best, only with a full understanding by scientists of precisely what that "good nutrition" is, the cooperation of nature in associating it with a reduction in heart disease and cancer, and the cooperation of 220 million Americans in achieving it.)

A detailed plan specifying the steps to be taken from 1979-83 to implement the Nutritional Status Monitoring System has been developed by the Departments of Agriculture and HEW. It states that the two departments

...will collaborate in the design, conduct, and analysis of data from surveys in the...assessment and monitoring program....Efforts will be undertaken to assure compatibility in...sample designs, data bases,

standard survey methodologies, data collection mechanisms, common analytic categories, and techniques for relating physiologic indicators of nutrition status with dietary intake data.

As part of this process, an expert panel will be convened "to provide advice and guidance."

The work plan provides for another Nationwide Food Consumption Survey in 1982-83 which may "incorporate health-related...measures." (What these measures will be aside from additional interview questions and perhaps height and weight remains to be seen.) The collaborative NFCS-HANES survey, designated as the Nationwide Nutritional Status Monitoring Survey, is projected for 1988. In the intervening years (following completion of HANES II in March 1980), NCHS will first conduct a survey of Hispanic Americans, as this panel has recommended, and, thereafter, "national health examination surveys...[which] may have limited or highly focused nutrition-related components." In 1984-88, "a series of NSMS [Nutritional Status Monitoring System]-related surveys of population subgroups, regional, local, or other area sectors" is envisaged but not identified more precisely or assigned to a designated agency, though presumably HANES would conduct a number. The analysis of HANES I and II data is to be completed by the end of 1980 and 1983, respectively. 25

Notes

1. Age-adjusted death rates from all causes dropped 25 percent in the same period (see Health, United States, 1978, National Center for Health Statistics, December 1978, p. 179).

2. Dietary Goals for the United States, Prepared by the Staff of the Select Committee on Nutrition and Human Needs, U.S. Senate, 95th Congress, 1st Session, February 1977, p. 9.

3. Cf. the careful statement of the National Nutrition Consortium: "...recommendations to reduce the amount of sugar, salt, fat and cholesterol in the American diet are being made in the hope that these changes will prevent a variety of chronic degenerative diseases. Since all of these diseases are multifactorial and none of them purely nutritional, preventive measures based on diet alone are not sufficient" (Guidelines for a National Nutrition Policy, "Nutrition Reviews, February 1980, p. 97).

4. See Jean Mayer, "Nutritional Aspects of Preventive Medicine," in Duncan Clark and Brian MacMahon, eds., Preventive Medicine, Little, Brown, Boston, 1967, pp. 187-207.

5. April 3, 1978 letter to panel co-chairmen Wilbur Cohen and William Stewart.

6. Preliminary Findings of the First Health and Nutrition Examination Survey, United States, 1971-1972: Dietary Intake and Biochemical Findings, National Center for Health Statistics, 1974, p. 3.

7. James E. Austin, "The perilous journey of nutrition evaluation," American Journal of Clinical Nutrition, December 1978, p. 2324.

8. Senator Carl Curtis of Nebraska, Congressional Record, February 18, 1969, as cited in Legislative History of the Select Committee on Nutrition and Human Needs, Prepared by the Staff of the Select Committee on Nutrition and Human Needs, U.S. Senate, 94th Congress, 2nd Session, October 1976, p. 128.

9. Nutrition and Health II, Nutrition and Health Revised with a Study of the Impact of Nutritional Health Considerations on Food Policy, Prepared by the Staff of the Select Committee on Nutrition and Human Needs, U.S. Senate, 94th Congress, 2nd Session, July 1976, p. 45.

10. April 4, 1978 letter from Walt R. Simmon, Committee on National Statistics, National Research Council.

11. Response to the panel's March 30, 1978 letter from Irwin Wolkstein, Associate Director, American Hospital Association.

12. In addition to programs of nutrition policy development, information compilation and dissemination, education, research, laboratory construction, diagnosis, training, technical assistance, and program coordination, demonstration, development, and evaluation, it called for an assessment of the nutritional health status of "approximately one million persons...over a period of 5 years"; the determination of "normal variation in tissue levels for all essential nutrients from birth through old age, and the effect of physiological stresses and diseases on these levels"; and anthropometric measurements of obesity and data on "food habits, nutrient intakes and activity levels" for 200,000 school children aged 8 to 18, over a 5-year period (see Hearings before the Select Committee on Nutrition and Human Needs, U.S. Senate, Part 3, The National Nutrition Survey, January 1969, pp. 1000-1011).

13. May 2, 1978 letter from Gerald F. Combs, Nutrition Program Director, Extramural Programs, National Institute of Arthritis, Metabolism, and Digestive Diseases.

14. September 14, 1971 letter from Ned D. Bayley to A.T. Samuelson.

15. September 13, 1971 letter from Elliot Richardson to A.T. Samuelson.

16. See Nutrition-Related Oversight Review, Hearings before the Subcommittee on Domestic and International Scientific Planning, Analysis and Cooperation of the Committee on Science and Technology, House of Representatives, 95th Congress, 1st Session, July 26, 27, 28, 1977.

17. A draft report of the Working Group on Surveys of Food Consumption,

Nutrition, and Health appears in Nutrition-Related Oversight Review, *op. cit.*, pp. 105-23.

18. "Proposal, A Comprehensive Nutritional Status Monitoring System," U.S. Department of Agriculture, U.S. Department of Health, Education, and Welfare, March 6, 1978 draft, p. 2.

19. *Ibid.*, pp. 4-5. A fuller discussion utilizing similar definitions of "assessment," "monitoring," and "surveillance" and introducing a further distinction between "surveillance" and "screening" will be found in Jean-Pierre Habicht, J. Michael Lane, and Arthur J. McDowell, "National Nutrition Surveillance," Federation Proceedings, April 1978, pp. 1181-87.

20. The initial designation of the nutritional elements of HANES I as a National Nutrition Surveillance Survey may be confusing; as "surveillance" is defined here, HANES I was engaged in assessment (and, insofar as its findings were comparable with the Ten-State Survey and HANES II, monitoring) but not surveillance.

21. June 29, 1978 letters from Gregory Ahart to the Secretaries of Agriculture and Health, Education, and Welfare.

In our interim report, we stated that "GAO staff expect much more of HANES and the Nationwide Food Consumption Survey than either is capable of producing" and that "As now constituted, HANES can not provide all the information that the GAO seeks"—in particular, it cannot identify the localities where specific groups have nutritional needs or monitor the effectiveness of programs seeking to meet these needs (The Health and Nutrition Examination Survey: What it should and should not do, National Academy of Public Administration, January 1979, pp. 16-17). This was, we are sorry to say, an error. The identification of local groups with nutritional needs and the evaluation of nutritional programs have been set forth by GAO, and accepted by the Secretaries of Agriculture and HEW, as goals for the comprehensive Nutritional Status Monitoring System, not for HANES.

22. Future Of The National Nutrition Intelligence System, U.S. General Accounting Office, November 7, 1978, p. 17.

23. *Ibid.*, p. 36.

24. *Ibid.*, p. 1. A more accurate statement would be, not "could achieve" but "might or might not achieve." The source cited is "information given in July 1976, hearings before the Senate Select Committee on Nutrition and Human Needs. See Committee prints Nutrition and Health II, pp. 77 and 78." In fact, no hearings are included in this print, which is a report and compilation prepared by staff of the Select Committee. The citation refers to a brief paper, "Benefits from Nutrition Research," by C. Edith Weir, Assistant Director, Human Nutrition Research Division, Agricultural Research Service, evidently extracted from a longer document issued by a task group of the Department of Agriculture in August 1971.

25. "Status of Joint USDA-HEW Efforts on Nutrition Status Monitoring & Surveillance Implementation" (draft, fall 1979).

VI HANES PLANNING AND CYCLING

It was part of our responsibility to advise on the kinds of policy issues which HANES should address, the kinds of data needed to address them, and the procedures which should be employed in detailing these issues and data—that is, in survey planning. To take these matters beyond the level of generalities, we thought it useful to work through the initial steps in planning a specific survey.

The present chapter deals with the HANES planning process and the central question of the duration and periodicity of surveys of the national population and of special groups. The following chapter reports the results of our practical planning trial, for which we chose the survey of Hispanic Americans we had recommended. The question of survey cycling is discussed further in Chapter VIII, together with the substantive content of repetitive or core items in successive national surveys.

Survey Planning and Operations

HANES planning has been conducted primarily by staff, in consultation with many health and nutrition experts and agencies. Thus, in planning HANES II, staff examined the 5-year plans of federal health agencies, Congressional hearings, legislation, and legislative proposals to identify information needs and issues of current and prospective public concern.

Letters summarizing the content of and the populations sampled by previous surveys and inviting suggestions for the content of the forthcoming survey were sent to members of the NCHS advisory panel; to chairmen of medical schools, pediatrics departments, and biomedical research institutions; and to state health officials and the administrators of federal health and research programs. Subsequent correspondence and consultations were conducted to follow up on particular suggestions. Numerous meetings were held with specialists at the National Institutes of Health, especially the National Institute of Arthritis, Metabolism, and Digestive Diseases; the National Institute of Neurological Disease and Stroke; the National Institute of Dental Research; the National Eye Institute; and the National Heart and Lung Institute.

The feasibility and reliability of each proposed measurement had to be determined. This involved judgments about its suitability for randomly invited examinees; that it not be risky, painful, embarrassing, or excessively time consuming; that it be compatible with other measurements; that necessary equipment be standardized and personnel be trained to use it; that adequate laboratory facilities and personnel be available for biochemical analyses; and that resultant measures be transcribable for computer processing. Judgments had to be made about the priority of different measures; about the prevalence and severity of the condition measured, its social and economic costs and consequences, and whether the measure would be included in only one survey or repeated in succeeding surveys. The final protocol had to be organized into a

smooth-flowing sequence of operations, fitted into a reasonable examination period, and accommodated to available budgetary and personnel resources. Finally, the entire survey—protocols, sampling, duration, expenditures, and personnel—had to be approved by NCHS, departmental officials, and the Office of Management and Budget.

So far as it goes, all of this is useful and necessary. However, several additional steps would help to improve HANES planning and management.

A Shorter Period of Data Collection

A firm period for the duration of data collection should be set early in the planning process and adhered to thereafter.

A number of factors affect the duration of data collection: available funds and (a separate factor that can be rationed even more strictly than funds) civil service positions, and the number of examination caravans that these permit; the length of individual examinations; the size of the sample and oversamples; the proportion of sampled persons who are examined; and sampling arrangements—the number of locations at which examinations must be conducted to assemble a sample representative of the target population. The record of both HES and HANES surveys has been repeatedly marked by extensions of the period initially projected for data collection. In part, this has been due to budgetary cuts and the effects of inflation. But other factors have also been responsible: a tendency to incorporate many lengthy measures requested by various agencies; to oversample many groups; perhaps excessive optimism, or insufficient realism, about the number of examinations that could be conducted within a given period; and an excessive rigidity that bound HES and HANES surveys to targets of 7,000 and 20,000 examinees, respectively, obtainable only at a fixed number and sequence of sampling sites. Thus, if data collection lagged, the period of collection was lengthened.

Since such delays have subjected HANES to much warranted criticism and reduced the value of its data, greater emphasis must be placed, on setting and keeping a shorter period of data collection than the 48 months for HES IV, the 38-54 months of HANES I, or the 49 months of HANES II. We believe that a period of 24 to 30 months is desirable and realistic for surveys of the national population. The shorter period is preferable and the longer should not be exceeded. All other factors must then be accommodated to the fixed imperative of a 24-month data collection period: the length of individual examinations, the number of persons examined in the primary sample or in oversampled groups, and examination arrangements—the number of mobile or fixed, permanent or temporary examining teams. One way to reduce the period of data collection is to contract for examinations in fixed sites in major metropolitan areas while assigning mobile caravans to smaller population centers; another way is to contract for the operation of a third mobile caravan.

There is nothing statistically sacrosanct about the 20,000 examinees utilized in HANES II to represent the national population and oversampled groups aged 6 months to 74 years; in HES I and IV, less than 7,000 examinees

sufficed to represent the national population and oversampled subgroups aged 18-79, and 25-74, respectively. 1

There is nothing sacrosanct about an examination of a given length: in HES IV, the examination took 4 hours; in the nutrition phase of HANES I, 2.5 hours; in HANES II, 2.8 hours. The examination length should, like the number of examinations, be adjusted as necessary to complete data collection within the prescribed 24 months.

In short, the planning shoe has been on the wrong foot. The volume and duration of data collection have been extended to accommodate as many data requests as possible with a fixed number of examinations. Instead, the period of data collection should be fixed and the volume and number of examinations and the number of examining teams adjusted accordingly.

Contracting for Examinations

The rate of data collection has been limited by personnel and budgetary resources. In the first flush of Congressional enthusiasm for nutritional information, HANES I was able to operate three mobile examination centers for a short period; but the number was subsequently reduced to two and, for a time, one. HANES II examinations have been conducted by two mobile centers and the same number will be utilized in the forthcoming Hispanic survey. These two centers have conducted about 420 examinations a month or 5,000 a year.

The ceiling on civil service positions has limited operations more than the ceiling on the budget, which was \$5.6 million in fiscal year 1978 (\$4.8 million in direct appropriations and \$800,000 in funds expended by other agencies). Hence, one evident way to increase the examination rate would be to contract for additional examinations.

The quality and cost of contract examinations have been explored on two occasions. In June-September 1975, contracts were let with medical organizations in Chicago and Baltimore for examinations comparable to those conducted in the same locations by mobile examination centers. The contractors were able to examine only 46 percent of sampled persons compared to 68 percent examined by the mobile centers; conformity to standardized procedures and protocols was poorer; the costs per examinee were similar (about \$340).

Nonetheless, it was concluded that efforts to increase participation and to train contractor staff could improve a contractor's performance.

As noted, the Office of Management and Budget required an additional test of contract examinations as a condition for approving the HANES II survey. In response to an August 1977 request for proposals only three organizations attended the bidders conference and only one submitted a tolerable proposal. The poor response was undoubtedly aggravated by the ridiculously short time, 16 days, allowed for the submission of proposals.

After negotiations to bring the proposal closer to the contract specifications, a \$232,500 contract was awarded in September 1977 to Westat, Inc., a social science and statistical research organization, which subcontracted with the American Health Foundation and the Health Maintenance Center of New York City for the conduct of 600 examinations and dietary interviews of persons 6 months to 74 years old in Manhattan from April-September 1978.

A staff evaluation compared the resultant data with those obtained in Manhattan in 1977 by a HANES mobile center. It found that the cost per contractor examination was 28-35 percent above, and the participation rate slightly lower than, that of HANES; that the quality of dietary interviews and laboratory analyses was unacceptable, the error rate on examinations was marginally acceptable, and the quality of x-rays, electrocardiograms, audiometric tests, and body measurements was acceptable or good. It concluded that more time and training was required for adequate performance and that the limited number of qualified bidders and few HANES staff available to provide the training limited the number of sites at which contractor examinations could be performed. 2

However, if a more reasonable period were allowed for proposal preparation, additional bids might well have been submitted. The problem of achieving and maintaining examinations of the requisite quality seems more serious. It might best be resolved by contracting for the operation of a third mobile examination center.

An Advisory Committee

To help staff to make these adjustments, to evaluate competing demands for limited examination time, and to serve as spokesmen for the health and nutrition community utilizing HANES data, an advisory committee should be established when planning for a survey starts.

Survey planning and operations should have several interlinked goals:

- o to adjust the sampling design, the protocol length, and the number of examinations and examining teams as needed to complete data collection within the assigned period;
- o to test, standardize, and prepare quality controls for new measures and equipment;
- o to clarify the questions which data are designed to answer and to ensure that these data are collected within acceptable and measured limits of reliability and variance;
- o to automate data recording and to edit and check the accuracy of the recording so that errors can be corrected while the subject is still at the examination center;
- o to prepare dummy tables for reporting the data before examinations

start, as well as analytic algorithms or definitions of all variables in the tables.

Ideally, members of the advisory committee and consultants involved in the planning process should have sufficient interest in the survey (as, for example, a professor of community medicine, epidemiology, pediatrics, or nutrition, or a public health commissioner) to obtain preliminary and final tabulations of designated data, to draw upon these data in public and professional discussions, and to write papers about them independently or jointly with HANES staff. Of course, committee members and consultants should have no special privileges and any other scientists or citizens should have similar access to HANES plans and data; it should be a function of the committee to facilitate and encourage such access.

The goal of planning should not be merely a sampling design and inventory of measures, but a set of basic tables, reports, and analyses. It should aim not to launch but to complete a survey, anticipating and preparing for each stage in the process: the scientific ideas and practical issues underlying requests for data; the precise data which may serve to answer, or at least to address, them; the equipment, procedures, and personnel which produce the data; the means of controlling and assessing their reliability; the methods of editing and coding the data; the rubrics under which the data should be reported; the computer programs necessary to classify and tabulate the data under these rubrics; and the expertise necessary to interpret the data. By envisaging the completion of a survey at its start, good planning reduces the gap in time and thought between data collection and reporting, enhances data utilization, and renders the entire survey more lean and cogent.

Subsequent Surveys

The Next Survey

To provide a test of the value of an expert committee in survey planning, we convened such a committee. However, before discussing its work, we should review the reasons that led us to recommend that the next survey examine the health and nutritional status of Hispanic Americans. This recommendation, set forth in our January 1979 interim report, was accepted by NCHS.

Plainly, the nation needs reliable information about the health and nutritional status both of the entire population and of many groups within it. This dual need was recognized in the discussions leading to the Ten-State Survey, which gave priority to assessing the nutritional status of poor families in designated states and districts. It was recognized in the discussions leading to the establishment of the Health and Nutrition Examination Survey, which gave priority to assessing and monitoring the status of the national population. It was recognized by respondents to our inquiry, as we have earlier reported, and by the proposed Nutritional Status Monitoring System of the Departments of Agriculture and HEW, which seeks to assess and monitor the status of the national population and also to assess and exercise surveillance over the status

of many special groups.

As HANES had conducted two (or, counting HES IV, three) surveys of the national population (1971-74, 1971-75, and 1976-80), the basic questions we had to consider were whether one or more national surveys should be conducted thereafter, without a break; if a break should be called, what special group survey or surveys should be conducted therein and what principles should govern that choice; and if special as well as national surveys should be conducted, what their respective cycles or staging should be.

We had little difficulty concluding that a third national health and nutrition survey should not follow directly on the heels of the second. Additional national surveys promised to yield less new knowledge than the survey of a special group; the reporting of HANES II data had already begun to lap that of HANES I, which would continue into 1982; a respite was indicated during which the management of national surveys could be rationalized and expedited. Hence, we concluded that the next survey(s) should examine the health and nutrition of one or more special groups.

Which groups?

Over 50 groups were suggested in responses to our inquiry to the health and nutrition community (see p. 44), and many others could be added. There is no magic formula for comparing the relative merit of each suggestion; the final choice is a matter of judgment. However, in making that judgment, we found it useful to consider the following questions:

1. Is there a demonstrable, major need for the survey?
2. If it finds evidence of nutritional impairments of health, can this knowledge be used to bring about significant health improvements?
3. Can the survey help to identify areas of real need so that remedial intervention can be effectively targeted?
4. Are funds for the survey adequate? Would scaling down leave a viable enterprise?
5. Can the survey be conducted expeditiously and economically? Can the group be identified, sampled, and examined without protracted and expensive changes in established procedures? Can the findings be reported promptly?

Our conclusion was that HANES should next survey the health and nutrition of the three major groups of Hispanic Americans clustered in the Southwest, Southeast, and Northeast states (see the next chapter, A Survey of Hispanic Americans). Other groups which we feel merit special study include the American Indians, low income elderly, adolescents, and children under 3. However, these judgments, reached late in 1978, might be revised in 1982 or 1984. We record them for whatever interest they may have; but we believe that the decision about each special survey should be made at the time by the

staff and advisory committee which is responsible for planning it.

Succeeding Surveys

The issue of the appropriate cycling of national and special surveys has been more difficult. In our interim report, we stated that "HANES examinations of the national population should be repeated at ten-year intervals" and that "one or more special surveys should be conducted" in the interval, "ending at whatever time will ensure the timely start of the succeeding national population survey." Since then, we have considered the matter more fully.

All panel members agree that the indispensable function of HANES is to monitor the health of the national population and that surveys of special groups, though important, should take second priority.

One member, Hamish Munro, believes that a national survey every ten years is adequate to chart changes in the nation's health and nutritional status, because it is difficult to determine if the small changes especially in nutritional measures taken at shorter intervals represent genuine trends or merely changes in the comparability of the measures.

The seven other members believe strongly that so much—in economic, social, and human terms, in long-term and short-term policies and programs—hinges on the status of the nation's health that it must be monitored and assessed at five-year intervals. To emphasize the fundamental importance of these health measures which seem periodically overshadowed by nutritional questions, some members would retitile HANES the Health Examination Survey. Nutrition, after all, is only a part of health; to single it, or one of a hundred other parts, out for equal attention with the whole is to exaggerate its importance.

Six of the seven recommend that the quinquennial national survey be completed expeditiously in 24 to 30 months and that the intervening period be devoted to one or two surveys of special groups. One member, Jean-Pierre Habicht, proposes a new arrangement in which the nation is divided into five regions of equal population, one of which would be surveyed and reported each year. After five years, the regional data would be cumulated and, thereafter, national reports would be issued annually by adding the latest region and dropping the earliest. A fuller exposition of this proposal is given on p. 107.

The compromise of a 7 or 8 year cycle for national population surveys would upset the proposed collaboration between HANES and the Nationwide Food Consumption Survey (which, under the proposed Nutritional Status Monitoring System, is to be changed from a 10-year to a 5-year survey).

The other critical factor is the duration of HANES national surveys. If they were conducted every 5 years and were, like HANES II, to take 49 months, an interval of only 10 or 11 months would be available for special surveys. In that time (at the HANES II monthly examination rate of 420 persons), 4,200-

4,600 persons might be examined, barely enough for some statistical purposes and quite insufficient for many others. In short, acceptance of both the HANES II schedule of performance and a quinquennial cycle of national surveys would virtually preclude the conduct of significant special surveys with existing HANES resources.

However, we do not accept the HANES II schedule as satisfactory and know no one who does—not HANES or NCHS staff, not Congressional critics, the General Accounting Office, or health and nutritional authorities who met with us or responded to our inquiry. And, as discussed earlier, we believe that HANES national surveys can and should be conducted in 24 to 30 months at most. That would leave an interval of 30 to 36 months between quinquennial surveys, which should suffice for two special surveys with 6,300 to 7,560 examinees in each. Accordingly, we have concluded that the HANES national health surveys should be conducted quinquennially, their midpoint synchronized as closely as possible with that of the Nationwide Food Consumption Surveys (now scheduled for 1983-84 and 1988-89).

Thus, the next HANES national health survey should start in 1983-84, and the next national health and nutritional survey, around 1988-89.

Each quinquennial survey should contain a core of standardized measures comprising about half of the 2-hour examination, and each detailed decennial survey, an additional core of standardized nutritional measures. It is of the utmost importance that these measures remain as comparable as possible, to ensure that observed changes represent true changes in the prevalence of health conditions and not in survey instrumentation, procedures, or sampling. The remaining portions of the survey should be devoted to the assessment of other conditions of special scientific or practical importance.

On the specific content of each HANES national survey and its relation to NFCS, we have a few observations founded primarily upon our study of HANES and of the proposed Nutritional Status Monitoring System. Although Department of Agriculture officials have provided us with information about NFCS and have twice met with us to discuss it, an evaluation of NFCS was not part of our charge.

HANES and NFCS are sources of important, interlocking data about the nation's health, nutrition, diet, and food utilization. We subscribe to the objectives, set forth in the Nutritional Status Monitoring System, of a closer collaboration between the two surveys, so that each can better complement, not duplicate, the other. However, it should be borne in mind that each survey has markedly different functions: HANES, to assess and monitor health and nutritional conditions; NFCS, to assess and monitor food consumption and the effects of seasonal factors and prices upon it. 3

The main area of duplication in the surveys upon which criticism has focused consists of a 24-hour dietary recall.

If the surveys are to be fully complementary, their scheduling, sampling,

field procedures, coding, and classifications, even the training of interviewers, should be as comparable as possible. If such comparability is achieved, the 24-hour recall questions can be dropped from HANES and assumed solely by NFCS in any quinquennium when both are conducted. While this would preclude the association of dietary data with health measures on the same individuals, the comparability of the two surveys would permit such an association for demographic and socioeconomic groups. In actual experience, the use of dietary data for group analyses has been both feasible and important, whereas, in the present state of the dietary survey art, their use for individual analyses has been unrewarding.

As a practical matter, two surveys taking different lengths of time, utilizing a different number of sampling locations and different staffs will not be precisely comparable in all respects, but a satisfactory degree of comparability should be attainable. The definition and achievement of that requisite and practicable comparability should be the responsibility of an impartial, qualified body with the necessary authority to enforce agreement. An appropriate body would be the Office of Science and Technology Policy in the Executive Office of the President or the Cabinet level Statistical Policy Coordinating Committee staffed by the Office of Federal Statistical Policy and Standards, formerly in the Office of Management and Budget and now in the Department of Commerce. OSTP or OFSPS, assisted by a committee of experts designated by the office director, should ensure that NFCS and HANES cooperate effectively to provide the data needed by governmental and private bodies to assess and monitor the nutritional status of the population without jeopardizing the vital HANES function of monitoring the health status of the population.

Notes

1. It is true, as several readers have noted, that the precise number of examinees is best determined after first determining the precise analyses, the breaks by given factors, that will be conducted. But all future analyses cannot be foreseen and no number of cases, not even the national census, is adequate for some analyses. The simple statement that 7,000 examinees were found adequate for HES I-IV also remains true.

2. See Report of the Health and Nutrition Examination Survey Fixed Site Study, April-September, 1978, National Center for Health Statistics, September 17, 1979 draft.

3. Robert L. Rizek, Chairman, Consumer and Food Economics Institute, Department of Agriculture, writes "We concur that HANES and NFCS have markedly different functions. The role ascribed to NFCS, 'to assess and monitor food consumption and the effects of seasonal factors and prices on it,' however, represents a misconception. The 1977-78 NFCS provides, for the first time, a full-scale measure of seasonal influences on food consumption. Results from the study will indicate the extent to which seasonality will be a factor in planning future surveys. Also, the NFCS surveys are not designed to be food

price studies. The primary intent of NFCS from its beginnings has been to provide indicators of dietary and nutritional status and related food information which will help educators and others in getting consumers to improve the nutritional quality of their diets" (April 9, 1980 letter to Harold Orlans of the panel staff).

Rizek is assuredly a better authority than our panel on the function of NFCS. If he states it accurately, the function of NFCS differs less from the nutritional aspects of HANES than we had believed; indeed, it differs in method more than in purpose.

VII A SURVEY OF HISPANIC AMERICANS

The Census Bureau has stated that, in March 1978,

there were 12 million persons in the United States who reported that they were of Spanish origin. About 7.2 million were of Mexican origin, 1.8 million of Puerto Rican origin [not counting those in Puerto Rico], 700,000 of Cuban origin, 900,000 of Central or South American origin, and about 1.5 million of other Spanish origin.... 1

Other sources estimate the total Hispanic population at as high as 16 million or even 20 million in 1979. "Because of high birth rates and legal and illegal immigration, Hispanics have become the fastest growing minority group in the country and may well outnumber blacks sometime between 1980 and 1990...." 2 Hispanics of Mexican origin are concentrated in the Southwest, especially in California and Texas; those of Puerto Rican origin, in New York and Chicago; and Cubans, in South Florida. About 85 percent live in metropolitan areas.

The health condition of many Hispanic people has been of concern to leaders of the Hispanic community and to health authorities; there is great practical as well as intellectual interest in learning more about their precise health status and its relation to the limited health services and restricted diet available especially to many poor persons.

Stanley Garn of the Center for Human Growth and Development at the University of Michigan has complained that "the term Hispanic...lumps Mexican Americans and Puerto Ricans and Cubanos sometimes even Tagalog speakers, people from Chile and the real genuine Castillians who just happen to turn up in the survey. Each...with nutrition problems and genetic problems and cultural problems unique to themselves." 3 However, Representative Edward Roybal of California, leader of the Congressional Hispanic caucus, observes that "Statistical visibility is policy visibility." 4 Roybal sponsored Public Law 94-311, June 1976, which requires federal agencies—and the Departments of Labor, Commerce, Agriculture, and HEW in particular—to "collect, and publish regularly, statistics which indicate the social, health, and economic condition of Americans of Spanish origin or descent." The law states that

...improved evaluation of the economic and social status of Americans of Spanish origin or descent will assist State and Federal Governments and private organizations in the accurate determination of the urgent and special needs of Americans of Spanish origin or descent;

...the provision and commitment of State, Federal, and private resources can only occur when there is an accurate and precise assessment of need....

Hispanics of Mexican, Puerto Rican, and Cuban origin will, of course, be

separately identified in the forthcoming HANES survey.

We invited a number of authorities to discuss the broad issues that should be investigated in an examination survey of Hispanic Americans; specific health and nutritional conditions, and factors likely to be associated with them, that might be important in these groups; and special problems which this survey would face and how they might be dealt with. The following persons, for whose help we are most grateful, met to discuss these issues with HANES staff in one or more of four days' sessions in the spring of 1979; many also submitted memoranda and some have been involved in subsequent communications with HANES staff:

Dr. E.L. Aguilar, Tucson Clinic, Tucson, Arizona
Dr. David Bayse, Clinical Laboratory Division, Center for
Disease Control, Atlanta
Ms. Maria D. Burgos, Expanded Food and Nutrition Education
Program, Cornell University Cooperative Extension, South
Bronx, New York
Dr. Blaine W. Glad, Human Nutrition Section, University
of California, Davis
Dr. J. Michael Lane, Bureau of Smallpox Eradication,
Center for Disease Control, Atlanta
Dr. Jane Neese, Clinical Laboratory Division, Center for
Disease Control, Atlanta
Ms. Siobhan Oppenheimer-Nicolau, Division of National
Affairs, The Ford Foundation
Dr. Richard Remington, School of Public Health, University
of Michigan
Dr. Robert E. Roberts, Department of Psychiatry,
University of Texas Medical School, Houston
Ms. Catherine Rodriguez, Bureau of Nutrition Services,
Arizona Department of Health Services, Phoenix
Dr. Cecil G. Sheps, Department of Social Medicine,
University of North Carolina Medical School
Dr. Michael P. Stern, Department of Medicine, University
of Texas, Health Science Center, San Antonio
Dr. Barbara Underwood, Department of Nutrition and Food
Sciences, Massachusetts Institute of Technology
Dr. Carlos Vallbona, Department of Community Medicine,
Baylor College of Medicine, Houston

Jean-Pierre Habicht and William Stewart of our panel participated in the meetings (Richard Remington, who chaired one meeting, joined the panel shortly thereafter) as did NCHS Director Dorothy Rice and eight NCHS staff members.

The broad recommendations emerging from the meetings were that the basic HANES format be maintained; that, should budgetary considerations limit the number of Hispanic groups which could be surveyed, first priority should be given to those of Mexican origin, second priority to those of Puerto Rican

origin, and third to those of Cuban origin (a ranking reflecting the number in each group); that the entire island of Puerto Rico be sampled; that the entire household, not individuals, be the basic sampling unit; that only Hispanic households be sampled, if the sample size is no larger than now projected (about 4500 households or 12,000 persons); and that the survey sample individuals 6 months and older.

The group discussed some of the broad problems with which the survey had to contend: the sampling; staffing; obtaining community cooperation; identifying ethnic status and the degree of acculturation; special aspects of the Hispanic diet; health and food attitudes, information, and practices; and the general approach which should be adopted in presenting and analyzing the data. It listed the following conditions as particularly worthy of measurement and suggested, for each, specific measures which should be used, investigated, or avoided: alcoholism, anemia, breast feeding, chronic obstructive pulmonary disease, dental conditions, diabetes, enzyme tests, gallstones, growth and development, obesity, parasites, and the nutritional status of vitamin A and trace elements.

Sampling 5

The objective is to ascertain and compare the prevalence and inter-correlations of characteristics measured in HANES II with those of Hispanic Americans.

The most efficient sampling for this objective is to sample only Hispanics, excluding all Anglos, blacks, etc. However, no comparison will then be made between Hispanics and other groups living in the same locality.

Seasonality

Seasons can affect the type of food, diet, physical activity, income, some physical variables such as cholesterol, and family location. In the Southwest, most migrant families are at home in the winter. HANES has conducted examinations in this area in the winter and in northern states in the summer. The same pattern should be followed in the Hispanic survey, to assure comparability with HANES II and to sample migrant households who would otherwise be missed.

Particular Sites 6

Chicago should be considered as a sampling site; having substantial numbers of Chicanos and Puerto Ricans, it would permit comparisons between the two groups in a similar setting. If feasible, Puerto Ricans should also be sampled outside New York, in places like Hartford or Boston, where immigration is more recent and health systems have less experience at serving them.

The Center for Disease Control has limited surveillance data from parts of Florida and Arizona. It might be useful to sample in areas where HANES data can be compared with surveillance data, as recommended in the Nutritional Status Monitoring System.

Staffing 7

The nature of the subjects' relationship and ease of communication with interviewers may affect the participation rate in interviews and examinations and the quality of data. Ideally, the examination center staff should be bilingual and the interviewers both bilingual and bicultural—in the local culture. A Puerto Rican interviewer may not be ideal in Texas or a Chicano interviewer, in Manhattan.

However, the HANES examination staff are expert, reliable, and devoted; their use will enhance the comparability of measures with those of HANES II; and other considerations, such as civil service status and the desirability of retaining the core staff for subsequent surveys, militate against replacing the entire present staff with a new group hired solely for this survey. Hence a reasonable compromise must be struck between the use of existing and selected additional staff.

Home interviewers should be bicultural; to have interpreters accompany them would be second best. HANES interviewers, who are outstandingly well qualified and have obtained high rates of participation in the examination, could train and supervise the new staff. Examination centers should have bicultural receptionists recruited from the appropriate Hispanic group. The physician's assistant should be bicultural; translators should be available, when needed, for the medical technicians. The dietary interviewers should be a bilingual dietician or, second best, a dietician assisted by a translator, who in turn must receive special training. It would, of course, be desirable for all examination staff to learn at least some Spanish.

Obtaining Community Cooperation

It will be important to identify national and local leaders of the Hispanic community, explain the objectives of the survey to them, and solicit their cooperation during both the planning and subsequent data collection and analysis stages. The presence of illegal immigrants will probably reduce participation in both the interview and examinations; hence the cooperation not only of health officials but of a broad spectrum of community leaders assumes greater importance in this survey than in other HANES surveys and warrants correspondingly greater efforts. Local Hispanic leaders can also help to locate middle-class Hispanics who should be sampled and may be missed if they do not live in the barrio.

Identifying Ethnic Status 8

Ethnic status is an important factor in sampling and in group comparisons. Screening at the household door will be necessary to determine if Hispanic persons are present. After the data have been collected, it will be necessary to compare the health status of Chicanos, Cubans, and Puerto Ricans, and different members of each group (such as those at different levels of acculturation and income).

For screening purposes, the list of ethnic identifiers should be brief, perhaps limited to four questions: 1. surname of the household head and maiden name of the spouse; 2. birthplace of the household head, spouse, and their parents; 3. use of Spanish in the childhood home of the household head and spouse; and 4. what ethnic group the household head and spouse identify with or consider themselves members of (similar to the fixed-choice questions in HANES I and the Current Population Survey). This procedure permits the delineation of persons of Mexican, Puerto Rican, Cuban, and other Spanish descent and ensures comparability with earlier HANES and Census statistics.

To estimate the level of acculturation, consideration might be given to determining: 1. marriage to a non-Hispanic; 2. if Spanish is used less frequently now than in childhood; 3. the ratio of Hispanic to non-Hispanic friends; 4. the observance of certain religious and social customs (which may differ by Hispanic group and even by state); 5. the relative use of Spanish and English newspapers, periodicals, radio, and TV programs; 6. if naturalized, the number of years spent in the country of origin and in the U.S.; 7. the use of Spanish in business and social relations—and in the interview.

Diet and Nutrition 9

Dietary questions should determine the extent to which traditional ethnic foods are consumed. Interviewers might, for example, ask about the use of plantains among Puerto Ricans and tortillas among Chicanos; for nutrient analysis, one should also know how the corn was prepared and if lime was added. Or subjects might be asked if they ate a number of representative ethnic and American foods during the preceding 24 hours, enabling the calculation of a dietary preference score. The sources, storage, and methods of preparing food should be recorded. It is doubtful if the present HANES lexicon of food items is adequate for this survey and the nutrient content of certain ethnic foods may have to be determined. Of course, the dietary pattern will be related to, and help in assessing, the level of acculturation.

The few studies conducted indicate substantial levels of malnutrition, most severe among migrant farmworkers. It may be due to ignorance of nutrition; a traditional, imbalanced diet among the poor; and the addition of unnutritious snack foods such as sweetened soft drinks, cakes, and potato chips. Among Chicanos, refined wheat tortillas, which are considered less "peasant" but are less nutritious, have replaced corn tortillas.

The traditional diets of Chicanos and Puerto Ricans differ, but both rely

on rice, bread, plantain, corn meal, and other starches. Puerto Ricans and Cubans may eat too much fatty food and sugars; adolescents and young adults show elevated cholesterol and triglyceride levels.

Chicanos and Puerto Ricans tend to suffer anemia and serious vitamin and mineral deficiencies, because they eat few vegetables or fruits. Obesity is often considered a sign of health and, among women, of beauty. Anemia and obesity are common among children; however, infant health has gradually improved with better sanitation and living standards and a rise in breast feeding.

Health and Food Attitudes, Information, and Practices 10

HANES II includes a section on health care needs. Further information about the sources, and obstacles to the provision, of health and food information and services can help to improve them. Answers should be sought to such questions as:

- a. the main sources of information about medical services;
- b. if the druggist, curandera, botanica, etc. is consulted and, if so about which health problems;
- c. the importance of Hispanic personnel and knowledge of Spanish in the choice of health services;
- d. if affordable medical care is readily available, its location, and how it is financed;
- e. if a doctor is seen regularly and, if so, when;
- f. if women are comfortable with male doctors;
- g. if women practice family planning;
- h. opinions about the efficacy of designated measures of health care;
- i. the main sources of information about the choice and preparation of food: the influence of parents, school, popular media, and health personnel; and
- j. the availability of, and participation in, school food programs.

Doctors were relatively unavailable to poor Hispanics in their countries of origin: they were expensive, few, and used only in emergencies. This tradition has too often been extended to the United States. Even when medical services exist, Hispanics may prefer to consult the curandera, grandmother, druggist, or botanica. Many Hispanics use traditional "cures"—laxatives for anemia, malt for pregnant and nursing mothers, and cod liver oil or the curandera's leaves for everything.

Clinics seldom strive to make Hispanics feel at ease, and their personnel, typically, do not understand the culture and the patient's meager knowledge of health. Hence there is little preventive medicine and little confianza (confidence) in medical service; people go to doctors only when they are very ill. Modesty often leads women to avoid male doctors; their husband or father may oppose treatment by strange men. However, women doctors are being added by some health services. Dental care is practically non-existent, is regarded as unpleasant and totally resistable. Mental health problems are stigmatized as "craziness." To have "nerves" is acceptable but to see a psychiatrist is not. Some authorities believe that depression is widespread, but treatment is highly limited and largely unaccepted.

The Structure of Analysis^{II}

The presentation of prevalence data should follow the same format as the planned HANES computer-generated reports on prevalence, mean, and standard deviations. These report the data by age, sex, race, income, education, certain ethnic groups (in the present survey, Hispanics of Chicano, Puerto-Rican, Cuban, or other origin), urban-rural, and regional location. The regional analysis may not be meaningful, because it will be confounded with the type of Hispanic group.

Further analyses should give priority to presumed relations between determinants, disease, and outcomes, as illustrated for obesity in Chart 4.

The relationships in the Chart 4 imply hypotheses about cause and effect, confounding factors, and the consequent appropriate analyses; in turn, these hypotheses influence the desired measurements for each variable. Many measurements now taken by HANES are adequate. Some other measurements are suggested below:

Obesity

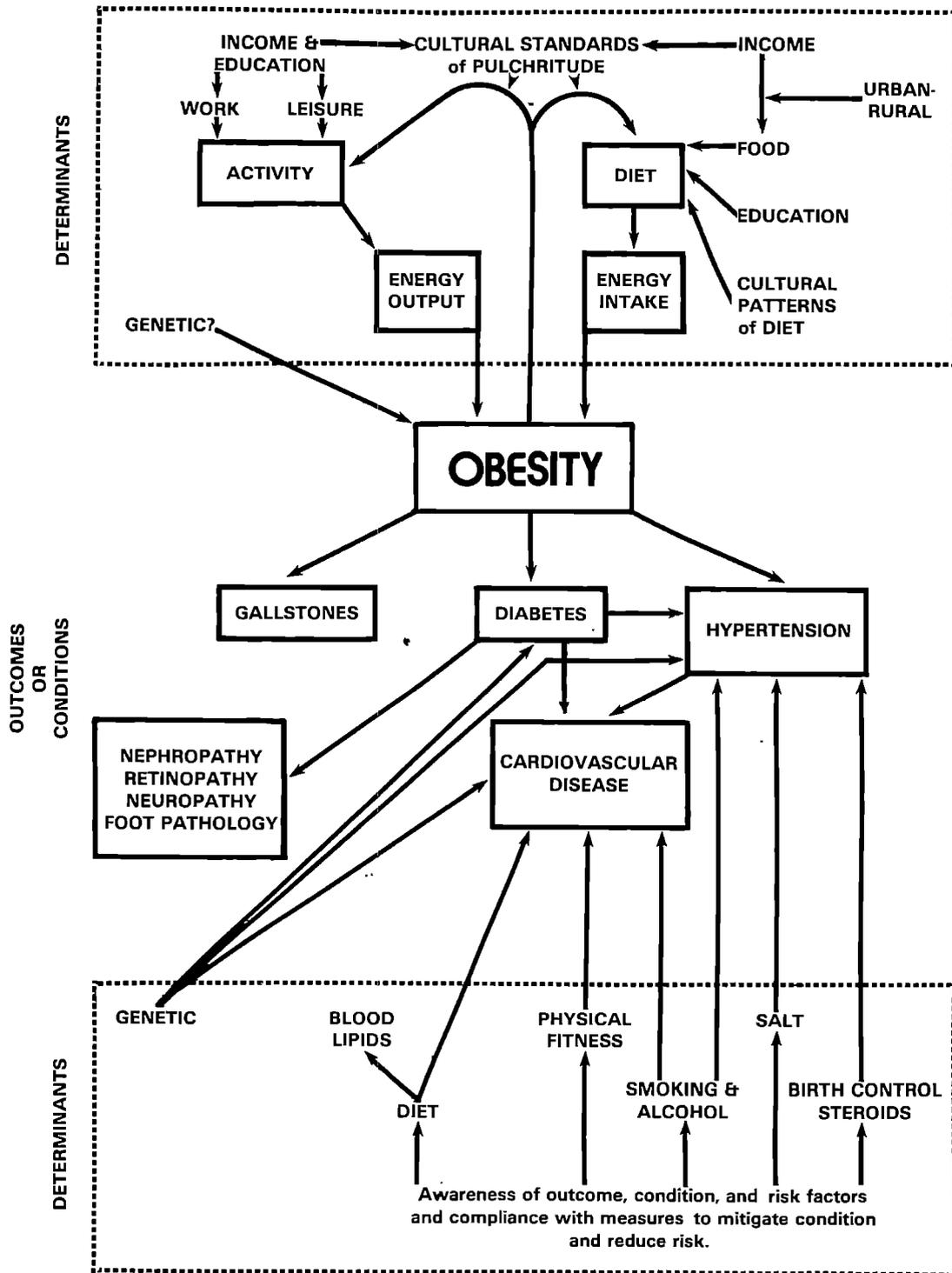
- a. Anthropometry, as at present.
- b. Investigate ultrasound fat thickness measures. Are they better associated with deleterious outcomes than is anthropometry?
- c. No x-rays.

Diet

- a. Measures must serve to isolate energy intake, energy concentration, meal patterns, and nutrient balance.
- b. The effect of cultural bias in the present recall inventory, of interviewer bias, and of cultural bias on the completeness and accuracy of response should be investigated.

Chart 4

DETERMINANTS AND OUTCOMES OF OBESITY



- c. The effect of acculturation on diet should be assessed.

Energy expenditure

- a. Assess level of physical activity at work by occupation and direct questions.
- b. Physical activities in leisure time.
- c. Follow up pilot work to measure 24-hour activity in the Health Examination Survey.

Genetic inheritance

This pervasive determinant should be measured by:

- a. Family history of condition.
- b. Minimal blood typing (requires a few drops) would exclude from family genetic analyses those whose blood type is not compatible with that of their parents. This typing is easy and cheap, but demands high quality control; confidentiality must be rigorous. Contrariwise, blood typing may be inadvisable, not only because of its sensitivity but because this survey is unlikely to make significant contributions to the understanding of genetic disorders, and these may not be important to the prevalence of obesity among Hispanics.

Hypertension

- a. Like many other HANES measurements, better documentation is needed on standardization, measurement imprecision, and blood pressure variability over time.
- b. Cultural factors affecting blood pressure in the examination setting must be considered.

Salt ingestion

- a. Use of salt shaker and consumption of salty snack food are collected in HANES II.
- b. The Na/creatinine ratio might be added in random urine samples. This is a good measure for group means, but the meat (muscle) intake for three days preceding the examination must be ascertained.

Coronary heart disease

- a. Present HANES cardiovascular measurements seem adequate. However, logistical constraints barred HDL cholesterol and chylomicron serum lipid determinations. Are they now feasible? The addition of a chylomicron

test would permit typing of hyperlipidemias, using a simple assumption about the relationship between high density cholesterol to total cholesterol.

b. Are serum lipids now determined in the fasting state?

c. An exercise test for occurrence and measurement of ventricular extrasystoles, pilot-tested for HANES II, might be reconsidered in consultation with the National Heart, Lung, and Blood Institute.

Physical fitness

a. The exercise test mentioned above would also measure physical fitness.

Smoking

a. Interviewing should go back to junior high school and relate smoking to physical examination measures.

b. A question on early morning production of bronchial secretion would help to interpret the effects of smoking.

c. The measurement of a closing volume in smokers might yield important data on latent chronic obstructive pulmonary disease.

Significant Conditions

Alcoholism 12

Valid historical data on alcohol intake are notoriously difficult to collect and, due to cultural factors, may be particularly difficult to get in the present survey. HANES dietary histories seek quantitative estimates of alcohol intake.

Liver function tests are non-specific and may not be abnormal until cirrhosis has developed. Tests which are allegedly more sensitive and specific should be investigated. The time when alcohol is drunk should be determined. Drinking at breakfast is much more significant than before or during dinner.

Anemia 13

Anemia, probably iron deficiency anemia, is evidently more prevalent among Hispanics, especially women and children, than among U.S. whites. Its exact prevalence is unknown and the nutritional cause is obscure. HANES II employs hematocrit, hemoglobin, and red blood cell count to diagnose the condition. Red cell folate, serum folate, B₁₂, ferritin, copper, zinc, lead, protoporphyrin, serum iron and total iron binding capacity are then used to ascertain the nutritional cause; a sample of non-anemics provides the normal standards for comparison.

These should be continued in the Hispanic survey. One might speak of overkill, but all are needed to identify the anemia's primary nutritional etiology. Hemoglobin electrophoresis is indicated for Puerto Ricans, because of the high prevalence of of hemoglobinopathies that may be expected from the African origin of many.

Breast feeding 14

As breast feeding is still widespread, mothers should be asked a series of questions to determine:

- a. If a child was breast fed, and, if so, until what age.
- b. If breast feeding was supplemented; if so, at what age, with what , and how much, food.
- c. When sugared water, orange or fruit juice, milk, cereal, vegetable and meat baby food, and finger foods or other solid food was started.
- d. What foods the child was eating when breast feeding stopped.
- e. If the child was not breast fed, why.
- f. If, while breast feeding, the mother was working or engaged in other activities outside the home.
- g. How old the baby was when she went to work.

Chronic Obstructive Pulmonary Disease 15

Chronic obstructive pulmonary disease is a major cause of adult morbidity, though there is no a priori reason to believe its prevalence differs among Hispanics.

The semi-automated spirometry data obtained by HANES have been difficult to interpret and may be little more sensitive or predictive than careful questions. Spirometry will add little information useful for public policy. Closing volume measurements, which are relatively simple, might be tried on persons at risk.

Dental Conditions 16

Caries, periodontal disease, and tooth loss may be widespread among Hispanics, since many receive little or no regular dental care. A dental examination such as that in HANES I (which was dropped in HANES II) should therefore be conducted, with an assessment of dental caries, periodontal disease, oral hygiene, and the need for, and availability, of dental care. Malocclusion need not be measured. If dentists are not readily available, dental hygienists should be considered. The help of the National Institute of Dental Research should be solicited.

Diabetes 17

The Hispanic survey cannot expect to shed light on juvenile diabetes. A 2-hour glucose tolerance test like that in HANES may identify adult diabetics. If subjects decline the 1-hour blood drawing, they can be diagnosed by elevated blood sugar and/or 2-hour post challenge, obviating additional blood sampling.

Those with controlled and uncontrolled diabetes should be asked about their awareness of the condition, their source of care, and the degree of their compliance with the treatment prescribed. Subsequent analysis should distinguish four groups: those who are unaware of their condition, aware but not on treatment, on treatment but not under control, and on treatment and under control.

The association of abnormal glucose tolerance and obesity, familial clustering, blood lipids, and other factors should be explored. In one view, late complications of maturity-onset diabetes should not be investigated, as they are rare and their prevalence will not affect the diagnosis or treatment of glucose intolerance. In another view, late complications are not rare and should be documented from exercise tests, blood chemistry, urinalysis, and eye examinations, which will be conducted in any event. Though the prevalence of late complications may not affect diagnosis or therapy, it might be very helpful in health care planning.

Enzyme Tests 18

Two enzyme tests are indicated for all examinees: red cell glutathione reductase to indicate possible riboflavin deficiency; and serum transaminase for possible vitamin B₆ deficiency.

Gallstones 19

Gall bladder, including biliary, disease causes more hospital visits and days in hospital than any other digestive disease. The National Institute of Arthritis, Metabolism, and Digestive Diseases (NIAMDD) has asked that gallstone detection be a major component of future surveys and proposed an ultra-sound technique which may definitively establish the presence of gallstones. If the test is positive but not definitive, the subject will be referred to local radiologists who, under contract with HANES, will take an x-ray as prescribed by HANES.

In investigating the feasibility of ultra-sound, HANES staff should ask NIAMDD to prepare a paper justifying the inclusion of this component and indicating its estimated sensitivity, specificity, positive and negative predictive value, precision, dependability, and reliability for Hispanic subjects under the HANES examination conditions.

If testing all subjects is inadvisable, abdominal complaints, questionable history, or physical findings prevalent in gall bladder disease could be used to

select those to be examined. Such screening should be carefully designed to guard against bias or insensitivity.

Growth and Development 20

Physical growth is quite sensitive to poor nutrition and environment and readily measured by good anthropometry. HANES has excellent anthropometric data for comparison and the staff are sophisticated at obtaining and interpreting it.

The relation of bone age indices of sexual maturation to nutritional status is at best complex; the determinations are cumbersome, expensive, and difficult to interpret. They should be omitted from the survey.

Intellectual as well as physical development may be affected by extremely severe malnutrition not encountered among ambulant children. Moreover, its measures are culture bound, difficult, and expensive and their interpretation is uncertain. Hence, they should also be omitted.

Parasites 21

The examination of stool samples for parasites should be considered, though it may be difficult to collect the specimens and special laboratory facilities will be needed to analyse them. Parasites can have serious nutritional effects, including anemia, and be associated with lower vitamin A values. They are a continuing problem among Chicanos, as new immigrants are often carriers. Hookworm is also found among Puerto Ricans in New York as well as on the island.

Trace Elements 22

Little is known about the distribution of trace elements in the U.S. population. The Center for Disease Control has proposed that hair samples be collected and analyzed for zinc, copper, chromium, and selenium; it has a pilot project for this kind of analysis in HANES II. If the methodology can be perfected, it should be included in the Hispanic survey.

Vitamin A 23

Earlier studies have found somewhat lower vitamin A values in Chicano than in white children. However, they were obtained by poorly controlled laboratory methods and were not accompanied by evidence of night blindness or clear ocular abnormalities. As methods may now be more reliable, vitamin A serum determinations should be performed on children from 6 months to 12 years old.

Vitamin A, dark adaptation, xerosis, and perhaps some new approaches should be examined to see if vitamin A deficiency can be found in children of a vulnerable Chicano population. Overt ocular abnormalities may arise only at a late stage of deficiency.

Other Conditions

Tests should be considered for tuberculosis, venereal disease, and milk intolerance. If possible, the relation between teenage pregnancy and low birth weight should be investigated. It would be desirable, but difficult, to get a reliable measure of anxiety during the examination, especially for the blood pressure test; and also desirable, but delicate, especially for a government survey, to determine the relation between religious convictions and the use of various family planning practices.

Further Planning

Recommendations remain just recommendations; advisers assembled for a few days can do only so much. Their distinctive value derives from their special technical expertise and/or their experience with policy issues—and from their very distance from the practical administrative and operational requirements with which HANES staff are necessarily absorbed. They can put HANES in a broader public context. They cannot replace the functions of government staff and officials who, no matter how many authorities they consult, must take final responsibility for the decision to conduct a given survey and for its methods, measures, and analyses. Advisers can ask only to be heard, not necessarily to be heeded.

HANES and NCHS staff have plainly given careful consideration to the views and recommendations summarized in the foregoing pages. They have arranged several regional meetings to discuss the survey with Hispanic and other health authorities and solicit their help in dealing with a number of problems, such as how best to: define and locate Hispanic persons; accurately itemize and record Hispanic diets and food practices; assess different levels of acculturation and their relation to health and nutrition; translate the survey into local, idiomatic Spanish; determine the linguistic and cultural qualifications which field staff should have and how these may affect participation rates and the quality of data; gain the trust and support of Hispanics and the participation of undocumented persons; and reduce the embarrassment and anxiety of examinees, especially women.

Field testing of the Hispanic survey may start in May 1980. The survey will be targeted on areas with a high concentration of Hispanics. Examinations may be conducted in 30 locations, including New York City, Chicago, Tampa and Miami, Texas, Colorado, New Mexico, Arizona, and California, and perhaps Puerto Rico. "The possibility has been mentioned of including some twin cities in the border region of the United States and Mexico...[such as] El Paso and Juarez...." 24

Within these areas, about 12,000 Hispanic subjects will be selected at random; non-Hispanics will not be examined. The sample unit will be families, not individuals; all members of small, and selected members of large, families will be included; the eligible population will consist of persons from 6 months to

79 years old. Aside from conditions of special significance to this population, the inventory will be similar to that in HANES I and II.

It is hoped to complete the 12,000 examinations in 18 months, an examination rate of about 670 a month or 8,000 a year compared to the 1979 HANES II rate of about 425 a month or 5,100 a year. Contracts for examinations in several metropolitan areas with large Hispanic populations will increase the rate.

The projected schedule calls for examinations to start in May 1981 and be concluded by December 1982. Data tapes and pre-programmed data tabulations would be available from June to December 1983, and fuller analyses by HANES staff and cooperating scientists, from April 1983 to June 1985.

Notes

1. Persons of Spanish Origin in the United States: March 1978 (Advance Report), Bureau of the Census, U.S. Department of Commerce, August 1978, p. 1.

2. Neal R. Peirce and Jerry Hagstrom, "The Hispanic Community—A Growing Force to be Reckoned With," National Journal, April 7, 1979, p. 548.

3. March 13, 1979 letter to George H. Esser, Executive Director, National Academy of Public Administration.

4. "The Growing Hispanic Population," National Journal, April 7, 1979, p. 549.

5. Based mainly on a statement by Jean-Pierre Habicht.

6. Based on communications for Siobhan Oppenheimer-Nicolau and Michael Lane.

7. Based on statements by Jean-Pierre Habicht, E.L. Aguilar, and Carlos Vallbona.

8. Reflecting statements by Robert Roberts and E. L. Aguilar.

9. Based on statements by Robert Roberts and Siobhan Oppenheimer-Nicolau.

10. Based on statements by Roberts, Oppenheimer-Nicolau, Aguilar, and Vallbona.

11. Written by Jean-Pierre Habicht, with commentary by Carlos Vallbona.

12. Based on comments of Lane and Vallbona.

13. Representing the views of Kurt Maurer of the HANES staff, E. L. Aguilar, Barbara Underwood, and Carlos Vallbona.

14. Based on statements by Aguilar, Habicht, Underwood, and Vallbona.

15. Based on statements by Lane and Vallbona.

16. Based on statements by Aguilar, Lane, Maurer, and Vallbona.

17. Reflecting statements by Lane, Blaine Glad, and Carlos Vallbona.

18. Comments by Jean-Pierre Habicht and Frank Lowenstein of HANES.

19. Comments by Aguilar, Maurer, and Vallbona.

20. Based on a statement by Michael Lane.

21. Based on statements by Siobhan Oppenheimer-Nicolau and Maria Burgos.

22. Comments by Aguilar and Maurer.

23. Reflecting comments by Lane, Underwood, and Vallbona.

24. Health and Nutrition Examination Survey of Hispanics, National Center for Health Statistics, August 21, 1979, offset.

VIII AN EVALUATION OF HANES

This chapter will illustrate the kinds of findings which HANES has made; indicate their major users and uses; review the conclusions of an earlier advisory committee which evaluated the National Center for Health Statistics in 1972; and then present our own conclusions about the value and limitations of HANES and the steps that should be taken to enhance its value and reduce its limitations.

Typical Findings

The findings of HANES and the three preceding Health Examination Surveys are so numerous and diverse, it is hard to summarize them concisely.

At least three kinds of findings can be identified: statements of 1. prevalence—the proportion of a population or group with a particular condition; 2. normative data—the distribution of values in a population or group; and 3. trends, or changes over time, in prevalence or in norms. Statements of prevalence (1) or norms (2) are based on a single survey and represent the assessment function of HANES; statements of trends (3), reflecting the findings of two or more surveys, represent its monitoring function (see p. 49). Normative data are useful in interpreting assessment and monitoring data; their special usefulness to physicians is in identifying "abnormal" values in patients. Findings of prevalence and trends can be simple or complex, not merely enunciating isolated "facts" but seeking relationships and explanations. The following examples illustrate each type of finding.

Prevalence and Norms

A statement by Philip Lee, Director of the Health Policy Program at the University of California Medical School in San Francisco, presents a disturbing summary of the major nutritional findings of HANES I and the Ten-State Survey:

- (1) Malnutrition is directly related to low-income and minority status.
- (2) Adolescents and the elderly show markedly high rates of nutritional deficiencies.
- (3) Among the poor, the problem is more one of lack of sufficient quantity of food than of nutritional quality.
- (4) Low hemoglobin and substandard iron intakes are widespread and correlate strongly with low socio-economic and minority status. The HANES states that above 95 percent of the pre-school children and childbearing women studied exhibited substandard iron intakes.

(5) A large proportion of Americans have calcium intakes below standards. Particularly vulnerable groups include the poor, minority peoples, women of childbearing age, and the elderly.

(6) A substantial proportion of Americans have substandard intakes of vitamin A, vitamin C, riboflavin and calories.

(7) Obesity is most prevalent among adult women in lower socioeconomic groups, particularly black women. In some groups more than 50 percent of the adult women are obese. 1

Another presentation of the same findings, which takes into account the nature and limitations of existing standards, is:

1. Iron malnutrition is directly related to low-income. Clinical and biochemical evidence of other kinds of malnutrition is rare and, except for vitamin A, not related to income.

2. Adolescents and the elderly show markedly high rates of nutritional deficiencies according to present standards, but the standards are uncertain for these age groups and the findings are inconsistent with malnutrition due to inadequate food intake.

3. A large proportion of Americans have nutrient intakes below the standards recommended by a committee of the National Research Council. 2 This is to be expected, since these are high, not low or average, standards, set to ensure that almost everyone receives adequate nutrients. Hence a great many normal healthy persons with good nutrition will necessarily receive less nutrients than those standards indicate. HANES has found no clinical or biochemical evidence that this leads to any malnutrition, except for iron, and possibly vitamin A, deficiency.

4. Obesity is most prevalent among adult, particularly black, women in lower socioeconomic groups. In some groups over 50 percent of the adult women are obese, according to present standards, despite their lower average caloric intake; the apparent explanation is their lower level of activity. In 1971-74, about 18.4 million or 33 percent of men and 23.4 million or 36 percent of women 20-74 years old were 10 percent or more above the desirable weight. 3 In many persons, obesity is associated with hypertension, diabetes, coronary heart disease, and other serious conditions.

Severe nutritional deficiency is rare in the noninstitutionalized U.S. population 1-74 years old. Not one case of kwashiorkor or marasmus was found in HANES I, which means that their prevalence in the general population was less than .02 percent. However, their presence in the aged, among institutionalized persons, or in isolated geographic pockets is not precluded.

Similarly, from a national standpoint, protein malnutrition due to a poor diet was essentially nonexistent in 1971-74. (The poor protein nutrition that

was observed was not related to income or diet but to an underlying medical problem.)

More preschool black than white children had low levels of vitamin A.

Large differences in the hemoglobin levels of blacks and whites have been widely reported, leading many observers to conclude that anemia is much more prevalent among blacks and, therefore, that their diet should be supplemented with iron. However, a careful analysis of HANES I data on the relation between hemoglobin level and transferrin saturation (an indicator of iron nutriture) in 3,074 white and 742 black women 18-44 years old (who were neither pregnant nor lactating) suggests that the major cause of the lower hemoglobin levels among blacks is genetic. Hence the hemoglobin standards used to diagnose anemia in whites are inappropriate for blacks. 4 However, even with appropriate standards, black women had slightly higher iron deficiency rates than white women.

...about 83 percent of the population eat meat one or more times per day, and another 15 percent eat it one to six times a week. Less than one percent...said they seldom or never eat meat.

...although over half of the population drinks milk at least once a day, 20 percent seldom or never have milk. The consumption of milk declines with age....

Almost half of the population seldom or never eat fish or shell fish, and 18 percent seldom or never eat eggs. 5

In 1971-74, an estimated 23.2 million or 18.1 percent of persons aged 18-74 had hypertension. The proportion rose rapidly with age, especially among women, and was higher among blacks than whites, except in the youngest age group. Some 11.1 percent of black compared to 3.4 percent of white women had severe hypertension. 6

Of persons taking anti-hypertensive medication, some 57 percent still had high blood pressure (readings of 160/95 or above); only 19 percent were definitely under control; the remaining 24 percent were borderline hypertensives. 7

In 1971-75, nearly 90 percent of persons 65-74 years old had a "significant eye abnormality, and about one-fifth of these...needed treatment....More than half of [those]...with family incomes of less than \$5,000 were not getting care compared with slightly more than a fifth of those with family incomes of \$10,000 or more." 8

Laboratory examinations of blood and urine samples of over 1,150 subjects 12-74 years old showed that, in 1976-77, 99.2 percent had a perceptible residue of DDT; 97.6 percent, a residue of pentachlorophenol; and from 0.2 to 71.9 percent, residues of 18 other pesticides. 9

HANES data have served to estimate protective levels, in 1974-75, of immunization for diphtheria, measles, three types of polio, rubella, and tetanus.

In 1971-72, the average weight and height of children and youth aged 1-17 was less for those below than above the poverty line.

...on the average, [blood] lead levels [in 1976-78] are relatively high in young children from 1 to 3 years of age, with a steady decline through adolescence until about the ages of 13 to 15 years....for males, mean lead levels gradually increase to a peak at age 34 to 36, remain relatively high until age 52 to 54, and then decline through the 73 to 75 year age group. For females, mean lead levels remain relatively low from ages 16 to 18 through ages 25 to 27, followed by a gradual increase until ages 55 to 57, with a subsequent decline through ages 73 to 75. 10

Trends

"Definite hypertension is as prevalent among U.S. adults age 18-74 years in 1971-74 as it was in 1960-62....At both points in time, the prevalence of definite hypertension is significantly greater among Negro than white adults, both men and women." 11

Between 1960-62 and 1971-72, the mean serum cholesterol level of men 18-74 and women 18-54 years old dropped slightly, by an amount that is not statistically significant and may be due to a lack of comparability in the laboratory methods employed; however, the mean cholesterol level of women 55-74 dropped markedly. The cause and consequences of the changes remain to be determined. 12

...the marked diminution and near cessation of the trend to constantly increasing size of successive generations of American children is...[a] dramatic and significant finding....This secular trend to ever-increasing size and earlier maturation (a universal finding among the countries of the western world for the past century that has become a good biologic index of the degree of technological and socioeconomic advance of the developing countries) has been extensively discussed....

From his careful comparisons of many generations of incoming Harvard students, Damon in 1968 was the first to seriously suggest the cessation, or at least a marked diminution, in this trend in America....The present findings both confirm those of Damon and extend them to include most segments of the American population. 13

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...nearly the whole population is growing heavier. In the early 1960s, the average American woman was 5 ft 3 in. tall and weighed

140 lbs.; today Ms. Average is pushing 5 ft. 4 in. and weighs 143 lbs. The average male used to be a shade more than 5 ft. 8 in. tall and weighed 166 lbs.; now he is 5 ft. 9 in. and tips the scales at 172 lbs.—a 4% weight gain. In general, shorter people have gained the least weight: the added avoirdupois has been most striking among taller men and women.

....Laments [HANES] statistician Sidney Abraham, "...the weight increase we found is due to fat." 14

Users and Uses

Only the primary users and uses of HANES findings can be safely identified; thereafter, as they pass from hand to hand, they are mingled with other data and their initial source may be lost—as well as the methodological reservations which, defining their meaning, should (but no longer) limit their use. A statistic adrift from its source may be empty of meaning and yet, like a floating bottle, useful as a missile. "I fear that the kind of data currently being collected by the HANES and USDA Food Consumption Surveys," Mark Hegsted, a former member of our panel, writes, "will be misinterpreted, as they have been in the past, to indicate large numbers of malnourished individuals which have no basis in fact." 15 The fear of this and other misuses of HANES data is amply grounded in experience. However, we will confine ourselves here mainly to correct and legitimate uses.

The major users of HANES findings, who can be identified from requests for publications and data, communications to our panel and HANES (especially during periods of survey planning), fund transfers, and other sources include:

Federal officials and agencies engaged in biomedical research; the provision of health, food, and nutrition services; the administration, planning, and budgeting of research, service, or education in these areas; the regulation of food and drug standards and those of other industries which may affect the public health; and the establishment and modification of policies in the foregoing areas.

State and local personnel and agencies engaged in the planning, supervision, administration, and provision of health, food, and nutrition services.

Higher educational institutions, their faculty, research staff, and graduate students (especially in schools of medicine, public health, nursing, and agriculture, biology departments, and research institutes) involved in education, research, publication, and varied public and private activities in the areas of health, biomedicine, and nutrition.

Independent research institutes and laboratories engaged in basic or applied research in biomedicine, health, food, and nutrition, and related operational and policy questions.

Companies developing, manufacturing, or marketing food products, beverages, drugs, tobacco, chemicals, medical and health equipment, furniture, and clothing, and trade associations serving these industries.

Providers of medical and health, food, and nutritional services, including life and health insurance and companies with large medical and health programs.

Professional and health associations, agencies, and foundations, special interest, public interest, and citizens groups in the food and health areas.

Private citizens, physicians, lawyers, scholars, and writers.

And, no doubt, the foregoing list overlooks a variety of other users.

Federal agencies.

The interests of federal agencies in HANES data have been manifest by their transfer of funds for its collection and their close cooperation in designing methods of measuring specific conditions. As has been noted, many institutes in the National Institutes of Health and other HEW health agencies have sought data on the prevalence, and trends in the prevalence, of various health conditions as one basis of estimating and projecting needs in, and planning and allocating resources to, programs of research, education, training, treatment, and prevention. Thus, HANES data on hypertension have been useful in planning of the Health Services Administration program to reduce hypertension; data on trends in health conditions among different age, income, and racial groups have been useful to the Medical Services Administration in Medicaid program projections. The National Heart, Lung, and Blood Institute has used HES and HANES data in developing plans for research into rheumatic and other heart conditions, allocating funds in its hypertension program, setting serum cholesterol standards for children and adults, monitoring trends in hypertension and serum cholesterol levels, and assessing the effects which educational programs to reduce fat intake may have had upon cholesterol levels.

In general, data on the prevalence, and trends in the prevalence, of conditions known or believed to be interrelated (such as the levels of caloric intake, exercise, and obesity, or of salt intake and hypertension) provide a source of insight and corroboration for independent scientific and epidemiological research and a check on the efficacy of measures of care and prevention.

HANES findings on trends in the prevalence of high blood pressure, cholesterol levels, obesity, the use of tobacco, and alcohol consumption help to assess the effectiveness of national programs to control these conditions and habits. The national high blood pressure program affords a good example. Only since the 1950s have pharmacological agents to lower blood pressure been available. In the early 1960s, HES established that only half of hypertensives knew of their condition; that, of these, only half were under treatment; and only half of those under treatment had their blood pressure satisfactorily

controlled.

When HANES repeated the examination in the early 1970s, a marked change was observed. Now, 80 percent of hypertensives knew of their condition and three-eighths (as against one-eighth a decade earlier) had their blood pressure under adequate control. HANES alone of all national statistical systems was able to monitor these developments, which indicate the success of efforts to control high blood pressure and the rapidity with which health conditions can change.

Health Services Administration staff have found HANES data on weight, height, and nutritional status helpful in developing educational materials and program standards, guidelines, and priorities in their nutritional and health services for migrants, Indians, and low-income mothers and children. For example, special attention was given to detecting and treating iron-deficiency anemia when HANES I data indicated its high prevalence among vulnerable groups. (Should further analysis such as we have reported show that these data have been misinterpreted, a corresponding correction in the HSA programs would doubtless be made.)

HANES data on the nutritional intake and status of the elderly have been useful in designing the "meals on wheels" services of the Administration on Aging.

Data on the prevalence of polio antibodies by age, sex, and income group, furnished to the Institute of Medicine at the request of Assistant Secretary of Health Theodore Cooper in March 1977, helped to determine the advisability, goals, and nature of a new immunization drive.

Data on prevalence, trends and norms have been of special interest to regulatory agencies in setting work priorities and adopting regulations to protect the public health. The Food and Drug Administration (FDA), Federal Trade Commission (FTC), and Environmental Protection Agency (EPA) have repeatedly relied on HANES data for these purposes.

Thus, HANES I data showing high urinary iodine levels in all segments of the population led FDA to study and consider measures to limit iodine exposure. HANES iron anemia data have played an important part in the consideration by FDA and the food industry of the desirability of supplementing selected foods with iron. In 1977, as part of its deliberations on the advisability of regulating the use of saccharin in soft drinks, FDA sought, and HANES provided, information on the prevalence and range of soft drink consumption among different groups and ages. FDA has supported HANES II blood level measurements, which, Food and Drug Commissioner Donald Kennedy states,

...are essential for establishing tolerance levels for lead in foods. Similarly, data are required to establish tolerance levels for other heavy metals. The establishment of baseline levels for such necessary trace elements as selenium, chromium, zinc, and molybdenum is essential to determine the need for fortification with

these elements in the food supply.

Another urgent requirement of this Agency is to assess the impact of consumption of high levels of nutrient supplements and other health foods. Information is required on the body stores, excretion levels, and evidence of toxicity of individuals consuming high levels of such supplements in order to establish safe levels of consumption. Data on the relationship between nutritional status and over-the-counter drugs is also a major FDA need. 16

FDA has been particularly interested not only in the norms but the extremes of intake, which may present special health hazards.

HANES data are of special importance to FDA decisions on food fortification and labelling policies. The 24-hour dietary intake information collected by HANES dieticians may be more reliable than that collected by market research interviewers in the Nationwide Food Consumption Survey 17 (though the latter covers a longer period), and the associated physical examinations and laboratory determinations provide an invaluable evaluation of the population's health status and the possible effects of dietary changes, including changes in food fortification, available from no other source. Commissioner Kennedy writes that

The HANES I data have been widely used by FDA as the scientific base for regulating the fortification of foods. These data have provided information about nutritional deficiencies found both in the general population and within special groups. With the availability of HANES II data, trends will be evident for the first time, enabling FDA to forecast future nutrition concerns, as well as evaluate the effectiveness of past measures to maintain and improve the nutritional quality of the food supply. We believe it is very important that a national health and nutrition examination survey be completed within approximately ten years from the start of HANES II so that both current status and trend data about our population's nutritional health will be available. 18

In evaluating the need for, and labelling which should be required of, a product offering a rich protein supplement, FTC staff examined estimates, derived from HANES data, of the number of persons with various levels of protein deficiency. In July 1975, the Assistant Secretary of Health advised the FTC that "protein supplements are unnecessary for most Americans."

...findings of pesticide residues in humans representative of the general population provide a major element in pesticide policy decisionmaking. These residues are demonstrative of the extent of the environmental distribution of the particular pesticide, and when coupled with laboratory animal data showing adverse biological effects, signal a potential public health hazard. In recent decisions regarding the uses of aldrin, dieldrin, heptachlor, and chlordane, the Administrator of the U.S. Environmental Protection Agency cited

and considered the findings of these chemicals in human tissue.

....the National Human Monitoring Program for Pesticides....[of] the Environmental Protection Agency...functions to determine...the incidence and level of exposure to pesticides...by the general population and to identify trends in these factors....At present, the human monitoring survey examines adipose tissue, urine and blood serum. The adipose tissue samples are collected by the cooperating pathologists while the blood serum and urine are collected under a cooperative agreement with [HANES].... 19

Preliminary reports have been published on the prevalence and mean and maximum values of 20 pesticide residues detected in HANES II examinees. EPA has given priority in investigating their health effects to pesticides with the highest prevalence. The Department of Energy (DOE) has financed the collection of HANES data on the carbon monoxide body burden because of its importance in monitoring air quality and determining the industrial and automobile emission standards DOE and EPA should set.

State and local health agencies

Some states, such as South Carolina and Florida, have followed the HANES (or earlier, the Ten State Survey) model to assess the health and nutritional status of their population or special subgroups. Others have used HANES normative data such as the growth charts and nutritional status indicators as a yardstick against which to screen the status of their citizens, especially those served by public food and health programs. State health officials responding to our inquiry were particularly concerned to assess the status of welfare recipients; participants in the food commodity, food stamp, school lunch, WIC (Women, Infants, and Children), and EPSDT (Early and Periodic Screening, Diagnosis, and Treatment) programs; and aged persons in nursing homes, congregate facilities, and other institutions.

Noting that HANES quality controls were strong where those of the Center for Disease Control's abbreviated nutrition surveillance program were weak, Massachusetts Health Commissioner Jonathan E. Fielding suggested that HANES staff help CDC to establish an improved surveillance system.

Operations at CDC should be improved and expanded with the technical expertise of the NCHS staff. In this way, we would take advantage of the best parts of both...systems. Data could flow from local communities to a central office (CDC) where it would be analyzed and returned to states and local agencies as a basis for evaluating their programs. Concomitantly, this system would identify the prevalence of health and nutrition conditions on a national level upon which research and policy decisions could be made. 20

A similar proposal is included in the Nutritional Status Monitoring System, under which the assistance CDC now provides to state health authorities in

checking nutritional status would be extended from 14 to all states and territories.

CDC and HANES staff have worked closely together (CDC conducts the laboratory analyses of HANES blood and urine samples) and a study is planned of how the diagnostic significance of the surveillance measures used by the states and CDC can be enhanced by relating them to the more comprehensive, representative, and reliable HANES data.

HANES staff have assisted officials in many states and communities in the design of examination surveys to assess the health and nutrition of the general population or special groups. More often, HANES data have been used to estimate the health status and needs of given groups (such as children in poor families, the elderly, or persons requiring mental health care) as the basis of planning services, budgets, and budgetary requests. Attention has been given by NCHS to the preparation of synthetic estimates whereby values for a state's population would be derived by applying the national group values obtained by HANES to the state's distinctive demographic mix.

Educational, professional, and scientific institutions

The largest volume of requests for HANES publications has come from individuals at higher educational institutions. The interests of their faculty and students are diverse enough to embrace most conceivable uses of health and nutritional data, basic or applied. Faculty testifying before Congressional committees may have the same policy interests as public officials. Graduate students of pharmacology or human engineering can have the same practical interests as drug company scientists or industrial engineers. The degree of interest expressed by leading scholars in utilizing assessment and trend data to plan and improve programs of treatment and prevention is striking.

Nonetheless, we will confine this discussion to the educational and research functions central to university professional schools and graduate departments, research institutes, and scientific associations.

HANES data are incorporated in basic texts and courses in pediatrics, epidemiology, nutrition, public health, community medicine, nursing, and many other fields. "The HANES reports," one nutritionist wrote us, "are excellent background for medical students doing nutrition-related studies/teaching in community settings." Millicent Higgins, Professor of Epidemiology at the University of Michigan, expressed a view shared by other scholars and our panel:

I have found the results of the various National Health Examination Surveys invaluable for teaching and research....a national sample provides information which is available from no other source and which serves as a standard of comparison for many other epidemiological, clinical, and statistical studies. All studies have their limitations and it is unreasonable to expect that any one study or survey can address all questions....However, without a

mechanism such as the Health and Nutrition Examination Survey, a widely available, appropriate and standard reference would not exist. Information about the frequency and relative importance of common conditions would not be available for a representative population and information about the distribution of diseases and physiological variables would also be lacking. Inferences about the frequency and distribution of disease would be made from death certificate data and medical records which are known to be inadequate for assessing morbidity and to possess a number of biases which do not exist in the H.A.N.E.S. data.

It is also desirable to have information about prevalence and incidence of disease over time. For example, the recent decline in mortality from cardiovascular disease could be due to decreased incidence of disease or increased survival or both. No information on time trends is available for morbidity. Similarly, the rising mortality rates for chronic obstructive lung disease are difficult to interpret in the absence of reliable morbidity data. The rise in deaths may be real or spurious. Serial measurements of morbidity from common diseases would be extremely useful.... 21

Leading authorities are likely to make exacting demands for, and perceptive analyses of, technical data and to subject them to searching scrutiny and criticism. They advance two somewhat conflicting positions. Many view HANES as an instrument of research, to provide 1. more accurate, sensitive, penetrating, and reliable measures of health conditions and 2. additional evidence—clarification, corroboration, or contraindication—and understanding of the factors that produce or affect these conditions.

On the first point, for example, Shiriki Kumanyika of the Cornell Division of Nutritional Sciences complains that "the dietary intake data relative to sodium are quite vague and unsuitable for precise comparisons among individuals. Also...the time of blood pressure measurement is not available....There is no question I might pursue which would not reveal some small but important element of missing data needed either as a variable or control." 22 John Brunzell, Chairman of the American Diabetes Association Committee on Food and Nutrition, expresses concern about the methods used to diagnose diabetes and stresses the importance of distinguishing juvenile, maturity, and adult-onset diabetes. 23 George Irving of the Federation of American Societies for Experimental Biology suggests the better assessment of "calcium and phosphorus status" and of "the extent and status, rather than just prevalence of certain disease states, particularly atherosclerosis and diabetes." 24

On the second point, a host of data are sought and used to explore, for example, the relation of candy eating to caries, of eating butter and margarine to previous strokes and coronaries, of salt intake to blood pressure, and, more broadly, of diet to disease; of age, social status, and life style to food preferences; of maternal nutrition to obstetric complications; of the length of institutionalization to health and nutritional status, of nutritional deficiencies

and toxic agents to developmental defects, and so on. Gabriel Stickle of the National Foundation wants health and nutritional status "related more closely to the events of the prenatal period"; 25 Frederick Jaffe, President of the Guttmacher Institute, seeks similar information for all young people—"e.g., birth weight, gestation, breast feeding, prenatal and postnatal care, etc., to study the early determinants of later health and nutritional status." 26

Robert Olson, Chairman of the St. Louis University Biochemistry Department, wants to see if "change in risk factors for coronary artery disease [e.g., "blood pressure, serum cholesterol, diabetes mellitus, prevalence of obesity, and the frequency of smoking"] can explain the decreasing death rate and incidence of this disease...." 27 A.E. Harper of the University of Wisconsin Departments of Biochemistry and Nutritional Sciences is explicit that, having established prevalences, HANES should now shift its focus to inquire about the factors associated with malnutrition. Instead of characterizing the nutritional status of different demographic groups, he suggests, the analytic procedure should be reversed; individuals with malnutrition should be singled out and their personal and family characteristics should then be characterized. 28

However, because they believe HANES measures and/or the random rather than controlled choice of subjects inadequate for research purposes, some scientists find it of limited scientific value. To the eminent University of Minnesota nutritionist Ancel Keys, HANES reports "are most disappointing and...it seems obvious that this has been an extremely expensive way of acquiring data of dubious value." 29 Stanley Garn, Professor of Human Nutrition and Anthropology at the University of Michigan, writes, "I am not interested in what proportion of people in the United States may be below standard for some nutrient. I am interested in flexible programs that have some ideas about where to go and what to look for and why." 30

Contrariwise, many respondents (especially, perhaps, epidemiologists and public health professors and officials) reject this view of HANES as a research instrument; its primary value, they assert, is to assess and monitor trends in the health and nutritional status of the nation. This position was forcefully advanced by a strong supporter of HANES who considers efforts to use HANES primarily as a means of research to be misguided and even dangerous to its central purpose. Like Higgins, he regards HANES as a necessary means

...to determine the prevalence of various health and nutrition conditions, and...to identify trends....risk factor research in diseases of multiple etiology is perhaps less efficiently accomplished through national surveys than through well designed case control studies, or...cohort studies....

....The HANES survey is not only, or even predominantly, a nutrition survey. Even if the entire nutrition community voted to stop the survey, there are congressional mandates and political constituency groups which require HANES data on the prevalence of other conditions....[The] meshing of health and nutrition in the same survey has at least allowed some use of HANES data for doing

statistical searches for relationships between nutritional variables and diseases and conditions.

...HANES should not be at the mercies of researchers with new and relatively unstandardized and unproven laboratory tests. Nor should HANES necessarily gather data on the distribution of trace micronutrients...whose function and relationship to ill health are unclear. This may condemn HANES to constantly surveying with relatively obsolete methods, but it's preferable to wasting money with faddish laboratory tests which may be forgotten before the data are ultimately analyzed. 31

Industry, physicians, lawyers, and citizens

Food and drug companies, market research and advertising firms are among those who have obtained HANES reports and tapes. In their responses to our inquiry, research directors and public affairs representatives of such firms reflect a broad professional interest in using these data to understand and improve the health of the population and the public and private services which maintain it. Here, we will deal only with the narrower uses directly related to product manufacture or marketing.

HANES reports and especially tapes record in great detail the specific foods and drinks consumed by subjects, their demographic characteristics, height and weight, health ailments and treatments, the use of drugs, tobacco, alcohol, the location of meals, and so forth. These unique, carefully standardized data, available at nominal cost, represent a mine of information about the needs, habits, conditions, and characteristics of consumers. To date, elementary data such as the norms and distribution of height and weight and nutrient intakes, seem to have been most used. As company staff become more familiar with the data on tape, more sophisticated uses are likely to be developed.

The smoothed centile growth curves showing height and weight by age and sex have probably been used more widely than any other single set of HANES data. Thousands of charts prepared by the Center for Disease Control in cooperation with NCHS have been distributed to personnel examining children in the Women, Infants, and Children program, state and local clinics, Head Start, and other public health programs. "Growth rates of individually examined and measured children are plotted on the charts and the comparison with the reference group population permits screening of persons at risk of nutritional deficiency." 32 Thousands of pediatricians and health personnel have made similar use of HANES data on growth charts distributed by Ross Laboratories and Mead-Johnson; the former alone have distributed over 4 million charts (which, one might say, is both a public service and a form of advertising). "During the past several decades researchers at Harvard collected extensive anthropometric data on more than 800 cases of congenital heart disease, both pre- and post-operatively." A comparison of these data with NCHS growth charts may help to determine the "optimal age of surgical intervention in specified conditions to minimize permanent growth

retardation...." 33 The charts are also helpful, of course, in assessing the effects on growth of medical and nutritional treatment.

Internationally, the World Health Organization has adopted these data as the appropriate standards for surveying children for nutritional deficiencies, because no other data could meet its stringent requirements. 34 These standards will therefore be used in the medical care of hundreds of millions of children around the world.

Height and weight data have been used by airline companies and unions to set weight standards for flight attendants and by insurance companies to revise their standards and rates for life insurance policies. Data on hypertension, cigarette smoking, and obesity, major risk factors for disability and mortality, have undoubtedly entered into many actuarial and health calculations. Clothing manufacturers and retailers have used the height-weight data to determine the relative number of different-sized garments to produce or order, equipment and furniture manufacturers have used them to determine the size and shape of their products and the location of controls. "Decisions [by food companies and regulatory agencies] on enrichment, fortification..., and genetic engineering (as for potatoes with high vitamin C content) of foods are currently taking into account the level of usage of the particular foods in the diets of the target groups...." 35

The height-weight data have also been extensively used as evidence in appeals, negotiations, and suits by individuals and groups alleging discrimination in hiring (e.g. of women, short persons, or individuals of Hispanic or Asian background) by police and fire departments and other agencies and in efforts to revise hiring standards.

HANES tapes provide private industry and citizen groups with some of the same data used by public agencies in planning health and food services. As James Grant, Vice President of CPC International, observes, "this enable[s] the private sector to respond to provide products and services to meet the perceived requirements of the defined target groups. The point...is not that one needs to develop special foods, but rather perhaps there are segments of the population which are not being supplied through existing offerings...." 36

On the other hand, Paul Cifrino, Executive Director of the Massachusetts Grocers and Retail Food Associations, observes that

The setting of a standard that is unreasonably high often leads to meretricious advertising. For example, a current campaign by a large food manufacturer states that recent government surveys indicate children do not receive enough vitamin C and that every conscientious mother should provide their product. As far as I know from the literature, there is no physiological evidence whatsoever that would support such a statement. 37

This type of criticism is common because HANES data on nutrient intake coupled uncritically with the standards published in the widely used Recommended Dietary Allowances (RDAs) often lead to unwarranted conclusions such as Cifrino notes. The National Research Council committee responsible for preparing the RDAs was chaired by Hamish Munro, a member of our panel. It cannot reasonably be said that RDAs are "unreasonably high" when, as Munro points out, they are explicitly set, not at the average of actual or desirable nutrient intake but at a level adequate to meet "the needs of individuals with the highest nutrient requirements"; therefore, by definition, "they exceed the needs of most people."³⁸ Yet it is true that RDAs may be misunderstood and/or misused. To reduce the possibility of misuse, the ninth edition of Recommended Dietary Allowances contains data on the average energy needs and desirable weights for various population groups, as well as the upper limits of intake for six trace elements which should not be "exceeded habitually."³⁹

The Hauser Committee Report

In 1972, a 12-member Committee to Evaluate the National Center for Health Statistics, chaired by Philip Hauser of the University of Chicago, submitted a wide-ranging report, Health Statistics Today and Tomorrow, 40 to Administrator Vernon Wilson of the Health Services and Mental Health Administration. (One member, Wilbur Cohen, is co-chairman of our panel; another, Dorothy Rice, is now Director of NCHS.) Most of its comments on the HES and HANES surveys and relevant aspects of NCHS remain pertinent and provide a good introduction to our own evaluation.

The report noted that health administrators "have a superfluity of statistics but little information." (And, it might have added, a superfluity of information but little certain knowledge.)

The primary role of health statistics in the United States should be

1. to provide a comprehensive picture of the nature and magnitude of the Nation's health problems;
2. to assess how well health services are meeting these problems, at what cost, and with what gain; and
3. to serve basic health research needs.

An effective system of health statistics must, then, provide those responsible for health services with necessary information to help understand the situation, identify problems, set priorities, define policy, plan programs, manage services efficiently, and evaluate effectiveness.

These are, of course, goals of the entire national system of health statistics, not of NCHS alone. They are roughly equivalent, for health, to the goals advanced for nutrition in the Nutritional Status Monitoring System.

The report stated that NCHS "statistical designs and the conduct of its major surveys have been exemplary....It has done a generally excellent job of meeting the demands of its users within the limits of available data...." But it listed seven problem areas, five of which are worth repeating, as they remain, to varying degrees, germane today.

1. Timeliness

Among the complaints of the users of the NCHS data, that of the delays in publication is overriding. Users of vital statistics data and data from HIS, HES, and HDS [Hospital Discharge Survey] all cite lack of timeliness as an urgent problem....

....Too much time elapses before tests for conditions of new concern, such as sickle cell anemia, lead poisoning, and other conditions associated with environmental hazards, are included in the [HANES] surveys.

2. Analysis

The quality of the analytical studies...has been consistently high....But many areas have received too little analytical attention. Important among the current analytical needs are trend analysis, socioeconomic analysis of demographic and health status data relating to the utilization and financing of health services, linkages of HIS and HES findings....

But a more basic question must be addressed. What is meant by health status? There are a variety of partial indexes, including disability days...and the incidence and prevalence of key diseases....indexes of morbidity are greatly needed today for program planning and evaluation....Further, measures of disability and functional status are needed....

5. Comprehensive Reports

The NCHS produces little in the way of publications which cover a broad range of subjects drawing from the several statistical operations of the Center....

...each [HES] publication is directed to a fairly narrow sector of survey findings; there are no reports dealing with findings in a comprehensive manner.

6. More Adequate Indexing

....It is very hard for users to know just what information is available and how to retrieve it....

7. Machine-Readable Data

It would be most helpful...if NCHS would make available basic data files in machine-readable format at the earliest possible date after collection and editing of the data.

The committee urged a major effort "to improve the timeliness of publication and other release of health statistics." Data "should be analyzed in a comprehensive context and interpreted with special attention to current and emerging health needs." The HIS and HANES programs should be more closely coordinated. NCHS should "vigorously pursue" research to develop health status indices.

NCHS should prepare comprehensive statistical reports on the population's health status and services; should publish and widely circulate comprehensive indices of its publications, tapes, and unpublished data; and should make available tapes with related data from several programs. (The annual publication Health, United States 1976-1977, 1978, and 1979 meets the first recommendation, and NCHS publication indices go some way toward meeting the second. However, more can be done to implement these recommendations with respect to HANES.)

A study should be undertaken of possible biases in HANES resulting from the seasonal pattern of examinations, as examination caravans circle north in the summer and south in the winter. (Fixed examination sites in northern and southern cities and examination of NFCS seasonal and regional food intake data could contribute to this study.)

Act, before undertaking the next cycle of HANES, to reduce the collection of material of marginal value in histories, examinations, laboratory tests and supplemental questionnaires. The present cycle is imposing too great a burden of time and effort on individuals examined and is producing more data for each examinee than can be properly processed, within available resources.

(Insofar as the HANES II inventory was shorter than that of HANES I, this recommendation was at least partly implemented.)

HANES data preparation and processing should be streamlined and should make "greater use of the computer to identify and make adjustment of defective data. The specifications for data editing and computer processing should be prepared at a much earlier stage, to reduce the time lag between completion of field work and the availability of clean data tapes for tabulation and analysis."

Many of the problems which the committee addressed persist. HANES data collection and reporting remain excessively slow. The reporting and analysis of data remain incomplete. The return in scientific knowledge and public policy from the masses of statistics often seems distressingly uncertain and the measures of nutritional health and nutritional status, distressingly

complex.

However, weaknesses which can be remedied by technical and administrative means should be distinguished from those which reflect limitations of current knowledge and the practical and political difficulties of translating that knowledge into consistent and effective public policies. HANES should be held responsible only for those deficiencies which it has the power to correct.

The Panel's Evaluation

Questions That Should Be Addressed

A cyclical examination survey is an important means of obtaining data significant for understanding and dealing with many health problems. However, it is expensive, time-consuming, and limited to information on randomly selected subjects that can be obtained safely, reliably, and accurately within 2-3 hours and for which the maintenance of comparability over long periods of time is a dominant consideration. Accordingly, it should be confined to questions it can best address, leaving other questions to be addressed by other means such as laboratory experiments; more intensive examinations of a few and more cursory examinations of many subjects; longitudinal studies of experimental and control groups; administrative records of institutions, agencies, programs, and services; established statistical series; policy studies; program evaluation; and ad hoc studies of many kinds. In identifying the type of information which can best be obtained by an examination survey, it is useful to ask and answer questions such as:

1. Does a given factor cause disease or decrease performance?
2. How detrimental is this factor to health or performance—that is, what is the dose-response relationship?
3. Can this factor be prevented or can its effects be mitigated in individuals?
4. How prevalent is the factor (e.g., different blood pressures or cholesterol levels) and its effects in a population? Is its prevalence increasing or decreasing?
5. Can the factor be prevented or its effects mitigated in a population?
6. What proportion of ill-health, reduced performance, and untimely death in a population may be ascribed to this factor now and in the future?
7. What are the likely benefits and costs of preventing the factor or mitigating its effects in a large population, based upon the results of intervention trials in small populations?
8. What are the actual benefits and costs of interventions undertaken in the large population? Are the actual benefits worth the actual costs?

Questions 1, 2, and 3 are normally addressed by laboratory, clinical, and epidemiological research. Questions 5 and 8 require population intervention

trials designed with evaluation as an intimate component. The Health and Nutrition Examination Survey cannot address any of these five questions efficiently. However, it can address questions 4, 6, and 7.

To answer question 4, the examination of a representative sample of a population is necessary. HANES was designed to address this type of question by obtaining data on the prevalence of various health and nutritional conditions. Some prevalence questions can be answered by comprehensive medical and vital statistics, the Health Interview Survey, Nationwide Food Consumption Survey, and other interview surveys. HANES alone can answer questions requiring comparable physical examinations of a representative sample repeated after an interval of time.

At present, no method has been specifically designed to address questions 6 and 7 as they relate to nutrition, although HANES could be modified to do so. Whether that would be worth doing would depend upon the nature of the answers to question 5 (and, of course, the specific questions posed). Often, when a dietary factor detrimental to health is identified and methods of prevention or treatment are developed, they are mounted directly (as in the fortification of cereal products to combat pellagra). An examination survey might help to shape a treatment program if treatment is very expensive and its applicability to the general population uncertain.

HANES is designed to gather data representative of the national population and cannot, without prohibitive expense, obtain comparable data on small geographic areas, important as they may be for state and local purposes. However, HANES data provide a useful national point of reference and comparison for independently derived local prevalence measures and estimates. They can also be used to impute prevalence levels for a local population of known demographic characteristics; the risks of this procedure can be much reduced by a small local survey to validate the imputation.

The foregoing discussion of questions and data relevant to health and nutrition policies and programs does not include the important HANES function of providing normative data for clinical use, such as the growth standards discussed on pp. 95-6.

The Proper Role of Hanes

What HANES Does

HANES provides estimates of the prevalence of illness, impairments, and other indicators of health and nutritional status, and the distribution of many conditions (height, weight, blood pressure, etc.) in the national population by sex, age, income levels, race, and region. Repeated HANES surveys can monitor changes in these prevalence levels and distributions. Data collected to assess prevalence and monitor trends can often also be used to identify special groups and/or conditions which should be further studied for better understanding or treatment. HANES is designed to do all of the foregoing and, within the limits of its resources and the state of the art, has done most of

them well, but slowly and incompletely.

What HANES Could Do

With minor modifications, HANES could do more quickly the same job it already does well.

With other modifications, HANES could determine the relative importance of nutrition for different health conditions (provided that a causal linkage between nutrition and each condition has been established by other methods). HANES could also estimate the value for the national population of different nutritional interventions (provided that the efficacy of each intervention has been established by small population trials). With greater modifications, HANES could investigate possible links between factors affecting nutrition and the health consequences of nutrition by longitudinal examinations of the same individuals.

The HANES sampling design now suffices for national and four regional estimates. Modifications to permit routine estimates for individual states and major metropolitan areas would be extremely expensive. However, HANES could, of course, examine a representative sample of a state or other local population.

The lag between the start of HANES I and the first release of tabular data was three years; it will take ten years from the starting date to publish the bulk of the data. There is much room for improvement in this regrettable performance. HANES currently is reorganizing so as to release some raw data on tapes within six months after the end of fieldwork. With more effective planning, quality control, and automated data recording, processing and presentation, HANES should also be able to release much tabular data, and to answer questions important for health and nutritional policy purposes, within six months after the completion of a survey. This requires an advance setting of priorities, mobilizing resources to meet them, and recognizing that HANES can do only a small fraction of all possible analyses. Staging the national survey by regions would speed data release, since data could be released as each region is completed. Alternatively, the sampling units could be divided into two rounds, each representative of the target population, permitting the reporting of interim data at the conclusion of the first round, as was done in HANES I.

What HANES Can Not Do

HANES should not attempt to meet criticisms which reflect excessive or misplaced expectations. HANES is not designed to obtain a representative and reliable sample of any state or local population or to detect any health or nutritional condition which affects less than 1 or 2 percent of the population (though a condition which seriously affects 2 or 4 million people certainly warrants attention by a special survey or other means). It is not designed to replace laboratory experiments, field trials, intensive longitudinal research, program evaluations, or the screening of individuals for medical or nutritional

services.

HANES cannot employ measures which are impractical in its mobile examination centers, squeeze five hours worth of measures into a two hour examination, provide simple answers to complex questions, or resolve many scientific and policy problems. It can provide much useful and even indispensable information, and answer many, but not all, questions about the health and nutritional status of the American people. It cannot transcend the current level of biomedical knowledge and techniques.

What HANES Should Do

1. HANES is an essential element in a balanced system of scientific and epidemiological research, assessment and monitoring surveys, surveillance activities, and program evaluations. It should cooperate with other elements, including the Department of Agriculture's food consumption survey and the Center for Disease Control's nutrition surveillance activities, so that their data can be complementary and mutually reinforcing, not duplicative.

2. HANES's first priority should be to conduct repeated, comparable examination surveys of the national population. Resources not needed for these surveys should be used to survey groups whose health and nutritional status is of special public importance.

3. The time taken to collect and release HANES data should be greatly shortened.

4. HANES data should be made more widely available and fuller analyses of their scientific and policy significance should be encouraged.

We will discuss more fully how each of the foregoing goals can be achieved.

1. The HANES Role in a National Information System

A comprehensive Nutritional Status Monitoring System to provide a great variety of information for a great variety of purposes has been proposed by the Secretaries of Agriculture and Health, Education, and Welfare. There is no need to repeat our earlier description of this system (see pp. 45 ff.), which outlines a ten-year program of national and local surveys; basic and applied, field, laboratory, and desk research; and associated developmental, analytical, and informational activities by many governmental and private agencies. If, as the Congress has stated, such a system is warranted for nutrition, which is only a fraction of the larger domain of health, what other systems are not warranted to monitor the nation's health? HANES is a key instrument for monitoring both the nation's health and nutritional status; both functions should be preserved in a proper balance, which takes into account, and does not duplicate, other available instruments.

As a major health survey, HANES should be coordinated not only with the

Health Interview Survey and other surveys of the National Center for Health Statistics but with the broader health statistical activities of the Department of Health and Human Services. 41 In its nutritional aspects, the main surveys with which HANES should be coordinated are the Nationwide Food Consumption Survey (NFCS); the nutritional screening activities of state and local health agencies; and the surveillance program of the Center for Disease Control (CDC); and many ad hoc surveys sponsored by federal, state and local governments.

The coordination of HANES with NFCS and the CDC surveillance program has already been discussed (see pp. 45-53). The cycle of HANES national population surveys should coincide with the 5 and/or 10 year cycle of NFCS; measures should be taken by an authoritative body such as the Office of Science and Technology Policy or the Office of Federal Statistical Policy and Standards to ensure the comparability of the definitions, procedures, classifications, and coding of the two surveys, so that their data on socioeconomic and demographic groups can be interrelated; the HANES questions on the 24-hour dietary recall can then be safely dropped in any cycle in which both surveys are conducted.

HANES's function with respect to screening and surveillance activities is essentially to provide normative baseline data against which the status of individuals or groups can be quickly assessed and suspect cases flagged for closer examination and intervention. Since this function depends upon the comparability of HANES instruments and procedures with those of local clinics, HANES staff should provide the technical assistance which CDC and other agencies may require to ensure it.

Many ad hoc examination surveys of selected groups are financed by federal agencies as part of their normal sponsorship of health and nutritional research and, occasionally, of program evaluation. One report lists eight recent studies dealing with the nutritional effects of food programs. The nutrition research sponsored by the National Institutes of Health is monitored by a Nutrition Coordinating Committee; that sponsored by NIH and other HEW agencies, by another coordinating committee reporting to the Assistant Secretary for Health; that by agriculture agencies, by the Department of Agriculture's new Human Nutrition Center; and interdepartmental research, by a Subcommittee on Human Nutrition and Training of the Federal Coordinating Council for Science, Engineering, and Technology. The General Accounting Office and Office of Technology Assessment have noted deficiencies especially in the interdepartmental coordination of nutritional surveys and research. 42

HANES could help to standardize the measurement methods of federally-sponsored surveys involving comprehensive examinations of representative groups; it might learn from the superior practice of some surveys and contribute to the improvement of others. If federally funded health and nutritional examinations involving probability sampling were coordinated with NCHS and HANES, duplicative data collection, inadequate sampling, and poor measurement and quality control methods could be reduced and the comparability and reliability of data enhanced. Such coordination would also facilitate the pooling of resources for assessing the status of the national

population and of special groups.

But HANES's authority and resources are limited. The important function of standardizing and improving the performance of diverse health surveys will be discharged adequately only when a body with adequate power elects, or when Congress instructs one to perform it. Whatever agency undertakes the task can receive important help from HANES.

2. Conducting National and Special Surveys

As noted, many public and private organizations can conduct health examination surveys of special groups. The Ten-State Survey had little difficulty finding state and city health departments and university medical schools able to conduct its examinations in 1968-70; and the necessary facilities, equipment, and personnel are not now in shorter supply, though the best laboratories and personnel may be very busy. However, the conduct of repeated, comparable national surveys—the monitoring of the health status of the national population—is the unique and uniquely valuable function of HANES, which no other organization can now duplicate.

Hence, we believe that establishing these national surveys on a firm, recurrent cycle, conducting them efficiently, and reporting them promptly should be the prime mission of HANES and should receive first call on its resources. Demands to assess the status of groups requiring special sampling arrangements or to oversample groups included in the regular sample should take second priority.

Ill-health and disability impose a terrible burden of suffering on our people, a great financial burden on the economy, and a heavy professional burden on health personnel, institutions, schools, and sciences. In 1976 or '77, an estimated \$162 billion was spent on health care, some \$62 billion of it, by federal, state, and local governments (these sums do not include the income and revenue lost due to illness). The activity of 14 percent of the noninstitutionalized population was limited because of chronic diseases or impairments. Some 1.6 million patients received long-term institutional care and 36 million discharges, 292 million days of short-term hospitalization; 6.3 million persons were employed in the provision of health services. 43

With resources of this magnitude devoted to a health industry whose costs have grown at an alarming rate, the expenditure of about \$6 million a year to determine, and monitor trends in, the prevalence of major ailments and disabilities is a modest investment in a vital kind of national health bookkeeping.

As we have recounted, the resultant data are utilized for innumerable purposes, including the formulation and monitoring of many important public policies.

Clearly, HANES is not the instrument of choice for health policies which must be established or changed rapidly in response to emergencies such as a flu

epidemic or an outbreak of food poisoning or deaths from a liquid protein diet or Legionnaires' disease. The Health Interview Survey can better monitor an epidemic and the Food and Drug Administration, the Center for Disease Control, and local health authorities can better track the source of sudden outbreaks. However, HANES may provide prevalence data against which the severity of an epidemic or the desirability of an inoculation campaign can be assessed. Its computerized data can be rapidly searched, and its blood and urine samples, mined, to help assess the potential scale of many health dangers.

HANES is the method of choice for monitoring the stability or change in the prevalence of health conditions which may occur over a period of years. The conditions may be known threats to life and health—the "killer diseases" such as heart disease and cancer, stroke and hypertension, diabetes, arteriosclerosis, and cirrhosis; or chronic conditions such as arthritis, mental illness, back pain, physical, dental, or sensory impairments. Or they may be slow-acting, cumulative threats such as low levels of pesticide ingestion, atmospheric pollution, and radiation, whose significance will not be known for twenty years. This ability of HANES to monitor long-term changes in health resulting from environmental factors was recognized in the 1978 statute authorizing an expanded role for the National Center for Health Statistics in environmental health statistics.

However, the irregular duration of national surveys (due to changes in resources and in the number of examinees) and uncertainty about their content and the time when data will be available has reduced their value and the ability of agencies to rely upon them for policy purposes. We will shortly discuss measures to make reporting quicker and more regular. Here, we will discuss the period which should elapse between national surveys.

The interval between the midpoint of successive HES and HANES surveys has ranged from 39 to 64 months and between the completion of successive surveys, from 36 to 69 months.

If national monitoring surveys are to be conducted on a regular, recurrent schedule, the following three alternatives are feasible with present mobile centers and field personnel, which conduct about 5,000 examinations a year. Each alternative permits the quicker release of data and the coordination of HANES's distinctive examination data with the Department of Agriculture's Nationwide Food Consumption Survey as part of a national Nutritional Status Monitoring System. This analysis omits consideration of contract examinations, because their potential examination rate is still undetermined. One hopeful expectation is that they might eventually add a capacity equivalent to a third mobile examination center, which can conduct 2,500 HANES II-type examinations a year.

A. One member of our panel, Hamish Munro, believes that a national survey every ten years is all that is warranted, especially for nutritional data. Nutritional and dietary intake measures are so unreliable and imprecise that it is uncertain if the small changes observable at five-year intervals are

attributable to changes in measurement methods, to the normal variability of measures and of the condition measured, or to a real change in the nation's nutritional status.

If a national survey were conducted every ten years and, as we have earlier recommended (see p. 59), took 24 to 30 months to complete, the intervening 7.5 to 8 years could be devoted to surveys of special groups. That would permit at least 4 special surveys with 10,000 examinees each, 5 surveys with 8,000 examinees each, or similar combinations totalling 40,000 examinations similar in length and geographic clustering to those in HANES II.

B. Seven members of our panel, whose view therefore represents our central conclusion, believe strongly that the status of the nation's health is too important to be monitored only once a decade and that national surveys should be conducted every five years. 44 This view, which emphasizes the importance of quinquennial national health surveys, is only in nominal conflict with Munro's position, which emphasizes nutritional surveys. All eight panel members agree that, given the assurances of comparability detailed on pp. 64-5, the dietary intake information can be collected by the Department of Agriculture in any quinquennium when both the Nationwide Food Consumption Survey and HANES are conducted.

Six panel members agree that, if quinquennial national health surveys are to be combined with intervening surveys of special groups, it is imperative to reduce the duration of national surveys from the 4 years of HANES II to 2 or 2.5 years. This will require a reduction in the number of examinations from 20,000 to 10,000-12,500, a reduction in the length of each examination, the addition of contract examinations, or some combination of the three.

C. Alternative A and B devote the two mobile examination centers exclusively to national or special surveys. A markedly different approach is recommended by one panel member, Jean-Pierre Habicht. This is to split the centers, allocating as much of their capacity as is needed to conduct national examinations at a steady rate, year after year, and assigning the residual capacity to examinations of special groups.

Thus, 1.5 of the two mobile centers could complete 3,750 examinations a year. If the national sample were divided into five regions of equal population size (instead of the four now utilized by HANES), each represented by 3,750 examinees, data could be collected and reported on one region each year. After the five regions were completed, national data based on 18,750 examinees could be cumulated and reported. Thereafter, national reports could also be issued annually by dropping the oldest and adding the latest region.

However, the residual half of a mobile center could examine only 1,250 persons a year. As it would take six years to complete a special survey of 7,500 examinees, it would be most practicable to undertake such surveys with an additional Congressional appropriation or in collaboration with other government agencies able to provide the resources needed to increase the examination rate.

Each of the foregoing alternatives, and other permutations and combinations, has its advantages and drawbacks. The first (with a 10-year cycle) permits surveys of the national population to alternate easily with large surveys of special groups, but at the cost of doubling the interval at which HES and HANES have monitored the nation's health. The second and third provide more frequent monitoring points, but reduce the number and size of special surveys which can be conducted. The third permits yearly releases of regional and (after 5 years) national monitoring data, but lengthens the duration of national surveys from the 4 years of HANES II to 5 years, reduces the number of examinations from 20,000 in HANES II to 18,750, and requires HANES planning, analytic, and field staff to work on national and (collaborative) special surveys simultaneously. It permits the more rapid introduction of new, and deletion of old, measures but for that very reason can render the inventory of measures less stable and more vulnerable to change. The first two alternatives can be more readily synchronized with quinquennial Nationwide Food Consumption Surveys than the third, though all three involve the comparison of health data collected over several years with food data collected in one year.

3. Speeding Data Release

Because HANES is the only survey in the nation which conducts repeated medical examinations of large, representative samples, it has been beset by many partially conflicting demands: for data on the national population and on selected groups; for data on prevalence levels, data on scientific and policy issues, and data to target intervention programs and evaluate their effects. Seeking to satisfy as many demands as possible, its goals have been clouded, its examinations and the period of data collection have been lengthened, and masses of data have been accumulated which have been tabulated, analyzed, indexed, and reported too slowly and spottily.

The primary goal of HANES should be to assess and monitor the health status of the national population in a timely manner. Any demands which retard or deflect it from that goal should be resisted. A series of measures, which we will detail, can make this goal entirely practicable and, indeed, ensure and routinize its achievement.

The time that elapses between the start of data collection and the reporting of findings is a product of many factors, including a. the length of individual examinations, b. the number of sampling sites in which examinations are conducted, c. the number of examinees, d. the rate of participation in examinations, e. the number of examining teams, f. the speed and adequacy of laboratory analyses and of expert interpretation of examination records and products, and g. the efficiency of data transcription, editing, coding, tabulation, and analysis.

a. The Hauser Committee recommended that examinations be shortened and, to some extent, they were in HANES II. They can probably be trimmed somewhat below the HANES II length of about 2.1 hours. The advisory committee which should be established in planning each survey can help to

accomplish this by scrutinizing data requests and ranking them in broad priority so that the examination can be pruned to whatever length is necessary to complete data collection on schedule.

b. The number of HANES sampling sites cannot be reduced without impairing the statistical reliability of the sample. HANES employs only 64 sampling sites compared to the Nationwide Food Consumption Survey's 114 and the Health Interview Survey's 376; the Office of Management and Budget has sought to increase the number, a desirable objective if it can be achieved without lengthening the period of data collection. The most practicable way to increase the number of sites would be to contract for additional examinations, but it is a close question as to whether contract examinations should be conducted in additional sites or should primarily serve to reduce the period in which a given number of examinations is completed. On balance, we favor the latter alternative. However, contract examinations should be undertaken only when the requisite comparability of measuring methods can be assured.

A major reason for the long period between the start of data collection and the issuance of reports has been the need to complete examinations in all 64 sampling sites before a representative sample of the population can be obtained. However, if the sampling sites were divided into two equally representative rounds, preliminary (albeit statistically less reliable) results could be reported after completion of the examinations in the first 32 sites. This procedure was utilized in HANES I, enabling preliminary findings to be published 33 months after the start of data collection.

c. The number of examinees in a national survey covering a broad age range (from 6 or 12 months to 74 years or from 6 to 79 years) has been about 20,000; the number in the narrower ranges of the Health Examination Surveys (6-11, 12-17, 18-79, or 25-74 years) has been about 7,000. As this includes the number representing both the age range and oversampled groups, it can obviously be reduced by reducing oversampling or the reliability or detail of possible analyses.

d. The examination rate of sampled persons has dropped from 87-96 percent in the first three Health Examination Surveys to 73-74 percent in HANES I and II (and 70 percent in HES IV, the 4-hour, detailed medical phase of HANES I). A high examination rate is vital to the representativeness of findings and has been one of HANES's most valuable features. It should not be jeopardized by shortening the period of examinations in given locations or by contracting for examinations by personnel who are notably less successful than HANES field staff in persuading interviewees to be examined. The current examination rate is not ideal and should it fall, the value of the survey would be endangered. To guard against that contingency, an inquiry is warranted into factors that might increase participation, such as a further increase in the honorarium to examinees, shortening the examination, and, perhaps, providing health counselling.

e. The number of examining teams can be increased either by increasing the current ceiling on field positions or by contracting. The latter course

appears more feasible, but may lower the quality and comparability of data. The most promising alternative may be to contract for the operation of a third mobile examination center. Changing no other factor (such as the length or number of examinations), that alone would reduce the period of data collection by a third, from the 49 month of HANES II to 33 months.

Of course, examinations could also be speeded up by reducing their quality i.e., by taking measurements more quickly and less carefully. But the most important single feature of HANES is the careful comparability of its measurements, which must be maintained or improved and more precisely assessed. It would be better to abolish HANES than to continue it in a way which, producing erratic data, would befoul our knowledge and confound public policy.

f. The speed and adequacy—i.e., reliability, comparability, and validity—of laboratory analyses and of the agreement by experts on the meaning of examination records and products has been a bottleneck that has delayed the processing and release of HANES data. For example, many blood samples have had to be reanalyzed upon the discovery of one or another oversight or error in the rigidly standardized procedures for their laboratory analysis; similar problems have beset the analysis of HANES II water samples; the translation of x-rays into codable data has required their independent examination by several experts. These bottlenecks can be overcome only by a) increased expenditures to obtain high priority services for initial or repeated analyses and more careful training of laboratory personnel, or b) the use of more reliable but more antiquated, rather than newer and less reliable, methods.

g. HANES I data collection took four and a half years; interpreting, transcribing, editing and verifying, coding, tabulating, analyzing, writing up, and publishing or otherwise releasing the data will take another five or six years or more. The time taken to tabulate and release basic data, especially those which recur in each national survey, can be reduced; that which is necessary to analyze them more fully and understand their significance for science and/or public policy cannot be so easily compressed. The problems of analysis will be discussed in the next section.

HANES monitoring functions require the repetition of a set of comparable measures in each national survey. These may be designated as the recurrent or core measures to distinguish them from ad hoc measures taken in a survey of the national population or a special group.

In the annual Health Interview Survey, about 25 of the 50-55 minutes of interview time is normally devoted to such core, and the remainder to ad hoc, items.⁴⁵ The core of HANES might also constitute about half of the examination time. The core measures may change gradually over time, as knowledge and techniques advance, but they should be changed slowly and with care to maintain the maximum comparability between successive surveys. The measures would consist of three sets of elements which can be identified with health and nutrition, respectively, or which are important to both:

1. The core of health monitoring measures would include the health history, measures of arthritis and rheumatism, orthopedic impairments, respiratory conditions, smoking, visual and auditory acuity, physical maturity, psychological health, needs for medical care, and tests for syphilis, immunity to infectious childhood diseases, and body burdens from smoking and pesticides.

2. The items important for monitoring both health and nutritional status would include the basic household demography, the general clinical and dental examinations, cardiovascular and heart measures, alcohol consumption, and measures of exercise and physical fitness (including a lung capacity test and pulse rate after exercise).

3. The nutritional core items are those pertaining to factors or conditions in which nutrition may play an important role for a significant—as a rule of thumb, 3-4 percent—proportion of the population.

The qualification "may play an important role" refers to factors or conditions recognized as public health problems in this country or types of malnutrition prevalent elsewhere which might become problems here. Among the former are iron deficiency anemia and energy nutrition, including obesity and exercise. Although the health consequences of sodium and lipid nutrition and fiber intake are less certain, they should also be carefully and thoroughly monitored. A simpler monitoring of marasmus, kwashiorkor, rickets, pellagra, and scurvy is adequate at present; should their prevalence rise, more detailed monitoring would be indicated. Nutrients such as a trace minerals, calcium and phosphorus, most of the B vitamins, and vitamin E would be excluded from the core because their public health effects are rare or undetermined. When these or other nutrients are shown to have significant effects, they would, of course, be included.

Dietary intake data has received more attention than is warranted in a health survey, as the prevalence of malnutrition can seldom be inferred from them. However, these data are useful to food companies and may help to explain changes in the prevalence of malnutrition among different groups. The comparability necessary to link the dietary intake data of NFCS with the health information of HANES, for designated demographic and socioeconomic groups, has already been discussed (see pp. 64-5).

The three sets of core elements now take over 75 percent of the examination and household interview time; they should be pruned to about 50 percent to free time for the assessment of other conditions and the more detailed assessment of selected core conditions (as was done for anemia, in HANES II). In future surveys, special attention is warranted to the causes of limitations of activity and poor physical fitness.

Examination and interview time is not, of course, the only significant resource allocation in HANES surveys; another involves money. Obtaining blood and urine samples takes little time, but laboratory determinations of nutritional biochemistry and fat biopsies can be very expensive. For many determinations, HANES has been dependent upon fund transfers from other

agencies.

Since core items are repeated in each national survey, their coding can be identical and it should be possible to use the same computer program to tabulate and print the results. Accordingly, during the planning stages, HANES staff and consultants can concentrate upon the analytic design, programming, and tabular format of items not included in the core. Agreement on the coding and tabulation of measures requested by other agencies should be a condition of their inclusion in a survey. It should then be possible, 12-15 months after the completion of examinations, to release the data tapes accompanied by a set of tabulations reporting these data by predetermined demographic and technical variables. 46

HANES's good quality control procedures can be further improved, to speed data cleaning and analysis. The variance of each measure, the components of variance due to measurement, and the procedures employed to standardize measures should be published so that users of the tape will know their statistical significance. This requires an estimate of the proportion of that variance attributable to the instrument and to measuring techniques. To assess the variance of measures taken at different times, a small fraction (perhaps 1 percent) of examinees should be reexamined a fortnight later, as is now done for anthropometry. Quality control charts should be maintained for both examination measures and laboratory determinations. It is also important to monitor and correct for the tendency of certain measures to wander or drift over time.

The art of ensuring stability in measurement techniques over long periods of times is rudimentary. NCHS must strengthen that art and produce quality control data demonstrating measurement stability.

4. Fuller Reporting and Analyses

The public release of complete tapes, with accompanying documentation and basic tabulations, should make HANES data more widely available. They embrace such a broad spectrum of biomedical conditions and are relevant to so many scientific and policy issues that the small HANES professional staff cannot themselves undertake all the analyses which should be conducted. Nor should they attempt to do so. They are not as expert in given fields as leading specialists at universities, research institutes, and other federal agencies; nor is it prudent or, in some cases, proper for civil servants to reach conclusions and offer recommendations on contentious issues of public policy which must be resolved by responsible policy officials and the Congress.

However, staff should, of course, prepare as many reports in their fields of competence as they can realistically complete within a reasonable period of time generally not exceeding the duration of the succeeding survey. They should arrange for additional reports and analyses to be conducted under contract by private scholars, and should provide all possible assistance to scientists, citizens, and public officials seeking to utilize HANES data. If staff are too busy to provide the necessary assistance, it should be provided under

contract by a university school of public health or a scientific information service.

HANES data should be made available freely, or at cost, to all who request them, together with information about sampling and measurement procedures so that their value and limitations can be understood. Basic tabulations should be published to guide and stimulate further analyses. As noted in Chapter VI, specialists involved in planning each survey should be encouraged to analyze—and, in the process, to involve others (who agree and disagree with them) in discussions of—their scientific and policy significance.

A comprehensive index should be prepared showing in convenient form the recurrent and singular data obtained in the four Health Examination Surveys and the two Health and Nutrition Examination Surveys. NCHS should also publish a broad compilation of assessments and trends drawn from all examination surveys, to serve as a basic reference manual and to indicate the nature and scope of available health and nutritional data.

No survey can publish, let alone fully analyze, all the data it collects. The proportion of HANES data that has been published, analyzed, or otherwise "utilized" may be too low; surely, HANES's performance can be improved. But that improvement should aim for realistic goals attainable with available funds and personnel.

As Rita Zemach observes, 47 each method of statistical reporting has its distinctive advantages and costs; no one method suffices for all purposes; a balanced mix will best serve the varied needs for the varied inventory of HANES data.

The publication of standard statistical reports (such as the Advanced Data and final reports of National Health Survey data) makes basic information widely available at low unit cost; technical specifications and qualifications can accompany the data; and comparisons can be drawn with data from preceding surveys. However, the limited detail provided is inadequate for many purposes; it is difficult to determine the exact uses made of reports or how well they meet the users' needs; publication is slow and their content reflects the interests and competence of staff.

Within the limits of the measures taken to protect confidence (which may require the deletion of data that could identify individuals and even sampling locations) tapes give users the same early access to raw data as staff. The best qualified authorities can examine the data in their areas of expertise; each can determine for himself the nature of analyses which will thus be far richer and more varied than those which staff are likely to conduct. Special constituencies—food and drug companies, professional associations, health agencies, graduate students, public interest groups—can base their advocacy of public health and nutrition policies upon many of the same data as public officials. However, they lack the staff's intimate familiarity with the survey's sampling, measurement, and coding methods, which may not be fully described in the accompanying documentation. Hence, subtle or gross errors can arise

and pollute the scientific literature and public policy debates. Similarly, food advertisers can knowingly or unknowingly mistake the significance of Recommended Dietary Allowances and dietary intake information drawn from HANES or the Nationwide Food Consumption Survey and trumpet the (unnecessary) contribution of their products to good health and nutrition. Such errors and distortions are an unavoidable cost of a free press, a free market, free scientific inquiry, and an open political and policy process.

Some observers have expressed concerns to us about excessive reliance upon distribution of tapes to report HANES findings. The analysis of tapes, they note, requires access to expensive computers which are more readily available to industry than to impoverished public interest groups. In their view, government staff have a responsibility to explain to the public and the Congress, in a clear and timely fashion, the meaning of the extensive survey data collected at considerable public expense.

We would share their concern about the undue control of analytic resources by any special interest group, were it true. In fact, university scientists and students, with access to computer facilities, have been among the largest users of HANES reports and tapes. A program administered by the Public Health Service, the National Center for Health Statistics, or the National Science Foundation to provide grants for computer analyses of HANES and similar tapes for educational, scientific, and policy purposes may be warranted; we have not investigated the matter sufficiently to judge. However, NCHS does have authority to contract for consulting and research services, and should sponsor analyses of specified HANES data to speed up their reporting and to enhance public understanding of the nation's health and nutritional status.

The responsibility of government staff to interpret "the meaning" of survey data is more complex and debatable. What if the meaning is uncertain, contradicted by other data, or compatible with twenty different policies?

The term "policy" is employed in several senses. Webster's defines it as "wise, expedient, or prudent conduct or management" and "a principle, plan, or course of action." One can identify political and nonpartisan, Congressional and Executive, lofty and lowly, broad and specific, enduring and changeable policies.

The public policies affected by health monitoring and assessment are often those involved in the planning and allocating of personnel and financial resources for research into, and the prevention and care of, different health and nutritional conditions; the education of different health personnel; and the construction or manufacture of different health facilities and equipment. HANES normative data have been important to the establishment of regulatory policies and evaluating their effectiveness.

But survey data alone rarely suffice to establish viable public policy. Insofar as policy reflects information and knowledge, it must respond to many other kinds of information. A survey merely maps the terrain which different

parties traverse as they please. Survey staff chart the contours of the nation's health, the prevailing and changing winds and rainfalls, temperatures, and barometric pressures. It is not their task, but that of the public, the Administration, and the Congress to set national health policies. The function of statistics is to alert, enlighten, and inform, not to shape and direct public policy.

There is...a basic tension and an ultimate inconsistency between the pursuit of the goals of policy relevance and integrity. This conflict presents a dilemma for statisticians. On the one hand, if the statistical system is designed to have the greatest total integrity, like a library that locks up its books, the system will lack the necessary flexibility to serve effectively the information needs of policymakers. On the other hand, if the system is designed to be totally and instantly responsive to policy needs and pressures, the proper professional and institutional protection of integrity cannot be maintained.

Given this dilemma, it is necessary to design a statistical system which can attain the proper balance between the unobtainable goals of total policy relevance and total integrity of statistics. 48

That is the type of system we envisage for HANES.

Notes

1. July 27, 1976 statement reproduced in Diet and Killer Diseases with Press Reaction and Additional Information, prepared by the Staff of the Select Committee on Nutrition and Human Needs, U.S. Senate, January 1977, p. 160. Lee also cited the Study of Nutritional Status of Pre-School Children as a source of these findings.

2. See Recommended Dietary Allowances, Ninth Edition, National Academy of Sciences, Washington, D.C., 1980.

3. "Overweight Adults in the United States," Advanced Data from Vital and Health Statistics, National Center for Health Statistics, August 30, 1979.

4. See Linda D. Meyers, Jean-Pierre Habicht, and Clifford L. Johnson, "Components of the Difference in Hemoglobin Concentrations in Blood between Black and White Women in the United States," American Journal of Epidemiology, Vol. 109, No. 5, 1979, pp. 539-49.

5. "Study Finds US Diet Means Lots of Meat," The Nation's Health, September 1978, p. 2 (reporting findings of HANES I, 1971-74).

6. See Health, United States, 1976-1977, National Center for Health Statistics, 1977, pp. 28-9.

7. Ibid., p. 34.
8. See Health, United States, 1978, National Center for Health Statistics, 1978, p. 230.
9. Preliminary, unpublished data on laboratory analyses of HANES II blood and urine samples (National Center for Health Statistics, 1979).
10. K.R. Mahaffey, J.L. Annet, H.E. Barbano, and R.S. Murphy, "Preliminary Analysis of Blood Lead Concentrations for Children and Adults: HANES II, 1976-1978," unpublished paper, National Center for Health Statistics, 1979.
11. Blood Pressure Levels of Persons 6-74 Years United States, 1971-1974, National Center for Health Statistics, Series 11, No. 203, 1977, pp. 24-25.
12. Jean-Pierre Habicht, J. Michael Lane, and Arthur J. McDowell, "National Nutrition Surveillance," Federation Proceedings, April 1978, p. 1185.
13. NCHS Growth Curves for Children, Birth-18 Years, United States, National Center for Health Statistics, Series 11, No. 165, 1977, pp. 14-15.
14. "Land of the Fat," Time, January 2, 1978, p. 52.
15. D.M. Hegsted, "On Dietary Standards," Nutrition Reviews, February 1978, p. 36.
16. July 5, 1978 letter to panel co-chairmen Wilbur Cohen and William Stewart.
17. Robert L. Rizek, Chairman of the Consumer and Food Economics Institute, Department of Agriculture, writes, "Use of the term 'market research interviewers' is misleading. In the NFCS, insofar as possible, we have used experienced interviewers. Prior activities may involve many types of surveys for governmental and commercial sponsors. Special efforts have been made to recruit persons with professional food and nutrition backgrounds. Interviewers are given an intensive 5-day training in handling of NFCS surveys. Less qualified persons are terminated at the close of training. There is a comparatively high 'mortality rate' among prospective interviewers. The NFCS field staff are not all dietitians, but they don't fit the term 'market research interviewers' either" (April 9, 1980 letter).
18. July 5, 1978 letter.
19. Frederick W. Kutz, Robert S. Murphy, and Sandra C. Strassman, "Surveys of Pesticide Residues and Their Metabolites in Urine from the General Population," in K. Ranga Rao, ed., Pentachlorophenol, Plenum, New York, 1978, p. 364.
20. April 10, 1978 letter to co-chairmen Wilbur Cohen and William

Stewart.

21. May 12, 1978 letter to co-chairmen Wilbur Cohen and William Stewart.
22. June 7, 1978 letter to the panel co-chairmen.
23. May 10, 1978 letter.
24. May 31, 1978 letter.
25. May 3, 1978 letter.
26. May 1, 1978 letter.
27. August 7, 1978 letter.
28. April 4, 1978 letter.
29. April 10, 1978 letter.
30. April 11, 1978 letter.
31. April 6, 1978 letter to the panel from a scientist who wishes to remain anonymous.
32. Harold Margulies, Acting Administrator, Health Resources Administration, September 30, 1977 response to inquiry by the Office of Technology Assessment.
33. NCHS Growth Curves for Children, Birth-18 Years, United States, op. cit., p. 7.
34. World Health Organization, forthcoming.
35. Marguerite C. Burk and Eleanor M. Pao, Methodology for Large-Scale Surveys of Household and Individual Diets, Agricultural Research Service, U.S. Department of Agriculture, Home Economics Research Report No. 40, 1976, p. 64.
36. April 14, 1978 letter to the panel.
37. May 23, 1978 letter.
38. Hamish N. Munro, "The Ninth Edition of Recommended Dietary Allowances," Food & Nutrition News, February 1980, p. 2.
39. Ibid., p. 1.
40. Health Statistics Today and Tomorrow, A Report of the Committee to Evaluate the National Center for Health Statistics, National Center for Health Statistics, Series 4, No. 15, 1973, 24 pages.

41. See Health Statistics Plan Fiscal Year 1979-1980, Department of Health, Education, and Welfare, December, 1979.

42. The Office of Technology Assessment states, "It is doubtful that OSTP through FCCSET [the Federal Coordinating Council on Science, Engineering, and Technology] would be able to adequately oversee coordination of nutrition research activities. The staff of the Office is small, and their responsibilities large. With a budget of \$50 million to \$117 million per year, nutrition research is a very small component of the FY 1977 \$3.6 billion research budget for health and agriculture" (Nutrition Research Alternatives, Congress of the United States, 1978, p. 31).

43. See Health, United States, 1978, National Center for Health Statistics, 1978, pp. 377, 388, ix, 324, 307, and 336.

44. Mark Hegsted, Administrator of the Department of Agriculture Human Nutrition Center and a former member of our panel, also favors a 5-year cycle for HANES. "Although these national surveys provide a variety of information that is useful, I believe the primary purpose is to document trends over time. Two points on the curve are not enough and considering possible errors in estimates, it is dangerous to simply compare two such points. Thus I conclude that 10 years is too infrequent and that we should insist on a 5-year turn around. It is even more difficult to maintain similar methodology in 10 year surveys. More frequent data allow some considerations of what might have happened, i.e., whether it [an observed change] is real or methodological or possible causes" (March 31, 1980 letter).

45. As estimated by HIS Director Robert Fuchsberg in February 1980. Actually, HIS consists of items which are a) repeated annually or b) at longer intervals, such as every five or six years, and c) ad hoc questions. In some years, the survey is primarily ad hoc.

46. This estimate is based upon the experience of the annual Health Interview Survey, which has normally been able to provide a tape of core data for the use of staff by the August or September following the completion of interviewing in December; standard, machine-tabulated tables are usually released six months later. Full data tapes are released to the public two years after they become available to staff. In that period, all parts of the tape are reviewed as staff prepare reports and errors are corrected. "We don't often have serious errors, but it happens," HIS Director Fuchsberg observes. The documentation necessary to make tapes intelligible takes about three man-months.

47. See Rita Zemach, Michigan Department of Public Health, "Providing Statistical Data to Users: An Analysis of Methods, Costs and Effectiveness," a paper presented at the annual meeting of the American Public Health Association in Washington, D.C., November 1, 1977. The following discussion draws upon points made in this paper.

48. James T. Bonner, "Policy Relevance and the Integrity of Statistics,"

Statistical Reporter, January 1980, pp. 64-65.

Cf. The remarks of Senator Edward Kennedy: "Health Statistics...must form the foundation of our Federal effort to rationalize the health care system....Their integrity must be guaranteed. The quality of their work must be impeccable. The results of their work must be widely available. Above all, they must not be politicized. They must not become an extension of the effort to sell a new policy, to justify new proposals....they must not be used in a partisan effort to sell a particular point of view to the Congress or to the nation. Their data may, when impartially judged, support a proposed new policy. But they should not have their basic missions adjusted to the momentary needs of the policy-maker or of the political process" ("The Congress and National Health Policy," American Journal of Public Health, March 1978, p. 242).

APPENDIX A

SPRING 1978 LETTER OF INQUIRY

The following letter was sent by the panel to over 700 individuals prominent in scientific, professional, and public health and nutritional affairs. Their responses are summarized on pp. 41-45 and 89-96.

**NATIONAL ACADEMY
OF PUBLIC ADMINISTRATION**
1225 Connecticut Avenue, N.W. Washington, D.C. 20036
202/659-9165

**Panel to Evaluate the Health and
Nutrition Examination Survey**

Sol H. Chafkin
Wilbur J. Cohen, Co-chairman
Jean-Pierre Habicht
David Mark Hegsted
Brian MacMahon
William H. Stewart, Co-chairman
James L. Sundquist

Our Academy panel has been formed at the request of the Health and Nutrition Examination Survey to evaluate its activities and recommend measures to make them more useful and timely. As part of our evaluation, we would appreciate your views on several points.

The Health and Nutrition Examination Survey, a unit of the U.S. Public Health Service, has conducted interviews, physical examinations, and laboratory tests to determine the health and nutritional status of a representative sample of the national population 6 months to 74 years old. One such survey was completed in 1974 and a second is now underway. It has taken over three years to examine 20,750 persons and additional years to report the findings. (A further description of the survey content and methods is attached.)

A national survey is necessary to determine the prevalence of various health and nutritional conditions in the population, and repeated surveys are necessary to identify trends. However, a national survey may fail to disclose conditions that affect groups comprising a small proportion of the population--as a rule of thumb, under 1 or 2 percent. That would be 200 to 400 persons in a survey of 20,000, but the need to relate a condition (such as malnutrition, obesity, or hypertension) to multiple factors (such as age, sex, income, exercise, etc.) requires a larger number of subjects--perhaps 4-8,000. In its recent mode of operation, the Survey has examined about 5,000 persons a year.

After the present national survey is completed in 1979, a third survey of the population can be begun or it can be postponed for a period of years and the resources devoted to the examination of selected groups whose health and nutritional status warrants special attention.

1. Which would you favor, and why: a third national survey, the examination of designated groups, or both?

a. Regardless of your answer to the foregoing, which of the following groups would you single out as most warranting study to identify their health and nutritional status? (This list of groups with few or no representatives in the current national survey is not exhaustive; please add any others you believe should be studied.)

Children 2 and under
Ethnic groups: Hispanic, Indian, other _____
Institutionalized aged
Migrant workers
Persons below the poverty line*
Persons over 74
Pregnant and lactating women
Recipients of food stamps, AFDC, _____
Other groups _____

2. What special information should the next survey obtain?
3. What special use(s) should be made of this information?

We welcome any further comments you may wish to offer about the past or future work of the Health and Nutrition Examination Survey, how it might be made more useful, and the health and nutrition issues it should address. A self-addressed envelope is enclosed for your convenience. (Please indicate if you wish any comments to be held in confidence.)

Thank you for your help.



Wilbur J. Cohen
William H. Stewart
Co-chairmen

* The present survey oversamples persons with income below the poverty line: an estimated 4,000 will be examined. That number is adequate for some, and inadequate for other, purposes.

Attachment

The Health and Nutrition Examination Survey

This Survey, a program of the National Center for Health Statistics (NCHS), conducts interviews and examinations of two hours' length on a probability sample of the national population. The sample is drawn and household interviews undertaken by the Bureau of the Census, under a contract with NCHS. The examinations, including health and dietary interviews, are conducted by NCHS field staff in two sets of caravans moved to 65 sampling sites across the nation, including Alaska and Hawaii. Great care is taken to standardize measurements and laboratory tests of blood and urine samples.

The second national survey (1976-79) is proceeding along similar lines to the first (1971-74), with the modification or addition of certain tests and measurements. Its purpose is to measure the prevalence of numerous health and nutritional conditions as well as changes which have occurred since the first survey (and earlier surveys of narrower scope and population segments). In addition to demographic and socio-economic data, a medical history and a psychological questionnaire is obtained from each subject.

The major health conditions surveyed are: anemias; diabetes; kidney, liver and heart disease; hypertension; speech and hearing problems; allergies; osteoarthritis and disc degeneration; respiratory function; and assessments of carbon monoxide, lead, and other pollutants and pesticides.

The information on nutritional status includes body measures, laboratory tests for normative nutrient data as well as for deficiency and toxicity levels, food frequency and 24-hour dietary recall data, use of vitamins and mineral supplements, special diets, and eating problems.

The current Health and Nutrition Examination Survey costs about \$5 million a year. Though reporting has been limited to selected parts of the data, all of the data tapes will be made available for independent analysis. Anyone wishing to receive information on available publications or data tapes should write to:

The Health and Nutrition Examination Survey
National Center for Health Statistics
Center Building
3700 East-West Highway
Hyattsville, Maryland 20782