

VITAL & HEALTH STATISTICS

Reporting Chronic Conditions in the National Health Interview Survey A Review of Tendencies From Evaluation Studies and Methodological Test

This report provides background information on the reporting of chronic conditions and physical impairments in the National Health Interview Survey and other health interview surveys. Relevant results from methodological and evaluation studies conducted or sponsored by the National Center for Health Statistics are reviewed systematically; and some findings from other health interview surveys and methodological experiments are also presented.

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Lester R. Curtin, Ph.D., *Acting Chief, Statistical Methods Staff*

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Foreword

Recently, the Center issued an RFP for a project to apply cognitive research methods to improve health survey instruments that collect information about chronic health conditions. That contract was nested in a larger project, supported by a National Science Foundation grant, that demonstrated the utility of conducting questionnaire design research in a cognitive research laboratory setting in collaboration with university scientists. Because it was anticipated that many prospective RFP respondents might be relatively unfamiliar with the survey process for measuring chronic conditions and its pitfalls, this report was prepared to provide them with that information.

In this report, Thomas B. Jabine presents an overview of the state of the art of collecting information about chronic conditions in household interview surveys. He describes the survey methods and instruments that have been used to collect these data by means of the National Health Interview Survey (NHIS) and other health interview surveys. He also describes the methodological studies that have been conducted or sponsored by the Center to evaluate the quality of survey data on health conditions, and discusses their findings.

After the report was prepared, it became apparent that it should be made accessible to a much wider audience than the one it was originally intended to serve. In addition to having met the needs of a relatively small number of psychologists who responded to the RFP, the report will, I believe, serve as a useful reference for many other social scientists, survey researchers, and health data consumers. However, the reader should bear in mind that the original report was not in any way changed to accommodate the wider audience to which it will

now become accessible. Thus, the report remains an overview rather than a critical assessment of the current status of questionnaire design research on reporting of chronic conditions.

A word of caution about a possible misapplication of the findings of the evaluation studies presented in this report for interpreting the quality of current data on chronic conditions. Nearly all of these methodological studies, especially the record check studies, were conducted during the late 1950's and the 1960's. In the intervening years, the disease prevalence rates based on the NHIS data have shown marked increases; the rates for some conditions have more than doubled. Therefore, it would be risky to assess the quality of current NCHS chronic disease statistics on the basis of evaluation studies that were done many years ago. Furthermore, most of the record check studies were conducted on relatively small samples selected from rather narrowly defined populations.

Mr. Jabine did an exceptionally good piece of work in preparing this report. Although he is solely responsible, he would be the first to acknowledge the help he received from Center staff, especially from Judith Lessler and Robert Fuchsberg. They overviewed his project when Dr. Lessler was serving as Visiting Scientist to the Center and before Mr. Fuchsberg retired as Director of the NHIS program. I should also like to acknowledge the help of Owen Thornberry and Ronald Wilson, who reviewed this report.

Monroe G. Sirken
Associate Director for
Research and Methodology

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Symbols

- - - Data not available
 - ... Category not applicable
 - Quantity zero
 - 0.0 Quantity more than zero but less than 0.05
 - Z Quantity more than zero but less than 500 where numbers are rounded to thousands
 - * Figure does not meet standard of reliability or precision
 - # Figure suppressed to comply with confidentiality requirements
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Reporting Chronic Conditions in the National Health Interview Survey

A Review of Findings From Evaluation Studies and Methodological Test

by Thomas B. Jabine

Introduction

This report was initially prepared for use in the National Center for Health Statistics (NCHS) study on cognitive aspects of survey methodology (the CASM Project). The cognitive sciences are concerned with processes like understanding language, remembering and forgetting, perception, judgment, and inferring causes. These and other cognitive processes are important in survey interviews¹ and the quality of survey results depends, to a large extent, on their outcome. The CASM Project, which is described in the "Background and history" section of this report, has the goal of determining in what ways the laboratory methods and techniques currently used for research in the cognitive sciences may be useful for understanding, measuring, and ultimately reducing errors in health surveys.

As part of the CASM Project, some "minicontracts" were awarded to university cognitive scientists to study the cognitive tasks performed by respondents to survey questions, and focused on specific factors known to be related to response error. Two of these studies concern the recall and reporting of chronic conditions in the National Health Interview Survey (NHIS). (The survey was originally called the Health Interview Survey; the word "National" was added later. For convenience, the current name (NHIS) is used throughout.) This report provides background information on reporting of chronic conditions and physical impairments in NHIS and other health interview surveys. Relevant results from methodological and evaluation studies conducted or sponsored by NCHS are reviewed systematically; and some findings from other health interview surveys and methodological experiments are also presented.

The survey objectives and operating procedures for the collection and processing of data on chronic conditions in NHIS are described in the section "Survey objectives and operating procedures." Current data requirements and procedures are described first; significant changes that have occurred since the beginning of NHIS in 1957 are then enumerated.

The section, "The quality of chronic conditions data," discusses what is meant by the quality of data on chronic conditions and identifies the principal methods of obtaining information about response errors associated with chronic conditions data.

The section, "Study findings," which is the heart of this report, reviews what has been learned by survey researchers about reporting of chronic conditions in interview surveys. Limitations of the findings from evaluation studies and methods tests, as well as gaps in their coverage, are also discussed.

For readers wanting more detailed information about operating procedures and research findings, this report includes, in addition to the list of references, appendixes. Appendix I contains descriptions, using a standard format, of the evaluation studies and methods tests conducted or sponsored by NCHS that provided information relevant to the reporting of chronic conditions. Appendix II lists conditions always regarded as chronic, and appendixes III and IV contain relevant excerpts from NHIS questionnaires, instructions, processing specifications, and publications.

Background and history

The mission of the National Center for Health Statistics (NCHS) is:

- To maintain a set of data systems capable of meeting the broad needs for accurate national health statistics.
- To make data available for data users.
- To conduct analyses on selected health and epidemiological issues.

A subsidiary NCHS mission is to maintain a vigorous methodological research program to improve the design efficiency of health data systems and the quality of health statistics.

In 1984, NCHS began a methodological research program directed at evaluating the usefulness of conducting questionnaire design research in a laboratory setting applying the theories and methods of the cognitive sciences. The goal of this research was to develop new methods for understanding, measuring, and ultimately controlling response errors in health surveys. The NCHS involvement in this area originated from its participation in an advanced research seminar on the cognitive aspects of survey methodology (CASM) that was convened by the Committee on National Statistics in 1983 and 1984.¹ That seminar investigated the potential for collaborative interdisciplinary research between cognitive psychology and survey research. Following that seminar, Monroe Sirken and Robert Fuchsberg applied for and received a grant from the National Science Foundation (NSF) to assist in the development of an NCHS research program on CASM.

One of the major NCHS health surveys, the National Health Interview Survey (NHIS), was chosen as the subject survey for CASM from among 20 surveys and data systems maintained by NCHS. NHIS was chosen because there was a long history of research on various aspects of this survey, and the subject had been discussed during the aforementioned NCHS seminar on the cognitive aspects of survey methodology.

The NCHS CASM project carried out two types of studies as collaborative efforts between NCHS staff and cognitive psychologists at research institutes and universities. The first component of the study project entailed investigating the use of the cognitive research laboratory to design and test the annual supplements to NHIS. The 1986 Dental Health Supplement was developed and tested simultaneously by field pretests and in the laboratory, and the results obtained by the two methods were compared and evaluated.²⁻⁴

The second component of the NCHS CASM study was devoted to more basic research on specific cognitive issues related to response in NHIS. One of the goals of the Committee on National Statistics seminar was to foster collaborative re-

search between cognitive scientists and survey researchers. This goal also became a goal of the NCHS project. The Center's efforts to improve its surveys through a methodological research program would be enhanced if a large number of researchers in a variety of settings focus on problems germane to health surveys. Thus, one of the goals of this component of the project was to initiate research at universities and research institutes on basic response problems that occur in health surveys. This goal was accomplished by issuing requests for proposals (RFP's) and awarding small research contracts to successful bidders. Researchers were given a fairly wide latitude as to the type of research they could propose. However, in order to assure that the research would be relevant to the Center's surveys, two topics were specified—recall and reporting of chronic conditions, and the general cognitive processes inherent in the recall of health information.

One of the most important components of NHIS is the production of national estimates on the prevalence of chronic conditions and health impairments. The collection of the data needed to produce these estimates is also one of the more difficult data collection tasks that the Center undertakes. As a result, a variety of research on the reporting of chronic conditions has been conducted over the years. In order to assist those responding to the RFP on chronic conditions, the Center commissioned the author of this report to write a background paper summarizing prior research on the reporting of chronic conditions. This report is a slightly revised version of that report and will be useful to other researchers in the field.

Two research contracts on reporting of chronic conditions were funded by the Center. Principal investigator Dr. Marilynn Brewer of the University of California, Los Angeles, is investigating how information on chronic conditions is stored in memory and how the information can be effectively retrieved during an NHIS interview. Differences between self-respondents and proxy respondents are being investigated. Thirty-five pairs of subjects are being recruited from a cooperating health maintenance organization. One member of the pair will have one of a selected range of chronic conditions and the other member will be a member of the same household who is eligible to serve as a proxy respondent under NHIS response rules. Differences in memory organization and retrieval strategies between those with direct experience of chronic conditions and those with second-hand knowledge will be investigated. These studies will provide insight into differences between self-reporting and proxy reporting noted in previous studies and differences between different questioning strategies. The results of the initial round of studies will be used to develop three different ap-

proaches for querying respondents about chronic conditions—a checklist approach similar to the current approach; a category approach, in which respondents are first asked about general categories of conditions, then about specific conditions within categories that generated a positive response; and a person-based approach, in which respondents are first asked whether any health conditions affected any behavioral or psychological aspects of their lives, their job performance, family life, and so forth. These different questionnaires will be administered to an additional small sample of people.

Dr. Barbara Means of the Human Resources Research Organization (HumRRO) is directing the second study. This study is investigating memory for acute conditions. Twenty-seven subjects are participating in one of several studies that explore reporting problems in NHIS. The impact of the serious-

ness of the condition and health self-concept on memory and report of acute and chronic conditions is being investigated. Chronic conditions are likely to result in recurring similar episodes of illness and use of health care facilities. Acute conditions are more likely to result in unique experiences. Different retrieval strategies may be useful in the two cases. A second issue that will be addressed is whether respondents with different assessments of their health differ in the retrieval strategies they use when asked NHIS-type questions. Dr. Means will also investigate how memory organization affects the recall of chronic conditions. Research in cognitive psychology reveals that recall is improved if some organizing information is available. Survey respondents who are asked to recall information in groupings that match their own organization of events could be expected to exhibit more complete recall.

Highlights

Highlights of the principal findings of this report are summarized in the following statements:

- Studies carried out prior to and during the early stages of NHIS showed that the levels of simple response variance and interviewer variance were fairly high in relation to sampling variance.
- Record check studies based on special clinical examinations and on records kept by the survey respondents' own physicians have consistently shown a high level of underreporting of chronic conditions in health surveys—in some cases as much as 80 percent. However, none of these studies has evaluated levels of reporting in a survey that uses the current NHIS procedures to collect data on chronic conditions.
- Record check studies have also shown a smaller but still considerable amount of overreporting, in the sense that conditions reported by respondents could not be verified by comparison with physicians' records or the results of clinical examinations.
- The levels of underreporting and overreporting vary widely by diagnostic category. Conditions regarded as sensitive are more likely to be underreported.
- Conditions that have caused survey respondents to restrict their activities, or to seek treatment, are less likely to be underreported.
- Persons who feel that their general state of health is good appear to be more likely to fail to report chronic conditions; however, the evidence on this point is ambiguous.
- The level of reporting of chronic conditions in telephone interviews appears to be about the same as for face-to-face interviews. There is some evidence that the use of self-administered conditions and symptom checklists might improve reporting.
- Self-response for all adults, compared with the present NHIS respondent rule, increases the rate of chronic conditions reporting by about 10 percent. This finding has been confirmed for both face-to-face and telephone interviews.
- Small-scale experiments suggest that the use of special interviewing techniques—respondent instruction, commitment, feedback, and long questions—used either singly or in combination, can significantly increase the rates at which chronic conditions are reported.
- Increases in the number of probes and checklist items have produced substantial increases in reporting.
- Limited evidence suggests that checklist item terminology could be an important factor in the level of reporting, especially for some regional and ethnic groups.

Survey objectives and operating procedures

Research on the cognitive tasks performed by NHIS respondents, who are asked to report on chronic conditions and related topics, will focus on what happens in survey interviews and on how the relevant questions are worded and presented on the questionnaire. However, the ultimate objective of the research is to find ways of getting better quality data on chronic conditions. Therefore, the research must be guided by knowledge of (1) the specific kinds of information on chronic conditions that NCHS is trying to collect by means of the NHIS, and (2) the entire set of survey operating procedures used to obtain data from respondents and transform them into statistical information for dissemination to users. Unless the survey objectives and operating procedures with respect to chronic conditions are reasonably well understood, it will be difficult to judge whether proposed changes in the NHIS questionnaire and interview procedures are likely to improve the data for chronic conditions.

This section begins with a description of the current NHIS objectives and operating procedures. To understand what is meant by "current," it is necessary to know something first about the general nature of the NHIS design.

In recent years, NHIS has operated on a calendar year basis, with a sample of roughly 40,000 households each year. Each year's sample is divided into 52 subsamples and interviews are conducted each week by the U.S. Bureau of the Census interviewers with the households in one of these subsamples. Each household is interviewed only once.

Questionnaires change to some degree from year to year. The core questionnaire is used to collect information on the same basic topics every year. The contents, wording, and format of the core questionnaire are revised occasionally, based on user consultations and a review of experience, and the results of evaluation studies and tests. The last such revision of the core items was introduced in the 1982 questionnaire. In most years, there is also a supplemental questionnaire; the topics covered by the supplements vary annually. In 1981, for example, the supplement covered child health. In 1983, it covered dental visits and the use of alcohol and tobacco. The supplements sometimes included questions on chronic conditions in addition to those included in the core questionnaires.

Ideally, the description of current survey objectives and operating procedures should be based on a single year. This is difficult, however, because the availability of documentation varies. The description that follows draws on these materials: The 1983 questionnaire (for the core questionnaire, there have been few changes since 1982); the 1981 interviewer's manual;

the 1982 Computer Processing Specifications, which contain the computer edit specifications and tape formats; the Medical Coding Manual and Short Index provided as Part III of the 1981 Public Use Data Tape Documentation; and selected NHIS publications based on the 1981 and earlier surveys. What follows is therefore not an exhaustive and precise description for the 1984 survey, but it does reflect the essential features of the current survey objectives and procedures with respect to chronic conditions.

Current survey objectives

For NHIS, a morbidity condition, or simply a condition, is defined as any "departure from a state of physical or mental well-being."⁵ Conditions include impairments that are "chronic or permanent defects, usually static in nature, that result from disease, injury or congenital malformation."⁵

Conditions reported in the NHIS are classified according to the *Health Interview Survey Medical Coding Manual and Short Index* and the *International Classification of Diseases (ICD), 9th Revision*,⁶ Volumes 1 and 2. The NHIS Medical Coding Manual⁷ is an extensive listing of coding rules and modifications to the ICD that make the code more suitable for a household interview survey.

At a given time, a person may have any number of conditions. However, for selected three-digit ICD codes and code groups, only one condition per person is retained even though two or more may have been reported; additional conditions are deleted in the computer edits.⁸

A chronic condition is one that was present in the past year and was either (1) first noticed more than 3 months prior to the week of interview or (2) was noticed 3 months or less prior to the week of interview and is one of the conditions identified by NCHS as "always chronic," regardless of onset (see appendix II).

Any chronic condition (according to the definition just given) with an onset over 3 months and reported as "cured" is deleted during the editing process if no other evidence from the questionnaire indicates that it was present during the past year, that is, the condition did not cause any (1) activity limitation, (2) 2-week disability, (3) 12-month medical attention, (4) 12-month bed days, or (5) the respondent did not report the condition as being present in the past 12 months. A final edit is also made to conditions reported in the "ever had" chronic condition checklist having ICD codes 390, 392-399, 401-405, 413, 414, 423.1, 424.1, 429.2, and 440. Using these criteria,

any conditions whose onsets occurred more than a year prior to the interview that were reported as “cured” and were not “present” in the past 12 months are also deleted.

What data relating to chronic conditions does NHIS attempt to produce? In theory, the survey could attempt to cover all chronic conditions as defined above and to provide data for each of the 6,058 possible four-digit ICD and NHIS categories. In practice, the objectives are more modest, because (1) the sample size is not large enough to support detail at the four-digit level; and (2) experience has shown that chronic conditions can be substantially underreported unless they are specifically mentioned to respondents using some kind of checklist procedure or are associated with some kind of impact—such as hospitalization, a doctor visit, or restricted activity—during a short period immediately preceding the interview.

It would not be practical to present each respondent with a checklist containing every one of the 6,058 four-digit diagnostic categories. After trying various procedures during the life of the survey (to be explained in the next section), in 1975, NCHS settled on the current procedure, which involves the use of six different checklists. As shown in table A, a total of 131 descriptors of chronic conditions are distributed among six checklists and organized by body system.

At each household interviewed, only one of these six checklists, predesignated by a random procedure, is used. Thus, the overall sample is divided into six subsamples. Survey estimates of prevalence for a particular group of chronic conditions are based only on the subsample whose checklist corresponds to that group.

NCHS prepares prevalence estimates only for the 134 condition groups shown in column (3) of table A and recommends against further breakdown of these categories.⁹ Precise definitions of the 134 groups (known collectively as recode C) in terms of ICD-NHIS codes appear in volume 2 of the 1982 *Computer Processing Procedures*.¹⁰

Comparison of columns (2) and (3) shows that there is not always a one-to-one correspondence between the descriptors and the suggested publication groups. The latter are based on diagnostic codes that take into account the checklist response and responses to additional questions asked about each condition reported. Some sets of two or more descriptors correspond to a single publication group; sometimes the converse is true.

Table A. Number of descriptors on questionnaire checklist and number of publication groups, by selected chronic conditions

<i>Chronic condition</i> (1)	<i>Number of descriptors on questionnaire checklist</i> (2)	<i>Number of publication groups</i> (3)
Total	131	134
Skin and musculoskeletal	26	19
Impairments	26	43
Digestive	23	16
Miscellaneous	17	25
Circulatory	22	15
Respiratory	17	16

SOURCES: Column (2): 1983 questionnaire, form HIS-1.
Column (3): 1982 *Computer Processing Procedures*, vol. 2, pp. 161-168.

Although there is no one statement that precisely specifies the data objectives for chronic conditions in NHIS, it seems fair to infer these objectives from looking at what is published or made available on the public use data tapes. On this basis, the primary objectives appear to be:

- To make estimates of prevalence for the 134 recode C chronic condition groups.
- To identify all chronic conditions associated with chronic activity limitations (that is, conditions that affect ability to work, keep house, attend school, or perform other activities), and to classify persons with chronic activity limitations by selected condition groups.
- To identify all chronic conditions associated with hospitalization, physician visits, or restricted activity during the 2-week reference period preceding the survey interview.

The public use data tapes provide more detailed diagnostic information than is necessary to meet the first objective: the 1982 tapes include, in addition to recode C, the four-digit ICD-NHIS code, and condition recode B, covering acute and chronic conditions, with 271 three-digit and 5 two-digit codes. However, this level of detail is not published by NCHS, and users of the public use data tapes are cautioned about the limitations resulting from sampling and nonsampling errors.

Current operating procedures

The main steps in each year’s NHIS are:

1. Development and testing of survey instruments and procedures.
2. Interviewer training.
3. Interviewing.
4. Manual edits.
5. Manual coding.
6. Data entry.
7. Computer edits.
8. Tabulation.
9. Report and tape preparation.
10. Dissemination of results.

All of these steps have important implications for the quality of the results. However, in keeping with the focus on the cognitive aspects of reporting chronic conditions, those aspects of interviewing, manual coding, and computer edits that relate very specifically to chronic conditions are emphasized. For a broader description of the survey operation, the reader may refer to NCHS Series 1, No. 11.¹¹ NCHS Series 2, No. 54,¹² gives a useful description of quality control procedures built into various phases of the survey operations.

Interviewing procedures

The two most important aspects of interviewing are the general conditions under which the interviews are conducted and the way in which the survey instrument—the questionnaire—is designed to capture information on chronic conditions. Changes in these conditions may improve respondents’ cognitive performance. However, the consequences of possible changes for the overall survey objectives and the operating costs cannot be ignored.

Some features of the interview that may be relevant to cognitive performance follow:

- An advance letter is mailed to most sample households explaining the purposes of NHIS—the fact that participation is voluntary and that individual data collected in the survey is kept confidential. If the advance letter has not been received or has not been read, it is shown to the respondent(s) at the start of the interview. Respondents are urged to participate even though they are not required to do so.
- For the most part, interviews are conducted in person (face-to-face) at the respondents' homes. Only one interview is conducted with each sample household. In most cases, all information is obtained at this first interview. If, after the interview, one or two items are missing, the interviewer may try to obtain this information by telephone. Telephone survey methodology has the potential for a greater role in NHIS and, since the mid-1970's, NCHS has conducted and sponsored several methodological studies to explore this potential.
- Interviewers are required to follow specific rules (respondent rules) about who may respond to various portions of the questionnaire and who may be present during the interview. Briefly, any responsible adult (19 years and over) member of the household may respond to the initial part of the interview in which the names and relationships of household members are obtained. For the remainder of the core questionnaire, the rules encourage self-response by persons age 17 years and over. Following the household listing section of the interview, all household members age 17 years and over who are available at the time of the interview are invited to participate. Household members under 17 years of age may be present but are generally not expected to report for themselves. However, self-response is not required. For each related group in the household, a single adult respondent is permitted to respond for all those who are not available at the time of the interview or not wishing to respond for themselves. Unrelated persons living in the household must, however, report for themselves. If they are not present at the time of the interview, a callback is required.

Respondent rules for supplements vary, depending on the topics covered. Clarifications of and exceptions to the respondent rules appear in the interviewer's manual, *Public Use Data Tape Documentation*.¹³ The respondent rules raise two important cognitive issues: (1) the effect of proxy responses and (2) the effect on self-reporting, especially for sensitive items, when other family members are present.

- The interviewing procedures are highly structured. Interviewers are expected to ask questions in the order they appear on the questionnaire and with the exact wording and emphasis shown. For some questions, followup probes are printed on the questionnaire. When they are not provided, interviewers are given examples of the kinds of probes that are and others that are not considered acceptable. In general, interviewers are instructed to discourage respondents from giving information not directly relevant

to the immediate questions, even though it may be needed later in the interview. Detailed instructions on "How to ask the questions" and "Probing" appear in *Public Use Data Tape Documentation*.¹³ To encourage conformity to these instructions, the work of each interviewer is periodically observed by his or her supervisor.

- The average duration of the core questionnaire interview is roughly 30 minutes. The interview may take considerably longer when there are numerous health conditions or events to report.

The questionnaire, capturing information on chronic conditions

Figure 1 provides a guide to the general structure of the 1983 NHIS questionnaire, form HIS-1. It shows that conditions are identified in three ways.

1. Through recall, when respondents are asked the reason for, cause of, or result of injuries, medical care utilization, or various kinds of activity restrictions or limitations. Conditions are identified in this way in sections 3, 4, 6, 7, and 10 in figure 1. The relevant questions in these sections are sometimes called "condition probes."
2. Through recognition (in the cognitive sense) when the condition appears on the designated checklist read to the respondents from section 9 of the questionnaire.
3. When conditions are mentioned by respondents in some context other than as a direct response to a question. This is likely to occur in the conditions section, which is used to obtain details of conditions previously identified. The cause of a condition already reported may turn out to be another condition.

Each time a condition is identified in any of these ways, its name is immediately recorded in a designated section of the questionnaire, with an indication of its source, that is, the questionnaire section in which the condition was first mentioned. This recording process provides a reminder to the interviewer that detailed information for each condition identified must be obtained when section 11 is reached. The source information has potential value for studying the relative effectiveness of different kinds of probes or cues and the checklist procedure.

In section 11, detailed information is obtained for each condition identified earlier. This information is used in processing to decide whether the condition is chronic or acute, to assign a diagnostic code, and to eliminate reported conditions that should not be counted, according to the survey definitions given earlier in this section. Information is also obtained about the association of each condition with restricted activities, the number of bed days in the last 12 months for checklist conditions, and the circumstances under which accidents leading to reported conditions occurred. The portion of the 1983 questionnaire used to record details of a single condition is shown in appendix III.

Several aspects of the questionnaire features designed to elicit condition data deserve special attention. First, the sections are ordered with the intent of identifying all conditions for each household member before detailed information is collected for any of the conditions mentioned. The assumption underlying

Section ¹ (1)	Respondent rule (2)	Reference period (3)	Conditions identified ² (4)	Remarks (5)
1. Household identification and composition	Any responsible adult	Now	No	Includes personal demographic characteristics needed for screening.
2. Hospitalization probe	All available family members 17 years and over	Last 13 months	No	Details of each hospitalization are obtained in section 10.
3. Current activity limitations	All available family members 17 years and over	Now	Yes	Limitations on work, housework, school attendance, and so forth.
4. Restricted activities	All available family members 17 years and over	Last 2 weeks	Yes	Work-loss days, school-loss days, and so forth.
5. Doctor visit probe	All available family members 17 years and over	Last 2 weeks	No	Details of each visit are obtained in section 6.
6. Doctor visits	All available family members 17 years and over	Last 2 weeks	Yes	
7. Injuries	All available family members 17 years and over	Last 2 weeks	Yes	
8. Health indicators	All available family members 17 years and over	Varies	No	Number of 12-month bed days and physician visits, perceived health status.
9. Condition checklist	All available family members 17 years and over	Varies	Yes	Depending on condition, reference period may be now, last 12 months, or ever.
10. Hospitalization	All available family members 17 years and over	Last 13 months	Yes	Conditions identified only if hospitalized during last 2 weeks.
11. Conditions	All available family members 17 years and over	Varies	Yes	New conditions may be identified in the process of obtaining details of conditions previously identified.
12. Demographic background	All available family members 17 years and over	Varies	No	Individual and family characteristics not covered in section 1.

¹The section numbers shown are not the ones used in the questionnaire.
²Detailed information for each condition identified in sections 1–10 is obtained in section 11.

Figure 1. Structure of the 1983 National Health Interview Survey questionnaire

this tactic is that if respondents with many conditions to report learn in the course of the interview that each condition reported leads to a long series of questions, they will become less and less likely to report additional conditions as the interview proceeds. As can be seen in figure 1, the same tactic is followed to obtain information on doctor visits and episodes of hospitalization. The tactic is fairly well known to survey researchers; it is also used in the National Crime Survey questionnaire to collect data on incidents of victimization. The decision to use this tactic in the National Crime Survey was supported by evidence from a methodological experiment that showed that doing all of the screening or probing first led to reporting of 2½ times as many incidents as an alternate procedure that collected detailed data for each incident as soon as it was reported.¹⁴

Second, the primary sequencing of the questionnaire is by topic rather than by person (household member). Thus, information on each topic is obtained for everyone before proceeding to the next topic. An alternative organization of the interview would be to collect all the survey information for one person before proceeding to the next person. Each method has potential advantages and disadvantages; no judgment as to which is better in any sense is intended here.

Third, the difference between the first two of the three methods of identifying conditions listed above is significant because of the differences in the cognitive tasks they impose on respondents. Method 1 is indirect: It requires first that respondents recognize current or recent instances of activity limitation

or restriction, doctor visits, injuries, and hospitalizations, and only then that they recall the names of the conditions associated with these instances. Method 2 is more direct: Respondents are presented with a list of specific conditions and asked to recognize those that apply to them or to other family members for whom they are reporting. Does the present core questionnaire represent the optimum combination of these two methods or could more effective arrangements be developed?

Fourth, in order to have some idea of the length of the recall period, it is of interest to examine the reference periods that apply to the various questions relating to conditions. Examination of column (3) in figure 1 shows the following:

1. Questions on restricted activities, doctor visits, injuries, and hospitalizations require recall of events occurring in the 2 calendar weeks *preceding* the calendar week (Monday through Sunday) in which the interview is being conducted (hospitalizations during the past 13 months are asked for, but detailed condition information is collected only if associated with a hospitalization episode that partly overlapped this 2-week period). About 85 percent of the interviews are conducted Monday through Wednesday of the survey week. The definition of the 2-week reference period is emphasized for respondents by showing them, at the start of each set of questions to which it applies, a calendar card on which the dates included in the period are outlined in red.

2. The questions on activity limitations refer to the situation now. Strictly speaking, "now" is supposed to mean last Sunday night (see *Public Use Data Tape Documentation*¹³).
3. The checklist questions on conditions have varying reference periods. The checklist section of the 1983 questionnaire is shown in appendix IV. Examination of the six checklists shows that three different time references are used: Now ("does anyone now have . . .?"), and the past 12 months ("during the last 12 months has anyone had . . .?"), and ever ("has anyone ever had . . .?"). The "now" question is used primarily for impairments. The "ever" question is used only in the circulatory conditions checklist for the more severe types of heart and circulatory conditions. Most of the conditions on the checklists use the 12-month reference period. There is a special requirement for two conditions, tonsillitis and laryngitis, included in the respiratory conditions checklist. When either of these is reported, the respondent is asked to report the number of occurrences in the last 12 months and, if there was only one occurrence, its duration. If it lasted less than 1 month, the condition is not counted.

Finally, there are some aspects of the procedure that may influence respondent comprehension of the survey questions. Important issues are the choice of checklist categories and the wording used for each category. The questionnaire designers have tried to provide medical and lay terms for conditions that are not the same, for example, "Hypertension, sometimes called high blood pressure?" and "Tachycardia, or rapid heart?" Several catch-all categories may pick up conditions for which respondents did not recognize a specific name, for example, "Any other heart attack?" and "Any other stomach trouble?"

The conditions on the designated checklist are read to the respondents, always in the order shown on the questionnaire. The interviewer's manual contains the following instruction:

If you are questioned as to the meaning of any of the listed terms, use the definitions printed on the questionnaire for that particular list. Do not attempt to explain or define any of the conditions further.¹³

Special provisions have been made for conducting NHIS interviews in Spanish-speaking households. In some instances, bilingual interviewers are used; in others, the interview is conducted through an interpreter. The condition checklists have been translated into Spanish so that the same terminology can be used in all such interviews.¹³

The foregoing discussion has referred to conditions generally, not to chronic conditions. The word "chronic" does not, in fact, appear anywhere on the questionnaire. The decisions as to which reported conditions will be counted as chronic conditions are made during manual and computer processing operations, as discussed next.

Manual coding

Although various items on the NHIS questionnaire are subject to manual coding, our concern will be only with *medical coding*, which is the manual coding operation in which numeric or alphanumeric codes are assigned to questionnaire information about diseases, injuries, accidents, deliveries, and operations.

Instructions for medical coding are published in the 1981 *Public Use Data Tape Documentation*.⁷ Medical coders also use as a reference the Ninth Revision, *International Classification of Diseases (ICD-9)*.⁶

For each condition identified, the medical coder is required to:

- Assign a three- or four-digit diagnostic or impairment code.
- Assign a supplemental one-digit code indicating whether the condition is chronic or acute.

In specified circumstances, coders also create new conditions, delete conditions reported on a condition page, combine two or more conditions reported on a single condition page, and merge two or more conditions reported on separate condition pages for the same person.

The instructions for medical coding are exceedingly complex and are not discussed in detail here. However, one should recognize that the end results of medical coding are greatly influenced by the precise nature of responses to open-end questions on form HIS-1. Therefore, some familiarity with the details of the medical coding procedure is important in order to understand the importance of the cognitive tasks that interviewers and respondents are asked to perform, especially the tasks involved in recording a precise verbal description of each condition reported. A few general comments and illustrations may help to clarify this point.

The objective of diagnostic coding is described as follows:

The objective, in diagnostic code selection, is to make use of all the information on the questionnaire to obtain the best possible description of the kind of disease and the part of the body affected, avoiding, if possible, the use of a symptom or ill-defined category, and neither overcoding nor undercoding.⁷

Most of the information used for diagnostic coding appears on the condition pages (see appendix III). Items 3, 4, 5, and 17 on the condition pages are critical for diagnostic coding and for assigning the chronic or acute code. These questions cover what the doctor (if consulted) called the condition, its cause, the body sites affected, the kinds of effects and, for a tumor, cyst, or growth, whether it is malignant or benign. In deciding whether to code the condition as chronic or acute, the coder frequently needs to use the response to question 5, which asks for the date of onset, that is, when the condition was first noticed.

The terms "overcoding" and "undercoding" refer to using separate condition codes when one is sufficient and failure to code separately conditions that should not be combined, respectively. Examples of overcoding would be failure to combine if the entries showed "heart trouble with cause of hypertension" or a footnote on the hypertension page of "same condition as . . ."; this can be combined into one diagnostic code (402.9) and one condition page. An example of undercoding would be to assign a single code based on the following entries:

Name: Allergies.

Causes: Sun, pork, melons, onions, and bananas.

Effects: Sick to stomach, difficulty breathing, and headache.

According to the manual, "Three codes are needed in the above example: gastrointestinal allergy (538), respiratory allergy (493.0), and allergic headache (236.2)."

Certain diagnostic codes and groups of codes are reserved for incompletely specified conditions (for example, 269.9 for nutritional deficiencies, unspecified) and for symptoms, signs, and ill-defined conditions (780–799).

The frequency with which these less precise diagnostic codes appear could be used as one indicator of the quality of condition information that is being obtained in the NHIS interviews.

The quality control procedures used for medical coding reflect the complexity of the undertaking. Diagnostic coding is subject to 100 percent independent verification. Every questionnaire is coded independently by two medical coders. Their codes are compared, and all disagreements are resolved by coding supervisors.

Computer edits

Like the manual coding instructions, the computer edit specifications are of interest in this report only to the extent that they identify specific questionnaire items and types of responses that have a significant impact on the final estimates for chronic conditions—their prevalence and association with medical care and restricted or limited activity variables. The discussion of computer edits that follows is based on the NHIS *Computer Processing Procedures*.^{8,10}

The 1982 processing procedures describe 30 separate weekly and quarterly computer runs. The input data are keyed and grouped by collection week. In runs 1–7, which are weekly runs, records that fail to meet the specified edits are rejected, corrected, and reprocessed. The remaining runs process the combined weekly files for each quarter. These runs involve further edits, imputation of missing or incorrect items, addition of various kinds of weights (used for estimation) to the records, insertion of recodes (including diagnostic recodes), and various sorts and merges. At the end of run 30 for the fourth quarter, the quarterly tapes are combined and processed further to produce the final tapes for internal and public use.

One of the steps in weekly run 4 is to identify and reject certain cured chronic conditions. A chronic condition is labeled as a reject if it meets *all* of the following requirements:

- Onset more than 3 months prior to interview.
- Reported as cured.
- Lasted for less than 3 months.
- Not identified as the primary or secondary cause of any type of limited activity.
- Not associated with any type of restricted activity in the last 2 weeks.
- The person did not see or talk about the condition to a doctor in the past year.
- The condition did not cause any bed days in the past 12 months.
- The condition was not reported by the respondent as present during the past 12 months.

These records do not require correction.

Quarterly runs 11–13 are concerned primarily with the condition records, that is, the records established for each of

the conditions reported for each person. In quarterly run 11, multiple conditions for specified three-digit ICD codes and code groups are rejected and acute or chronic codes that are inconsistent with diagnostic codes are corrected. In quarterly run 12, diagnostic codes are checked for validity and conformity to applicable age and sex limitations. In addition, diagnostic recodes are assigned.

Quarterly run 13 consists of a series of edits of condition records. Acute conditions not involving doctor visits or restricted activities in the past 2 weeks are deleted. Chronic conditions derived from checklist 5, for which the time reference was "ever," are screened and deleted if they have *all* of the following attributes:

- Onset was more than 12 months ago.
- No restricted activity days in last 2 weeks.
- Not identified as a primary or secondary cause of activity limitation.
- No associated doctor visits or bed days in the last 12 months.
- Condition is reported as cured and not present in the last 12 months.

Many of the computer edits relating to chronic conditions are necessary to correct errors introduced in the manual coding or data entry operations. However, the deletion of certain chronic conditions seems to depend on responses to several items on the condition pages: current status, duration, date of onset, relation to activity limitations and associated doctor visits and disability days. All of these items require significant recall or judgment tasks. Chronic conditions often manifest themselves gradually: The first symptoms may be barely noticeable. Yet the counting rules for conditions that were first noticed within the past year are different from the counting rules for conditions first noticed over 1 day more than a year ago. Likewise, the difference between 3 months and 3 months plus 1 day is critical. These cutoffs make unreasonable demands on the ability of most people to recall exactly when such events occurred. The questions that must be asked to apply these counting rules may also require difficult judgments by respondents. In answer to one question, the respondent must decide whether he or she still has the condition in question. Those who answer no must make a judgment as to whether the condition is completely cured or just under control.

Historical changes in survey objectives and procedures

There have been many minor changes and some major changes in the NHIS objectives and procedures related to chronic conditions. A full accounting of these changes is beyond the scope of this review; however, a brief account of the more significant changes in the questionnaire will be given here. (For a more detailed account of these changes, showing relevant parts of the questionnaire, see NCHS Series 1, No. 11.¹¹)

Figure 2 shows the dates and nature of changes since the NHIS began in July 1957. The changes are primarily of two kinds: (1) The change from the condition approach to the person approach, which was made in January 1969 following an 18-month experimental comparison of the two approaches, and

<i>Time or period</i>	<i>Questionnaire features</i>
July 1957	Survey started, using condition approach. ¹ A checklist of 26 chronic conditions and 9 impairments was used.
July 1957–June 1967	Minor changes in approach. Toward end of period, checklist was revised to include a total of 51 chronic conditions and impairments.
July 1967–December 1968	Condition and person approaches ¹ each used for one-half of sample. Collection of data on chronic conditions limited to 1 body system—digestive—using 31-item checklist.
January 1969–December 1974	Person approach ¹ used, with collection of prevalence data limited each year to specified groups of conditions. 1969—bones, joints, muscles, skin 1970—respiratory 1971—impairments 1972—cardiovascular 1973—nervous, glandular, genitourinary 1974—no chronic condition list
January 1975–December 1981	More than 100 chronic conditions of major interest were divided into 6 separate lists based on major body systems. Only 1 condition list was asked in each household.
January 1982–present	Use of the 6 separate conditions lists each year has continued. However, there have been several changes in (1) the interviewer instructions for using the condition lists, (2) the items and instructions for completing the condition pages, and (3) the questions on limitation of activity, days of disability, and physician visits that lead to reporting of some chronic conditions.

¹See text for explanation of condition and person approaches.

Figure 2. Major changes in the collection of data on chronic conditions in the National Health Interview Survey, by time period

(2) changes in the specific content of the condition checklists and the nature of their use.

The condition approach, which was used for the first 10 years of NHIS, provided for the reporting of all kinds of conditions through a short series of direct questions to elicit reporting of illnesses and injuries, followed by a checklist. For the person approach, which is the one now used, the direct questions on illnesses and injuries are replaced by probe questions on health-related actions, such as restricting activities and seeking medical care. Information on conditions responsible for these actions is sought whenever there is a positive response to a probe question. Actually, neither of the approaches used before or after the 18-month experimental comparison was (and is) a pure condition or person approach; however, in general terms, they can best be defined as:

- *Condition approach:* A series of direct probes on illnesses and injuries, followed by a checklist.
- *Person approach:* A series of indirect probes leading to reports of illnesses and injuries, followed by a checklist.

There have been several changes in the content of the condition checklists and the procedures for using them.

In 1966, the checklist was expanded from 35 to 51 chronic conditions and impairments. This was done in response to methodological studies conducted after the start of the survey that suggested that chronic conditions were underreported. At the same time, the checklist conditions were grouped by three different time references—now, last 12 months, and ever—however, only the first two of these had been used previously.

During the 18-month experimental comparison of the condition and person approaches (July 1967–December 1968), the checklist used for the person approach contained 31 specific conditions associated with a single body system—the digestive system. The comparison showed that chronic digestive conditions that were included on the person approach checklist, but not on the condition approach checklist, were reported considerably more often in the person approach half of the sample.

This fact led to the general conclusion that conditions specifically mentioned on a checklist were likely to be more fully reported than those accessible only through direct or indirect illness and injury probes. To avoid the negative consequences that might result from using a long checklist, NCHS decided to use a more detailed checklist, but to collect information each year only on a subset of all chronic conditions related to a particular body system. The person approach was deemed more compatible with this partial checklist coverage in terms of meeting other survey requirements, so it was introduced at the same time in January 1969.

From 1967 through 1973, NHIS went through a complete cycle of covering chronic conditions in each of the six subsets for a year (digestive conditions were covered for half of the sample during the 18-month experimental period). No chronic condition checklist was included in the 1974 survey. It was then decided to cover all six sets of checklist conditions every year by dividing the sample of households into six subsamples and asking about only one of the six sets of conditions in each subsample. This procedure is still being followed.

The 1982 revision of the NHIS core questionnaire did not include any major changes in the approach to collection of information on chronic conditions. An experimental comparison of alternate questionnaires prior to the revision suggested that the changes introduced in 1982 would not affect reporting of chronic conditions in any substantial way. NCHS plans to include a full description of the changes and an analysis of their effects in its Series 10 publication on current estimates from the NHIS for 1982.

An analysis of changes in other aspects of NHIS, including processing procedures, would not be pertinent to the objectives of this review. However, one change adopted in 1983 will be mentioned in order to make it clear that questionnaire changes are not the only ones that may affect survey results for chronic conditions.

Earlier in this section, a condition record edit in weekly run 4 that rejects certain chronic conditions reported as cured

and meeting several other tests implying lack of current or recent impact was described. A review of the weekly rejects from this edit suggested that some of the rejections were not appropriate. Additional tests relating to presence of the condition, bed days, and doctor visits in the last 12 months were recommended.

These new criteria, which will reduce the number of rejects, were introduced into the edit in 1983. The change in the edit procedure has affected the way in which the responses for the specific questionnaire items involved are used to determine which conditions should be included in the estimates.

The quality of chronic conditions data—definition and measurement methods

The term “quality” is given a restricted meaning in this discussion of the quality of the NHIS data of chronic conditions. Only nonsampling error is considered, not coverage error, that is, failure to include certain members of the target population in the frame or failure to obtain interviews, for whatever reason, for sample households or persons.

Interest centers on two factors: (1) What chronic conditions *should have been reported* for each person in the NHIS interviewed households; and (2) what chronic conditions *were reported* for each person. In symbolic terms, suppose the answers to both questions for the i^{th} sample person are known. The conditions that should have been reported may be denoted by:

$$C_{i1}, C_{i2}, \dots, C_{ir_i}$$

and those that were reported by:

$$C'_{i1}, C'_{i2}, \dots, C'_{is_i}$$

where r_i chronic conditions should have been reported and s_i chronic conditions were, in fact, reported, for the i^{th} person. Either r_i or s_i , or both, can be zero.

Errors occur whenever the C_{ij} and C'_{ij} , each one of which has a diagnostic code, do not match exactly. The highest level of error occurs if the match is based on the full four-digit ICD-NHIS code. Errors generally are fewer if recode C or some other grouping of four-digit codes is used. Note that underreporting of chronic conditions can occur because a condition is not mentioned at all in the interview or because it is reported but is incorrectly counted as an acute condition.

The next section addresses the question of what chronic conditions should be reported in NHIS. The following section enumerates the different kinds of methodological and evaluation

studies used to estimate levels of error in reporting chronic conditions.

What chronic conditions should be reported?

This difficult question is one to which the designers of NHIS and others have given considerable attention, especially in the survey's early stages (see, for example, Woolsey and Nisselson;¹⁵ Krueger;¹⁶ Woolsey;¹⁷ Nisselson and Woolsey;¹⁸ Feldman;¹⁹ and Kalton.²⁰ To see why the question is difficult, let us first consider a broad definition of chronic diseases (from the Commission on Chronic Illness).²¹

Chronic diseases consist of impairments or deviations from normal that have one or more of the following characteristics:

- Are permanent.
- Leave residual disability.
- Are caused by nonreversible pathological alteration.
- Require special training of the patient for rehabilitation.
- May be expected to require a long period of supervision, observation, or care.

Chronic diseases thus defined can be identified through autopsies, laboratory tests, clinical examinations, interviews by medically trained personnel, and survey interviews by lay interviewers. None of these methods is free from error, but the methods used by the medical profession produce more complete and accurate data than survey interviews. Chronic conditions that are asymptomatic, especially in their early stages, are almost certainly not reported in survey interviews. On the other hand, even the most objective procedures are subject to various kinds of measurement error.

Figure 3 illustrates the progressive effects of chronic conditions in several dimensions. A condition involving only minor

<i>Pathological changes</i> (1)	<i>Feeling of well-being</i> (2)	<i>Treatment of condition</i> (3)	<i>Activity restriction and limitations</i> (4)
Minor pathological changes	No effects noticed	None	None
Subjective and objective symptoms appear	Moderate effects noticed	Self-treatment	Temporary cutback in secondary activities
Loss of selected functions	Severe effects noticed	Seek medical care	Temporary cutback of major activities: Work, school, and so forth
Disability	...	Hospitalization or other institutional care	Permanent cutback of secondary activities; permanent cutback of major activities; or help needed for routine personal care
Death

Figure 3. The progressive effects of chronic conditions

pathological changes “. . . may not have any detectable manifestations, or it may be manifest only in terms of laboratory evidence of clinical signs,”¹⁵ that is, it would not be manifested in the dimensions shown in columns (2), (3), and (4) of figure 3. One could not reasonably expect to detect conditions of this kind in a health interview survey.

At the other end of the scale, death removes the individual from the target population, as does institutionalization, for example, transfer to a long-term nursing home.

Between these extremes, the likelihood that a chronic condition will be reported increases as its effects approach the lower end of any of the four scales shown in figure 3. The treatment of condition column (3) determines whether diagnostic information obtained in an interview permits assignment of the correct diagnostic code. As soon as medical care is sought, the probability that the respondent will be able to give an accurate description of the condition increases markedly.

What should be the standards by which the quality of NHIS chronic conditions data are evaluated? The definition of a condition appearing in an NHIS publication begs the issue. This definition, which was cited in part in “Current Survey Objectives,” begins: “A morbidity condition, or simply a condition, is any entry on the questionnaire that describes a departure from a state of physical or mental well-being.”⁵ Along the same lines, Kalton²⁰ says: “When information is collected in a general morbidity survey solely by interview, the definition of illness must be framed in terms of what the respondent reports . . .”

Nevertheless, Kalton and the NCHS staff responsible for NHIS are very much aware that changes in survey design and in the instruments and procedures used in health interview surveys can affect the completeness and accuracy with which chronic conditions are reported. As will be seen in the next section, there is a large body of convincing evidence that this is so. The historical changes in NHIS, which were described in an earlier section of this report, demonstrate the desire of NCHS over the years to improve the quality of reporting on chronic conditions.

In summary, no clear answer can be given to the question: “What chronic conditions should be reported in NHIS?” The strategy adopted has been to evaluate the quality of reporting periodically by several different methods. Each evaluation method has its own standard of quality, some more demanding than others. Efforts to improve the quality of reporting of chronic conditions will undoubtedly continue as long as evaluation studies and methodological experiments suggest that significant improvements are possible.

Methods of evaluation

Various methods—formal and informal, quantitative and qualitative—can be used to assess the quality of household survey data. As background for the next section of this report, in which results of relevant evaluation studies and experiments are presented, this section provides a scheme for classifying the different assessment methods available. The scheme follows closely one that was used by the United Nations²² in a technical study on nonsampling errors. Most of these assessment techniques have been used on one or more occasions to study errors

in reporting chronic conditions; several studies have combined results obtained by using more than one technique.

The analysis of response errors has been facilitated by the development of error models that partition total survey error into several components: sampling variance, simple response variance, correlated response variance (primarily interviewer variance), response bias, and joint effects of some of these components of error. As will be indicated later, some methods of assessment provide information on specific components of response error. It will be assumed that readers are familiar with the definitions of these components of error. A discussion in nonmathematical terms of the relevant error model may be found in the nonsampling error study²² referred to. For a description of the mathematical structure of the model, see NCHS Series 2, No. 54.¹²

Formal techniques

Formal techniques for measuring response error are quantitative and generally provide direct estimates of one or more components of response error. The four principal techniques are: interpenetrating samples, reinterviews, record checks, and analytical methods.

There are two main uses of *interpenetrating samples* in the assessment of survey errors. In *interviewer variance studies*, randomization of interviewer assignments within small groups of interviewers provides a basis for estimating the contribution of interviewers to nonsampling variance. The same techniques can be used to estimate the contributions to nonsampling variance of other survey personnel, such as supervisors or coders, but no such studies relating specifically to chronic conditions have been located.

In *split-panel experiments*, or tests, two or more fully interpenetrating samples are used in an experimental design context to compare the results of different survey instruments or interviewing procedures. Comparing the results for different samples does not, in itself, provide any information about the level of response error associated with any of the treatments tested. Some type of validation information—for example, from reinterviews or record checks—is needed.

In survey *reinterview* studies or programs, a subset of the sample households or persons are interviewed for a second time by a different interviewer shortly after their initial interviews. Some or all of the topics covered in the initial interviews are included in the reinterviews. Depending on the precise techniques used, reinterviews may be used to estimate simple response variance or response bias, or both.

In *record checks*, record-keeping systems external to a survey often contain information that is the same as or similar to that collected in the survey. If the record data are believed to be sufficiently complete and accurate, they may be compared, at the individual level, with survey data to provide estimates of response bias. In *direct* record checks, records for sample persons are located in the external record sources after the interviews have been completed. In *reverse* record checks, a sample of persons (or other units) is selected from the record system and these persons are interviewed, using the standard survey procedures. There are a number of subtleties involved in the design of record checks and the interpretation of their findings.

For a useful discussion with illustrations from health interview surveys, see Marquis.²³

In *analytical methods*, the findings from analytical studies usually provide somewhat less direct evidence about response error than do the other formal techniques. Analytical methods are used for *internal* or *external* studies, depending on the sources of the data used. One example of an internal analysis for the NHIS would be a review of the extent to which chronic conditions are coded to the ICD-NHIS "catch-all" categories for the population and for subgroups defined by demographic and social characteristics. Another internal analysis, considering the supplemental questionnaires to be internal to the survey, would be to study the extent to which chronic conditions not reported in the core questionnaires are picked up on the condition checklists and other inquiries included in supplements. A third possibility would be to analyze the effectiveness of indirect probes for conditions by using the condition source information recorded on the questionnaire by the interviewers.

External analyses (as opposed to record checks) compare survey estimates with more or less comparable aggregate data from other sources. For example, condition prevalence estimates from NHIS could be compared with estimates based on the NCHS National Health Examination and Nutrition Survey, in which data are collected by direct physical examination, tests, and measurements of the sample population studied. Comparisons of this kind normally require a number of adjustments to allow for differences in the target population and in the concepts and definitions used.

Informal techniques

Informal evaluation techniques may be either quantitative or qualitative. Usually they do not provide direct estimates of different components of response error. However, they can provide useful indications about features of the survey or other factors that may be associated with response error.

The quantitative informal evaluation techniques mentioned in the United Nations study²² on nonsampling errors include analyses of the following kinds of survey operating records: completion rates, item nonresponse, manual edit reports, quality control records from coding and data entry operations, and computer edit and consistency check results. Completion rates have been excluded from consideration in this review, but the other areas are all relevant. Analyses of this kind may serve to identify problems relating to particular conditions or questionnaire items. To give a hypothetical example, if the quality control records for diagnostic coding showed that frequent disagreements between coders and verifiers were associated with a particular group of conditions, consideration might be given to such measures as changing the relevant diagnostic categories on the checklist, adding a special item on the condition pages, or giving interviewers some additional instructions about this group of conditions.

Qualitative evaluation techniques suggested in the United Nations study relate to the interviewing stage of the survey. Techniques suggested include:²²

- (i) Field observation and reports by members of the survey professional staff.
- (ii) Inclusion of one or two items at the end of the questionnaire for interviewers to note particular problems that occurred in the interview.
- (iii) Debriefing sessions for interviewers and field supervisors.
- (iv) Tape recording of a small number of interviews.
- (v) Final reports by interviewers and field supervisors, with special emphasis on identifying questionnaire items that had frequent problems and describing those problems.

For recording interviews, if the objective is to study the cognitive processes that occur during interviews, use of videotapes rather than audiotapes may enhance the usefulness of the recordings.

Study findings

Few topics investigated in household surveys have been the subject of as much methodological research as morbidity. Perhaps only labor force activity and crime victimization belong in the same league. All three topics present complex conceptual problems and impose difficult cognitive tasks on survey respondents.

This section reviews findings from methodological research on health interview surveys, insofar as it has related to reporting of chronic conditions. The first subsection describes the main sources of information used. The second subsection presents information on the size of various components of nonsampling error, as estimated by several of the methods described in an earlier section. The final subsection examines relationships of these errors, or response effects, to data requirements, characteristics of respondents and interviewers, and survey design features.

Sources of information

The National Health Interview Survey (NHIS) was not the first major health interview survey in the United States. In the early 1920's, a series of local health surveys was initiated in Hagerstown, Maryland. A major national survey, the National Health Survey, was conducted in 1935–36. Supplements to the *Current Population Survey* in February 1949 and September 1950 were used to collect data on the prevalence of disabling illness (Woolsey²⁴). During the early 1950's, several major regional and local health interview surveys were conducted in, for example, Baltimore; Pittsburgh; Hunterdon County, New Jersey; Kansas City, Missouri; New York City; and the State of California.¹¹ Several of these surveys incorporated fairly sophisticated methodological and evaluation studies or pretests that provided evidence on problems in reporting chronic conditions in health interviews and on the relative efficiency of alternative design features. The experience in this series of surveys had considerable influence on the design of NHIS.

An excellent review of the findings from these regional and local surveys that are relevant to morbidity reporting is available in Feldman.¹⁹ Several articles based on results of individual surveys appeared in the *American Journal of Public Health* during the 1950's and early 1960's. Findings from the Baltimore survey are discussed by Krueger,¹⁶ from the Pittsburgh survey, by Thompson and Tauber,²⁵ from the Hunterdon County survey, by Trussell, Elinson, and Levin,²⁶ and by Elinson and Trussell,²⁷ from the San Jose pretest for the California sur-

vey by Allen, Breslow, and Weissman;²⁸ and from a 1956 survey in six North Dakota counties by Enterline and Capt.²⁹ Sanders³⁰ compares early results from NHIS with prevalence rates based on clinical evaluations in the Baltimore survey. In other journals, Horvitz³¹ reports additional findings from the Pittsburgh morbidity survey; Rubin, Rosenbaum, and Cobb³² discuss results of a Pittsburgh Arthritis Study; and Belloc³³ reports on validation of reports of hospitalization in a San Jose, California, health survey.

With minor exceptions, these reports on the health surveys of the 1950's do not provide copies of the questionnaires and other forms used, and there is limited discussion of precise definitions and procedures used to count conditions and to assign diagnostic codes to them. As a result, it is rather difficult to determine to what extent findings might be applicable to the current NHIS, whose content and procedures are unusually well documented. Possibly, the detailed reports of the Commission on Chronic Illness (sponsor of the Baltimore and Hunterdon County surveys), which have not been examined in the course of this review, would contain more detailed documentation. (Reports of the Commission with the general title *Chronic Illness in the United States* were issued in several volumes by the Harvard University Press in the late 1950's.)

The designers of NHIS gave much serious thought to the concept of morbidity in general and to the specific definitions that would be most appropriate for use in the NHIS, from the users' and respondents' points of view. Useful discussions appear in Woolsey and Nisselson;¹⁵ Woolsey;¹⁷ Nisselson and Woolsey;¹⁸ Feldman;¹⁹ and Woolsey, Lawrence, and Balamuth.³⁴ Nisselson and Woolsey¹⁸ describe the Charlotte pretest for NHIS conducted early in 1957. The results of this pretest had a direct influence on the initial design of the NHIS questionnaire and the associated interviewing procedures.

Once NHIS was underway, NCHS undertook a variety of methodological and evaluation studies. Some of these studies were incorporated in the survey itself; others were carried out separately via contracts with research organizations. Two separate record check studies were carried out during the early stages of the survey. The Survey Research Center, University of Michigan, during the life of the survey, has undertaken a series of experimental studies on questionnaire design and interviewing procedures, focusing on health survey applications. All of these studies are well documented. The primary sources of information are NCHS Series 1 and 2 publications (see the list of references following the text). A recent summary of findings from the Michigan studies is given by Cannell, Thornberry,

and Fuchsberg.³⁵ To facilitate review of the design and results of these studies (insofar as they are relevant to reporting of chronic conditions), each of 11 major studies is summarized in appendix I, using a standard format. For each study, the summary describes: the type of study; the study population; the sample design; the sample size; the data collection method(s); the questionnaire(s) and interviewing procedures; the validation procedures (if any); and the principal findings relevant to chronic conditions. For record check studies, the record sources and matching procedures are described. References to more detailed reports are given. In most cases, detailed accounts of the study design and procedures and copies of the questionnaires are available in these reports.

Other NCHS publications that provide useful background are included in the list of references. Especially worth reviewing are the selected Series 10 publications that present NHIS data on chronic conditions; information on concepts, definitions, and survey design; and the latest available *Public Use Data Tape Documentation*, which contains detailed information on processing procedures, including diagnostic coding and computer edits.

During the 1970's and 1980's, relevant articles and reports have appeared in various journals, proceedings, and other publications. A 1972 article by Kalton gives a broad review of the advantages and disadvantages of household surveys as a source of morbidity and other health data. Articles by NCHS staff and outside researchers appear frequently in the annual proceedings of the Social Statistics Section and, since 1978, the Section on Survey Research Methods of the American Statistical Association. A report of recent work at the Michigan Survey Research Center (Cannell, Miller, and Oksenberg³⁶) appeared in the 1981 volume of *Sociological Methodology*. Finally, of particular interest to cognitive researchers will be the report of the Committee on National Statistics (1984) project on cognitive aspects of survey methodology (CASM), published in December 1984.¹ The goal of the CASM project was to persuade cognitive scientists and survey researchers to explore together the possibilities for cross-disciplinary research. Members of both disciplines met for a week in June 1983 for extended discussions, using NHIS as a vehicle to focus their ideas. The CASM report includes numerous suggestions for research on the data collection procedures used in NHIS.

To supplement the contents of the CASM report, the following articles and reports are recommended:

1. Woolsey and Nisselson, 1956.¹⁵
2. Nisselson and Woolsey, 1959.¹⁸
3. Feldman, 1960.¹⁹
4. Wilson and Drury, 1984.³⁷
5. NCHS Series 1, No. 11, 1975.¹¹
6. NCHS Series 2, No. 69, 1977³⁸ (a convenient summary of findings from relevant studies reported on earlier in the NCHS Series 2 publications).
7. NCHS Series 10. One or more of the recent numbers containing data on chronic conditions.³⁹⁻⁴⁵

Levels of response error

This section summarizes information on the levels of response error in reporting chronic conditions. The main com-

ponents of response error for which estimates are presented are interviewer variance, response variance, and response bias. The major sources of these estimates are interviewer variance studies, reinterviews, record checks, and analytical studies. The following section discusses how these kinds of errors are affected by data requirements, design features, and respondent and interviewer characteristics.

Anyone who tries to synthesize the results of a large series of methodological studies must confront the fact that different studies seldom, if ever, measure exactly the same thing. Study objectives, designs, instruments, and operating procedures vary widely. Results of different studies are sometimes reasonably consistent, but sometimes they appear to contradict each other. This review tries to identify results that seem to be robust. However, the reader is urged to adopt a cautious frame of mind with respect to possible applications of the findings presented here, in NHIS or other health interview surveys, and to seek out more detailed information about the relevant studies.

Interviewer variance studies

Early data on interviewer variance come from the Pittsburgh Arsenal Health District Survey (Horvitz³¹) and the Charlotte pretest (study No. 1). (Study summaries, which include references to published articles and reports, appear in appendix I.) Horvitz estimated the interviewer variance for a single item—persons ill per 1,000. He found it to be different from zero at the 0.01 level of significance and estimated that it accounted for 72 percent of the total variance, including sampling variance. In the Charlotte pretest (study No. 1), the results were not as conclusive. For households where self-response was used, the interviewer variance for the variable chronic conditions per person was significant at the 0.05 level and was estimated to account for about one-half the total variance. However, for households where proxy response was permitted (the present NHIS procedure), the interviewer variance for this item was not significantly different from zero.

The most definitive estimates of interviewer variance come from the study built into NHIS during 1960-63 (study No. 2). Interviewer variances were estimated for six variables related to chronic conditions, separately for 1960-61 and 1962-63. The estimated ratio of interviewer variance to total variance for these 12 variables ranged from 0.31 to 0.91, with a median value of 0.71. It was concluded that "... the reporting of chronic conditions and activity restrictions associated with such conditions have the highest ratios of between-interviewer variance to total variance" (NCHS Series 2, No. 54¹²).

Clearly, interviewer variance made an important contribution to total variance of chronic condition variables during the early period of NHIS. No data are available to determine whether the subsequent questionnaire revisions or changes in interviewer selection, training, and supervision have had any impact on the levels of interviewer variance.

Reinterviews

Although supervisory reinterviews are still part of the NHIS quality control program, the only published data on their results are those appearing in NCHS Series 2, No. 54,¹² covering the early years of NHIS. The main findings are shown in the sum-

mary for study No. 9, appendix I. Estimates of response bias and response variance can be derived from reinterviews. The estimated relative net bias for the proportion of persons with one or more chronic conditions was -14 percent (the negative sign indicating that the reinterview proportion was higher than that obtained in the initial interview), considerably higher than that for estimated proportions related to hospitalization and restricted activity measures. The relative net bias of -24 percent for chronic conditions per 100 persons was higher than for all other rates for which bias estimates were obtained. About three-fifths of this bias resulted from additional chronic conditions reported for persons for whom one or more conditions were already reported in the initial interview.

The measure of simple response variance estimated from reinterviews is the index of inconsistency. This index takes on values from 0 to 100, with higher values indicating greater response variability. Further details on the calculation and interpretation of this index are given in appendix III of the NCHS Series 2, No. 54.¹² The average value of the index of inconsistency for the proportion of persons with one or more chronic conditions, over a 7½-year period, was 17.2 percent (based on reconciled reinterviews). Similar or moderately higher values were obtained for restricted activity items, but the estimated index for persons with one or more hospitalizations in the last 12 months was much lower, 5.5 percent.

In summary, reinterviews have shown rather substantial net underreporting of chronic conditions and levels of response variance similar to those observed in other surveys for variables such as migration and unemployment. It should be possible to analyze reinterview data for more recent periods of the survey to determine whether there are any observable trends in estimates of bias and response variance for chronic condition variables.

Record checks

Record checks provide evidence of underreporting and overreporting of chronic conditions in surveys. The term "record" is used here to refer to information on morbidity obtained from a source other than a survey interview and is believed, in some sense, to be more accurate than information reported in the interviews. The differences observed between survey reports and record data, which are interpreted as measures of survey underreporting and overreporting, depend to a considerable degree on the kinds of records used in a given study. Two pos-

sible sources of records must be considered: First, the records of physicians who have treated the persons surveyed in the normal course of events; second, records of thorough clinical examinations of the persons surveyed, conducted specifically for the purposes of a record check study. The second type of record should cover existing conditions more completely and, therefore, should indicate a higher level of underreporting (and possibly a lower level of overreporting) when compared with the survey reports.

The levels of underreporting and overreporting estimated from a record check are also affected by the matching rules used. Is the condition reported in the survey the same one that appears on the record? If precise agreement, say at the four-digit ICD level, is required for a match, the estimates of underreporting and overreporting will be much higher than if agreement within broader conditions groupings is considered to constitute a match.

The natures of record sources and of matching rules vary widely between studies, as do numerous other features of the study designs, such as target populations. Nevertheless, it may be possible to reach some broad, if tentative, conclusions.

In the Baltimore and Hunterdon County studies conducted by the Commission on Chronic Illness, thorough clinical examinations were conducted for a subsample of the persons included in the interview surveys. Table B shows results, for all conditions combined, of the interview-examination comparisons.

The Baltimore and Hunterdon County interview surveys covered all conditions and did not require self-response for all adults in the sample households—proxy responses were permitted for those not present at the time of the interview. Thompson and Tauber²⁵ reported on a study in which self-responses to interview questions limited to diseases of the cardiovascular-renal system were compared with diagnoses based on clinical examinations. Table C shows the results of this comparison.

Thus 66 percent of the survey-reported health conditions were confirmed by clinical examination and 65 percent of the clinically identified conditions were reported in the survey.

Three record checks covering chronic conditions have been carried out since the start of NHIS: The Health Insurance Plan of Greater New York (HIP) study, the Kaiser-Permanente Health Plan (KP) study, and the Michigan Survey Research Center study of reinforcement and question length. The last two also incorporated split-panel tests of alternative questionnaires. The three study designs and results of these studies are

Table B. Estimates of underreporting and overreporting from Commission on Chronic Illness studies, by study location: 1952-55

Study location	Survey overreporting, percent of conditions from survey found in clinical examination			Survey underreporting, percent of conditions from clinical examination reported in survey		
	Close match	Approximate match	No match	Close match	Approximate match	No match
	Percent					
Baltimore (<i>n</i> = 809)	54.4	15.9	29.7	17.2	5.0	77.8
Hunterdon County (<i>n</i> = 846)		¹ 47	53		¹ 22	78

¹The Hunterdon County data did not distinguish the degrees of matching.

SOURCES: Baltimore, Krueger,¹⁶ Sanders;³⁰ Hunterdon County, Trussell, Elinson, and Levin.²⁶

Table C. Underreporting and overreporting in Pittsburgh Heart Study, by interview response: 1952-54

Interview response	Clinical diagnosis	
	Heart disease	No heart disease
Have you ever had heart trouble?		
Yes.....	85	44
No.....	45	209

SOURCE: Thompson and Tauber (table 1).²⁵

summarized in appendix I (study Nos. 7, 10, and 11, respectively). They all differed from the Baltimore and Hunterdon County studies in one especially significant way—the record data for these three studies were developed primarily from records kept by physicians in the course of regular treatment of the persons included in the sample, but in the two earlier studies all sample persons were given a comprehensive clinical examination specifically for the purpose of the study.

Table D presents estimates of underreporting and overreporting from the HIP, KP, and Michigan record check studies. As might be expected, given the record sources, the estimates of underreporting for these three studies, although still high, are below those calculated from the Baltimore and Hunterdon County studies. The HIP survey questionnaire was similar to that used in NHIS at the time, although experimental questionnaires designed to improve reporting were used for parts of the samples in the KP and Michigan studies; this may explain their better results.

The low estimates of overreporting from the Michigan study are harder to explain. However, they may result from the fact

Table D. Estimates of underreporting and overreporting from the Health Insurance Plan of Greater New York (HIP), the Kaiser-Permanente Foundation Health Plan (KP), and the Michigan Survey Research Center studies

Study and year	Survey underreporting: Percent of physician-identified conditions reported in survey		Survey overreporting: Percent of survey-reported conditions confirmed by physician records or reports	
	Match	No match	Match	No match
	Percent			
HIP—1958.....	31.9	68.1	39.6	60.4
KP—1962-63.....	153.3	46.7	59.6	40.4
MICHIGAN—1968				
Number of school years completed				
0-11 years.....	64.9	35.1	92.1	7.9
12 years or more.....	55.3	44.7	87.6	12.4

¹Consisting of 36.6 percent close matches and 16.7 percent approximate matches.

SOURCES: See summaries for studies Nos. 7, 10, and 11 in appendix I.

that the findings were based on 13 selected chronic conditions. Each of these conditions was included on a checklist in the survey questionnaire and each was also included on a form completed by physicians to indicate which of these conditions they considered to be “definitely or probably present” for each sample person among their patients.

Sirken, Roysten, and Bercini⁴⁶ reported on a study that provided estimates of survey underreporting of cancer. The records in this study came from a cancer registry. Interviews were conducted at the residence addresses of the persons selected from the registry, interspersed with a control sample of other addresses. Overall, 89 percent of the cancer cases from the registry were reported in the household survey interviews.

Keeping in mind the caveats given earlier in this section, the above record checks would seem to justify the following broad conclusions:

1. Chronic conditions identified from physician records and clinical examinations are substantially underreported in survey interviews.
2. Some conditions reported in surveys are not confirmed by physician records or clinical examinations.
3. Taking the physician and examination records as the standard or validation criterion, the net result of underreporting and overreporting in surveys is a significant underestimate of the prevalence of chronic conditions.
4. There are indications that somewhat better results can be achieved in surveys where coverage is restricted to specific condition groups or body systems.²⁰

There is also some evidence (see study Nos. 7 and 11) that underreporting can be reduced by improvements in questionnaire design and interviewing techniques. However, measures taken to reduce underreporting (as measured in record checks) may also lead to reporting of more conditions that cannot be confirmed by clinical examination. Survey designers need to consider whether such a result would be consistent with their data objectives and, if not, how to avoid it.

Analytical studies

A search of the literature did not provide much evidence from analytical studies about the overall levels of response error or its components.

Nisselson and Woolsey¹⁸ analyzed the extent to which information obtained in the Charlotte pretest on the nature of diseases, injuries, and impairments was sufficiently detailed for assignment of ISC diagnostic codes. They found that:

In roughly 60 percent of the cases all of the information needed for coding was obtained. In about 15 percent the interviewer asked the right questions but the respondent did not know the answers or gave irrelevant or highly unlikely responses. In the remaining 25 percent one or more needed items were not sought by the interviewer.

These findings led to some changes prior to the start of the national survey, but the authors said that “. . . the problem of the adequacy of diagnostic entries continues to be a troublesome one.”

A comparison of estimates of the prevalence of heart disease from the NHIS and NCHS National Health Examination

Survey (NHES) is described in NCHS Series 10, No. 94.⁴⁷ Prevalence rates for heart disease and hypertensive conditions reported in the 1972 NHIS were compared with rates based on conditions classified as *definite* heart disease or hypertension in the 1960–62 NHES. The results are shown in table E. Undoubtedly some of the heart conditions classified as definite in the NHES had not been diagnosed previously and would have had a very low probability of being reported in a survey interview.

Correlates of response error

In the previous section, estimates of the levels of response error and its components were presented. These estimates of response error pertain to data on chronic conditions collected in surveys that varied widely in content and design. This section will examine the available study findings to determine how levels of response error for chronic conditions data are affected by variations in content; characteristics of sample persons; interviewer characteristics and performance; and design features such as questionnaire design, interview mode, and respondent rules.

Content

General versus specific—Kalton²⁰ points out that for surveys concerned with only one or a few illnesses, it is possible “. . . to take each illness in turn and collect all of the information needed to determine whether or not a person is suffering from it.” In this manner, he argues, “more accurate diagnoses can be obtained.” Starting in 1969, NCHS moved part way in this direction by limiting collection of prevalence data in each year’s survey to chronic conditions associated with one of six body systems (see figure 2). Starting in 1975, the same approach was continued in a different design format—each annual sample is divided into six subsamples and chronic conditions prevalence data are collected for a different body system in each subsample.

The results of the split-panel comparison of the person and condition approaches built into NHIS in 1967–68 (study No. 3) provided the rationale for this shift. The checklist, which was restricted to chronic conditions involving the digestive system, included many more such conditions (31) than the general checklist used with the other half of the sample (out of 40 checklist items for all body systems, 5 related specifically to

the digestive system, and 2 others—“tumor, cyst, or growth” and “cancer”—could lead to reports of conditions related to the digestive system). Questionnaires with the more detailed checklist for chronic conditions of the digestive system produced prevalence estimates nearly twice as great as the less detailed list (115.7 versus 65.6 conditions per 1,000 persons, respectively). However, for chronic conditions of the digestive system causing activity limitations, the prevalence estimates for the two approaches were similar (8.3 versus 8.5 per 1,000 persons, respectively).

Diagnostic detail—When diagnostic categories like those used in the ICD-NHIS system are grouped hierarchically, errors in classification of a condition to the most detailed categories may or may not affect its classification to grouped diagnostic categories. Thus, when assigning reported conditions into groups, classification error rates will always be smaller than or at worst equal to error rates for classification to diagnostic categories within these groups. An illustration of this effect is provided by the results of matching physician- and interview-reported conditions in the HIP study (study No. 10). Of the total conditions that matched in any sense, 51.5 percent matched on the basis of a diagnostic classification system consisting of 278 categories. An additional 11.3 percent matched when the 278 categories were collapsed to form 43 groups (the remaining 37.2 percent did not agree at this level, but the interview reported a condition or symptom that could have been associated with the physician-reported condition).

A distinction must be made between the level of diagnostic detail to be shown in the survey results and the operational process for classifying chronic conditions to that level. As explained in an earlier section of this report, NCHS prepares prevalence estimates only for 134 condition groups and recommends against further breakdowns. Operationally, however, the questionnaire is designed to obtain sufficient diagnostic information to code to the 6,058 four-digit categories of the ICD-NHIS system, and conditions are coded to this level. There does not appear to be any experimental evidence about how the use of this approach affects the accuracy of classification to the condition groups for which estimates are published.

Diagnostic categories—Several of the articles and reports on record check studies provide estimates of underreporting and overreporting rates by diagnostic group. As shown in table F, rates vary widely by diagnosis.

Because methods of data collection and validation and the diagnostic groups used are not directly comparable between studies, it is not easy to single out particular conditions or groupings as being well or poorly reported in surveys. A rough classification of conditions by levels of underreporting and overreporting is shown in the summary of findings from the Kaiser-Permanente study (appendix I, study No. 11). Woolsey³⁴ made the following observation about estimates of underreporting by diagnosis from the HIP study: “It seems evident from examination of the findings that conditions which are rather specific disease entities, having identical terminology for the physician and the layman, had the best correspondence.” Included in this category were: asthma, hay fever, gallbladder conditions, chronic bronchitis, diabetes, heart conditions, and gastric ulcers, for all of which the clinically detected conditions

Table E. Prevalence estimates per 100 persons for selected chronic circulatory conditions: National Health Interview Survey (NHIS) and National Health Examination Survey (NHES)

Condition	NHIS (1972)	NHES (1960–62)
Heart disease	6.6	13.2
Rheumatic heart disease	0.5	1.1
Coronary heart disease	2.3	2.8
Congenital heart disease	0.4	0.2
Hypertensive heart disease	1.5	9.5
Hypertension with or without mention of heart disease	10.2	15.3

SOURCE: NCHS Series 10, No. 94.⁴⁷

Table F. Number of diagnostic groups for which matched rates were reported and percent not matched by diagnostic groups, by direction of match and study: Selected studies

Direction of match and study	No. of diagnostic groups for which rates were reported ¹	Percent not matched by diagnostic group	
		Range	Median
Underreporting²			
Baltimore	41	0-100	77
Hunterdon.....	20	36-99	74
HIP ³	47	24-100	70
KP ⁴	42	14-79	42
Overreporting⁵			
Hunterdon.....	21	2-87	43
HIP ³	39	30-100	63
KP ⁴	45	1-87	44

¹All groups with fewer than 10 conditions observed were deleted.
²Conditions found in clinical exam or medical records matched against survey reports.
³HIP = Health Insurance Plan of Greater New York.
⁴KP = Kaiser-Permanente Foundation Health Plan.
⁵Conditions reported in survey matched against clinical or medical records.
 SOURCES: Baltimore—Krueger,¹⁶ table 1. Hunterdon—Trussell, Elinson, and Levin,²⁶ tables 2 and 3. HIP—NCHS, Series 2, No. 7,⁴⁸ tables 18 and 23. KP—NCHS, Series 2, No. 57,⁵² tables 4 and 5.

were reported in the survey at a rate of 60 percent or better (Woolsey, Lawrence, and Balamuth³⁴).

With respect to *underreporting* of specific diagnostic groups, one might expect that *sensitivity* might be an important factor. In two surveys, respondents have been asked hypothetical questions about their perceptions of the sensitivity associated with disclosure to other persons of information about the presence of specific conditions. In the HIP survey (NCHS Series 2, No. 23⁴⁹), out of 16 conditions included in an inquiry of this type, the three conditions considered most sensitive were, in order, venereal disease, mental illness, and cancer. In connection with one of the Michigan studies, 145 psychology students were asked how they would feel about letting other people know they had certain conditions (17) and symptoms (19). The highest levels of embarrassment were reported for:

- *Conditions:* Bladder trouble; hemorrhoids; trouble with female organs; prostate trouble; tumor, cyst, or growth; and cancer.
- *Symptoms:* Coughing up blood; loose bowels; pain in female organs; pain going to the bathroom; mental illness; and venereal disease.

A review of the data on underreporting of specific medically identified conditions from the studies used to construct table G showed that nearly all of the conditions perceived as being sensitive were, in fact, underreported at rates well above the median in each study. The only clearcut exception was hemorrhoids, for which the nonmatch rate was somewhat below the median in the two-record check studies for which hemorrhoids was shown as a separate diagnostic category.

Impact of condition—Evidence from the record check studies shows a clear positive association between complete-

Table G. Percent of medically identified conditions reported in Kaiser-Permanente Foundation Health Plan study interviews, for selected impact variables

Selected impact variable	Percent
Receiving medicine or treatment	
Yes.....	67.5
No	45.4
Has pain or discomfort	
Yes.....	65.8
No	47.7
Health problems are a source of worry	
Yes.....	70.7
No	51.3
Has limitation on ability to do work or housework	
Yes.....	71.2
No	45.9
Has ever had limitation involving food or beverage	
Yes.....	61.4
No	44.2
Days since last visit to medical plan facility	
1-7 days	91.4
8-14 days.....	72.5
15-84 days.....	64.6
85-224 days.....	53.0
225-364 days.....	45.4
365 days or more.....	40.8
Visits to medical plan facility in last 12 months	
1 visit.....	44.3
2 visits.....	52.8
3 visits.....	65.3
4 or 5 visits.....	74.0
6 visits or more.....	86.0

SOURCE: NCHS Series 2, No. 23, tables 24, 26, 30, and 32-35.⁴⁹

ness of reporting of medically identified conditions and variables that measure the impact or salience of those conditions for persons who have them (or sometimes for their proxy respondents). Impact is measured in various ways: symptoms, including pain or discomfort; extent; recency and duration of related medical care and treatment; restriction of normal activities; disabling effects; and others.

In the Baltimore study, only 22 percent of all conditions identified in clinical examinations were reported in household interviews. For the subgroup of conditions classified by the examining team as "could have been reported," that is, those which had symptoms, had received medical treatment, or whose existence was clearly evident, 30 percent were reported. Surprisingly, when conditions in this subgroup were classified further as mild or moderate-to-severe, there was very little difference in completeness of reporting for the two groups (Krueger¹⁶). For the Hunterdon County study, Trussell, Elinson, and Levin²⁶ reported that the "over-all proportion of match for 'disabling' clinically evaluated conditions was not importantly higher than for 'non-disabling' clinically evaluated conditions (24 versus 18 percent, respectively)." However, this still was an increase of one-third.

More extensive data on the relationship between impact variables and underreporting are presented in the reports from HIP and Kaiser-Permanente record check studies. In the HIP study, the number of physician services received for a condition was an important factor in determining whether that condition was reported in the survey. Only 27 percent of all conditions with one related service were reported, but 57 percent of conditions with more than one service and 80 percent of conditions with 10 or more services were reported (Woolsey, Lawrence, and Balamuth³⁴). The recency of the last physician service related to the condition was also an important factor in survey reporting. Where the interval between the last service and the household interview was 2 weeks or less, 58 percent of all medically identified conditions were reported. However, for intervals of more than 2 weeks, but less than 4 months, only 36 percent were reported; for intervals of 4 months or more, only 24 percent were reported (NCHS Series 2, No. 7, table 5⁴⁸).

Table G shows the relationships between survey reporting of medically identified conditions and several impact variables in the Kaiser-Permanente record check study. The strongest factors affecting completeness of reporting appear to be the number of visits to Permanente Medical Group facilities in the 12-month study period and the recency of the last visit prior to the survey interview.

In the Kaiser-Permanente study, plan physicians were asked to report on the diagnostic terms used and the amount of emphasis placed on the diagnosis during their discussions with patients. For 72 percent of the medically identified conditions, physicians reported that in their discussions with patients they had used a specific term codable to the same diagnostic group as the final diagnosis. These conditions were reported somewhat better in the survey, but the difference from conditions that were less clearly described in physician-patient discussions was not very large (48.7 versus 43.7 percent, respectively, see NCHS Series 2, No. 23, table 20⁴⁹).

Characteristics of sample persons

The relationships between response error and characteristics of sample persons are affected by the respondent rules used in surveys. This subsection covers relationships between underreporting, as measured by record checks, and the demographic and other characteristics of sample persons *when they respond for themselves*. The effects of using different respondent rules will be discussed later in the section on design features.

Three of the four major record checks that provided estimates of undercoverage used respondent rules similar to those of NHIS, which permit proxy response for related adults not present during the interview. Only the Kaiser-Permanente study required self-response for all sample persons; therefore, the results presented in this section are taken from that source. Estimates of underreporting for various types of persons are shown in table H.

In general, demographic and socioeconomic characteristics do not seem to explain much of the variation in underreporting of medically identified conditions. Women 65 and over and members of families with low income did report conditions considerably better than average. However, the most striking association displayed in table H is that between completeness

Table H. Percent of medically identified conditions reported in Kaiser-Permanente Foundation Health Plan study interviews, for selected characteristics of sample persons

<i>Characteristic of sample persons</i>	<i>Percent</i>
Sex	
Male.....	56.2
Female.....	53.6
Male	
17-24 years.....	65.3
25-34 years.....	51.2
35-44 years.....	52.4
45-54 years.....	60.0
55-64 years.....	51.1
65-74 years.....	59.7
75-89 years.....	59.1
Female	
17-24 years.....	43.4
25-34 years.....	54.9
35-44 years.....	51.6
45-54 years.....	50.9
55-64 years.....	52.7
65-74 years.....	68.3
75-89 years.....	69.1
Amount of higher education	
No college.....	55.9
Some college.....	51.5
Race	
White.....	55.1
Black.....	49.2
Relation to head of household	
Head of household.....	53.9
Spouse.....	54.7
Child.....	57.5
Other.....	66.2
Family income	
Less than \$3,000.....	64.0
\$3,000-\$4,999.....	53.5
\$5,000-\$6,999.....	52.4
\$7,000-\$9,999.....	54.4
\$10,000 or more.....	53.3
Perception of own health	
Excellent.....	39.6
Good.....	55.1
Fair.....	67.3
Poor.....	69.6

SOURCE: NCHS Series 2, No. 23, tables 10-13, 16, and 19.⁴⁹

of response and the sample person's perception of his or her general state of health. Whether this represents cause or effect would be difficult to say without further study. The health status question appeared near the end of the survey questionnaire, so the responses to it might have been affected by the number of kinds of conditions actually reported in the interview.

Interviewer characteristics and performance

There is not much quantitative evidence available on interviewer characteristics and response errors in health interview surveys. In the Pittsburgh Morbidity Survey (Horvitz³¹), interviewer assignments were randomized at the block level. There

were 10 male interviewers, all medical students, and 8 female interviewers, only 2 of whom were medical students. An analysis of variance using the statistic persons ill per 1,000 in the month prior to the interview, by interviewer, showed that the difference in the means by sex—117.0 for male interviewers and 107.9 for females—was not significant. However, the difference in the means for medical students (124.3) and other interviewers (89.5) was significant. According to Woolsey and Nisselson,¹⁵ the interview in the Pittsburgh study was not structured. Greater standardization of the interviewer task could be expected to reduce interviewer effects.

There are indications that interviewer performance for chronic condition items is sometimes a problem. Data from the NHIS supervisory reinterview program showed that most of the interviewer assignments that were rejected based on reinterviews had problems related either to conditions or hospitalizations. During a 5-year period in the mid-1960's, 115 out of 1,554 interviewer assignments were rejected because errors exceeded tolerance levels. Of the 115 assignments rejected, 53 were rejected because of errors in the number of conditions and hospitalizations reported and 30 were rejected for errors in reporting the characteristics of conditions and hospitalizations (NCHS Series 2, No. 54¹²).

Groves, Magilavy, and Mathiowetz⁵⁰ studied interviewer effects in health surveys conducted by telephone. As part of their study, they monitored the proportion of interviews in which various questions were "read correctly," that is, without significant changes from the wording specified. The chronic conditions question was read correctly in only 67.4 percent of the interviews. This was the lowest value for the 15 questions monitored; the median was 87.8 percent. The authors suggest that the source of "error" in this case might have been the question wording rather than the interviewers.

In this same study, the investigators looked for relationships between interviewer variation and various measures of interviewer performance. They were unable to find any significant relationships.

Design features

There is abundant information, much of it from controlled experiments, on how reporting on chronic conditions is affected by variations in survey design features, such as, data collection mode, respondent rules and, especially, different aspects of the survey questionnaire and associated interviewing procedures. Eight of the 11 studies summarized in appendix I (all except study Nos. 2, 9, and 10) incorporated split-panel tests of design variations.

The findings from these studies have unquestionable value in evaluating the relative effectiveness of different ways of collecting information on chronic conditions. However, they are subject to two significant limitations. First, study Nos. 1, 6, 7, 8, 10, and 11 were all conducted with relatively small samples selected from rather narrowly defined populations. The three Michigan studies (Nos. 6, 7, and 8) were based on samples of white females in the middle age ranges living in the Detroit area. Using such a restricted, relatively homogeneous population was a conscious decision taken to reduce experimental variation from sources other than the treatments being tested.

The disadvantage of this strategy, of course, is that it limits the generalizability of the findings to more broadly defined populations. Study Nos. 7, 10, and 11 were each restricted to members of a single health insurance plan in a limited geographic area.

The second limitation arises from the fact that the collection of chronic conditions data in NHIS is, as was explained in an earlier section, a complex process involving questions on different topics appearing throughout the entire questionnaire. In the experiments that tested two or more versions of the survey questionnaire, the versions usually differed in many ways, not just in a single question or feature. Because the number and kinds of chronic conditions reported may have been affected by several of the features that varied from one version to another, it is sometimes difficult to pinpoint the effects of specific questionnaire variations.

This presentation on the response effects of design features starts with a brief discussion of general survey features: Periodicity, collection mode, and respondent rules. The remainder of the section deals with the effects of questionnaires and the associated interviewing procedures.

Periodicity of interviews—The NHIS is a single-visit survey; each sample household is interviewed only once, except for the small subsamples that are reinterviewed. Feldman¹⁹ suggests that a periodic-visit survey might "uncover a greater volume of cases than a single-visit survey," and cites several reasons for this. For example, some chronic conditions vary in intensity over time, and are more likely to be reported if the interview occurs when they are in a more active stage. Feldman also points out that data on chronic conditions, from a series of interviews of the same persons, could be combined to minimize the effects of underreporting.

While there have, of course, been numerous longitudinal health studies combining data from lay interviews and other sources, there has not been any definitive or extensive test of the use of a panel survey approach, incorporating features such as bounded interviews, to collect data on chronic conditions.

Data collection mode—The principal modes of survey interviewing are face-to-face and telephone. Telephone interviews can be subdivided into computer-assisted telephone interviews (CATI) and conventional telephone interviews. Survey data can also be collected on self-administered questionnaires. We will be concerned with the latter collection mode only insofar as it has been used in combination with interviews, for example, in surveys combining use of respondent diaries and interviews.

Since the late 1970's, NCHS has conducted and sponsored a considerable amount of research to evaluate the effects of using telephone interviewing in the NHIS and other surveys. Much of this research was undertaken by the Survey Research Center of the University of Michigan in a program that had three main components: (a) a comparative evaluation of health interview data obtained in face-to-face interviews and in telephone interviews based on random-digit dialing, (b) comparative evaluation of alternate telephone interview procedures, and (c) several methodological studies specific to the telephone approach.

Some results from these studies are described elsewhere in this report. The effects of the alternate modes on reporting of chronic conditions are described here. The mean number of

chronic conditions per person reported in telephone interviews was essentially the same as the number reported in face-to-face interviews with households that had telephones, 0.421 versus 0.415 (Cannell, Thornberry, and Fuchsberg³⁵). The comparison of CATI and conventional telephone interviewing favored the latter. In a comparison restricted to persons who reported for themselves, the mean number of chronic conditions per person reported in conventional interviews was 0.523, compared with 0.474 for CATI interviews (Groves and Mathiowetz⁵¹).

The use of respondent diaries as an alternative to retrospective health interviews was tested in a 1952 study in San Jose, California (Allen, Breslow, Weissman, et al.²⁸). Separate results were not developed for acute and chronic conditions. The overall rates of illness reported for a calendar month were higher among those keeping diaries, with the differences being accounted for mostly by less severe illnesses and those that were not medically attended. The diary procedure was more expensive and led to a higher proportion of vague descriptions of the conditions reported.

In one of the Michigan experiments (study No. 8), diaries were tested as an adjunct rather than an alternative to interviews. The steps in the diary procedure were: (a) the interviewer introduced and left the diary, (b) the respondent kept the diary for a week, and (c) the interviewer returned after a week, reviewed the diary with the respondent, and completed the followup interview. This procedure was compared with a standard retrospective interview procedure. A substantially greater number of acute conditions were reported when the diary procedure was used, but the differences in diary versus control for chronic conditions were not significant.

Another example of the use of self-administration in connection with a health interview survey occurred in the Kaiser-Permanente record check study (study No. 11). In the two experimental versions of the survey questionnaire, respondents were asked, at the appropriate point in the interview, to read and complete the conditions checklist themselves; however, in the control version of the questionnaire the interviewers read the conditions checklist to the respondents. Unfortunately, this experimental feature was confounded with several other treatment differences so that its effects on the rate of chronic conditions reporting cannot be isolated. Both of the experimental versions resulted in somewhat better reporting in interviews of conditions identified in medical records (NCHS Series 2, No. 23, table 6⁴⁹); some of the improvement may have resulted from use of a self-administered checklist.

In the same study, variations in checklist item content and wording of specific items were also tested, but no analysis of the results is given in the two published reports (NCHS Series 2, Nos. 23 and 57).^{49,52}

Respondent rules—The NHIS respondent rule is essentially that all persons age 17 years and over who are available at the time of the interview should be asked to report for themselves; proxy responses are acceptable for other related persons. Requiring self-response for all adults would increase interviewing costs; nevertheless, it might also improve response significantly. Feldman¹⁹ summarizes the evidence on this score from surveys conducted prior to the start of NHIS. Most of

these studies provided only quasi-experimental evidence on differences between self-response and proxy response. Nevertheless, there was fairly convincing evidence that self-response led to reporting of more chronic conditions.

Properly designed experimental tests of alternate respondent rules were included in the Charlotte pretest (study No. 1) and the NHIS respondent rule experiment (study No. 4). In both of these studies, use of a rule requiring greater self-response than the regular NHIS respondent rule led to increases on the order of 10 percent in reporting of chronic conditions and related variables. This increase was not, of course, the result of a shift from 100 percent proxy response to 100 percent self-response. The main result of the stricter respondent rule was a substantial increase in the proportion of males reporting for themselves, from 42 to 96 percent. Under the standard survey rule, 81 percent of females were already reporting for themselves; this rate also increased to 96 percent under the stricter rule (White and Massey⁵³).

In the Michigan study of reinforcement and sensitization (study No. 6), women in the sample were asked to report the same information for themselves and, as a proxy respondent, for a second person in the household, usually the respondent's husband. The results for self-response and proxy response are not directly comparable, because all of the self-responses were for women and most of the proxy responses were for men. For what it may be worth, the mean number of chronic conditions per person, averaged for all three treatments used in the study, was about 25 percent higher for the self-responses. This finding is fairly consistent with the 10-percent increase that resulted from a smaller change in the proportion of self-respondents in the NHIS respondent rule experiment.

A more recent Michigan study compared results for self-response and proxy response in telephone health survey interviews with content similar to that of NHIS (Groves and Mathiowetz⁵⁴). An unexpected result of this study was that proxy response produced higher levels of reporting for many health variables, including restricted activity, doctor visits, and acute conditions. For chronic conditions, however, the results were consistent with earlier studies: a significantly higher proportion of self-respondents had at least one chronic condition.

Questionnaire features and interviewing procedures—The unique feature of the Michigan studies has been their concern with the psychological dynamics of survey interviews. Some exploratory studies were undertaken to observe what happened in health survey interviews and to ask interviewers and respondents about their perceptions of what occurred (NCHS Series 2, No. 26⁵⁵). The findings from these studies led to the formulation of several hypotheses about techniques to improve reporting in interviews. These techniques were then tested in a series of controlled experiments.

All of the techniques tested are potentially applicable to household interview surveys on almost any topic. As usual, our concern here is with their effects on the reporting of chronic conditions. The four main techniques studied were:

- *Respondent instruction*, used at the start of an interview to inform respondents what is expected of them.

- *Commitment*, a technique whereby respondents are asked to agree explicitly to work hard at providing complete and accurate information during the interview.
- *Feedback*, used by the interviewer during the interview to indicate adequate or inadequate performance to the respondent. Positive feedback is often called reinforcement.
- *Redundant question phrasing* (long questions), used to help respondents understand the intent of a question and to give them more time to think of suitable responses.

Positive feedback was tested in the Michigan study of reinforcement and sensitization (study No. 6), and was found to lead to a significant increase in the mean number of chronic conditions reported per person. Increases were estimated at 20 percent for self-response and 48 percent for proxy response. An interesting finding from this study was that the increase for self-responses came primarily from the group of conditions considered to have low "embarrassment levels," and the increases for the proxy responses came from conditions with medium-to-high embarrassment levels.

In the Michigan study of reinforcement and question length (study No. 7), the effects of these two factors on reporting of chronic conditions were estimated in a 2×2 factorial experiment. Survey reports for 13 selected chronic conditions were compared with visit records kept by the survey respondents' physicians. The results differed according to the respondent's education. For persons with a 12th grade education or better, long questions without reinforcement produced the most accurate reports, but for persons who had completed less than 12 grades, the combination of short questions with reinforcement was most effective. Underreporting by treatment groups amounted to 30–57 percent for the more educated respondents and 22–24 percent for the less educated respondents. Overreporting amounted to 7–9 percent for the more educated respondents and 11–14 percent for the less educated respondents.

In two subsequent Michigan studies reported by Cannell, Miller, and Oksenberg,³⁶ various combinations of the respondent instruction, commitment, and feedback techniques were tested. Two of the survey questions were related to chronic conditions considered to be sensitive. One asked whether the respondent had ever been treated for a mental or nervous condition of any kind. The other asked for reports of symptoms and conditions in the pelvic area (all the respondents were women). For these two questions, a higher frequency of positive responses was taken as an indication of more accurate reporting. The experimental treatments, individually and in combination, led to significantly more reporting of conditions and symptoms in the pelvic area. Differences between control and experimental groups for the question on mental or nervous conditions were not significant at the 0.05 level, but the reported frequencies were higher for the experimental groups.

A combination of three of the four experimental interviewing techniques—respondent instruction, commitment, and feedback—was tested against controls in Michigan experimental studies of health survey telephone interviewing methods. Cannell, Thornberry, and Fuchsberg³⁵ reported that the experimental treatment resulted in a higher rate of chronic conditions

reported per person, 0.530 as compared to 0.422 for interviews using standard procedures.

These experimental results were encouraging; however, the interviewing techniques tested in the Michigan studies have not yet been adopted in NHIS. Further research and some testing in an operational setting would be essential before making the extensive changes in the survey instruments and procedures needed to use these techniques (for a further discussion, see NCHS Series 2, No. 69³⁸).

Finally, the specific questionnaire items used to collect information on chronic conditions must be explained further. As described previously (see figure 1), chronic conditions are identified in the NHIS interview by using condition checklists and a series of probes relating to activity limitations and restrictions, use of health services, and injuries. Detailed information about each condition so identified is then obtained by asking the questions on a "conditions page."

There is convincing evidence that increasing the number of probes or the number of checklist items can lead to increases in the mean number of chronic conditions reported per person. One of the Michigan studies (study No. 8) tested an extensive questionnaire that "... provided the respondent with multiple cognitive frames of reference, multiple cues, additional probes, and recognition of items through a questionnaire asking a large number of questions" (NCHS Series 2, No. 49⁵⁶). Compared with a control questionnaire similar to the one used at the time in NHIS, the extensive questionnaire led to an increase of 58 percent in the mean number of conditions reported per person. Most of the increase came from conditions not included in the checklist, which was identical for the extensive and control questionnaires. The report on this study states that "in spite of this lower impact, most of the newly reported conditions were shown to be medically important in their public health implications" (NCHS Series 2, No. 49⁵⁶).

Not all cues or probes are effective in producing more reports of chronic conditions. In the Michigan study of the effects of reinforcement and sensitization (study No. 6), the use of the "sensitization" approach, which consisted of asking respondents about a list of symptoms at the start of the interview, did not lead to increased reporting of chronic conditions.

The 1967–68 study comparing the condition and person approaches (study No. 3) demonstrated that adding new items to a checklist could increase the mean number of chronic conditions reported substantially, at least for a specific body system. Increasing the number of checklist items that related to the digestive system from 7 to 31 led to a 76-percent increase in the number of chronic conditions reported for that body system. This finding led to the present system of using more detailed checklists covering only a single body system in each interview.

It is quite possible that adding even more probes and checklist items would lead to further increases in reporting of chronic conditions. However, doing this might have some adverse effects. Field costs would increase. Respondent fatigue might lead to a decline in completeness of response as the interview progresses. Nisselson and Woolsey¹⁸ describe an experiment carried out during the Baltimore Health Survey to test for checklist item order effects. In that survey, a 33-item chronic disease checklist was followed by a list of 12 selected symp-

toms. Changing the order of items on the list of symptoms affected the frequency with which they were reported. The sample was not large enough to detect order effects in the chronic conditions list.

A more general concern is that adding probes and checklist items might lead to overreporting, in the sense that some of the conditions reported might not be detectable by clinical examination, or might have such minor impact that they would be of little or no interest to users of the NHIS data.

One would expect that the specific wording of checklist items and condition probes might have significant response effects. How well do respondents understand the condition-related terms used in the checklists? Are there regional or ethnic variations in the terms used by laymen to describe particular conditions?

The literature reviewed for this report is largely silent on these issues. As mentioned earlier, Woolsey, Lawrence, and Balamuth³⁴ found evidence in the HIP study that conditions for which laymen and physicians use the same terminology were more fully reported in survey interviews. Belloc³³ compared diagnoses appearing in hospital records with diagnoses reported by the same persons in surveys. Table J shows the results of this comparison for disorders of the upper gastrointestinal tract. These data suggest that some of the survey respondents were using the more familiar term stomach ulcer to describe what physicians had diagnosed as duodenal ulcers.

Insofar as ethnic variations in terminology are concerned, a personal communication to the author stated that "Researchers in the University of Miami Health Ecology Project . . . finally came up with 'Ethnic Symptoms Lists' and 'Ethnic Con-

Table J. Number of persons reported in survey interviews and hospital records, by disorders of the upper gastrointestinal tract: San Jose Health Survey

<i>Diagnostic category</i>	<i>Number reported in—</i>	
	<i>Survey interviews</i>	<i>Hospital records</i>
Total	8	8
Ulcer of stomach	5	1
Ulcer of duodenum	0	5
Other disorders of stomach and duodenum.	2	2
Symptoms referable to upper gastrointestinal tract.	1	0

SOURCE: Belloc.³³

ditions Lists' because their informants (from the five largest ethnic groups in Miami) systematically had clear differences in understanding and meaning from the questions as on National Health Survey instruments" (Snow, 1984⁵⁷).

Conclusion—This review of the response effects of health interview survey design features has presented some of the principal findings from published reports of experimentation and research on survey methods. A more intensive review of the literature and of unpublished materials related to NHIS would undoubtedly be rewarded with further useful information about the complex processes involved in collecting information on chronic conditions in health surveys. Nevertheless, there are many unanswered questions, and cognitive scientists should have no difficulty in finding areas of inquiry where their perspectives and research tools can make a contribution.

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⁵⁹K. W. Haase and R. W. Wilson: The study design of an experiment to measure the effects of using proxy responses in the National Health Interview Survey. *American Statistical Association Proceedings, Social Statistics Section*. 289-293, 1972.

⁶⁰M. G. Kovar and R. A. Wright: An experiment with alternate respondent rules in the National Health Interview Survey. *American Statistical Association Proceedings, Social Statistics Section*. 311-316, 1973.

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Appendix I

Selected experimental and evaluation studies and the findings on reporting of chronic conditions

Replication studies

Prior to start of NHIS

Study No. 1. Charlotte pretest

Type of study—Pretest for the National Health Interview Survey (NHIS), including a split-panel test of respondent rules and an interviewer variance study.

Study population—The study population was the noninstitutionalized population in Charlotte, North Carolina, standard metropolitan statistical area (SMSA) (Mecklenberg County), February 1957.

Sample design—A one-stage area sample of segments with an expected average size of six addresses. Different sampling rates were used for urban and rural segments and for white and all other segments, so that the resulting unweighted sample would reflect the distribution of these characteristics in the U.S. population.

For the split-panel test, the two respondent rules were used at alternate households by each interviewer. For the interviewer variance study, the study area was divided into four zones. The 24 interviewers were assigned at random to the four zones, six to a zone, and their assignments randomized within zones.

Sample size—The sample size consisted of 200 segments (expected six households per segment).

Collection mode—The collection mode was a face-to-face interview. The two respondent rules were:

- a. All adults (18 years and over) interviewed for themselves, with minor exceptions.
- b. Proxy response accepted for related adults absent at time of interview.

Survey questionnaire—Chronic conditions were identified from a series of questions on illness, two general questions on chronic conditions and impairments, and a checklist containing 31 specific conditions and impairments.

Validation procedures—None.

Principal results—The principal results are as follows:

1. Chronic condition rate

<i>Respondent rules</i>	<i>Chronic conditions</i>
	Rate per person
Self-response (rule a)	0.799
Proxy response (rule b)	0.734
Difference (a) - (b)	0.065
Sampling error of differences	0.050

2. Interviewer variance. The F ratio for between- and within-interviewer variance for chronic conditions (rate per person) was significant at the 0.05 level for respondent rule a (self-response) but not for rule b.

3. Checklist

<i>Source of condition</i>	<i>Named on checklist?</i>	
	Yes	No
Checklist question	1,238	173
Other (prior questions)	998	574

¹Reading of the checklist brought out some reports of conditions other than those read.

Reference—Nisselson and Woolsey.¹⁸

Studies built into NHIS

Study No. 2. NHIS interviewer variance study

Type of study—Estimation of interviewer variance through randomization of assignments.

Study population—The study population was the civilian noninstitutionalized population in 10 large SMSA's, 1960-63.

Sample design—For overall NHIS design see description for study No. 3. In each of the SMSA's included in this study there were two or more NHIS interviewers. Assignments within each pair or triplet of interviewers within an SMSA were randomized in an interpenetrated design.

Sample size—During the period 1960-63, a total of 6,415 segments of 6-9 households were included in the randomized assignments. Of these, 1,204 were excluded from the analysis, primarily because they were completed by interviewers other than those assigned. The remaining 5,211 segments contained about 34,000 households with 110,000 persons.

Collection mode—The collection mode was a face-to-face interview.

Survey questionnaire—The standard NHIS questionnaire.

Principal results—For all items relating to chronic conditions, the between-interviewer variance accounted for a high proportion of the total variance, as shown in table I.

Investigation of the results for the 1960-61 period showed that one interviewer of the 25 in the study at that time "contrib-

NOTE: A list of references follows the text.

Table 1. Estimates and estimated variance components for selected items related to chronic conditions

Time period and item	Estimate	Relative variance		
		Total	Between-interviewer	Ratio—between-interviewer
1960-61				
Chronic conditions per female	0.769	0.00483	0.00442	0.915
Chronic conditions per male	0.612	0.00434	0.00370	0.854
Chronic conditions, 1 bed day or more in last 12 months per person	0.115	0.00476	0.00404	0.848
Chronic conditions, 1 bed day or more in last 2 weeks per person	0.024	0.00861	0.00604	0.702
Proportion of persons with 1 chronic condition or more	0.389	0.00196	0.00174	0.886
Proportion of males with 1 chronic condition or more	0.369	0.00230	0.00193	0.839
1962-63				
Chronic conditions per female	0.848	0.00117	0.00068	0.586
Chronic conditions per male	0.667	0.00093	0.00029	0.312
Chronic conditions, 1 bed day or more in last 12 months per person	0.132	0.00142	0.00064	0.455
Chronic conditions, 1 bed day or more in last 2 weeks per person	0.028	0.01029	0.00734	0.713
Proportion of persons with 1 chronic condition or more	0.408	0.00034	0.00016	0.475
Proportion of males with 1 chronic condition or more	0.387	0.00046	0.00017	0.362

uted a disproportionate amount to the estimates of between-interviewer variability.¹²

Reference—NCHS Series 2, No. 54.¹²

Study No. 3. Comparison of the condition and person approaches in NHIS

Type of study—A split-panel test of alternate questionnaire versions.

Study population—The study population was the U.S. civilian noninstitutionalized population, July 1967–December 1968.

Sample design—At the time of this study, the NHIS sample was a multistage probability sample of households, with 357 primary sampling units and using both list and area frames at subsequent stages of sampling. Sampling and data collection are continuous: Each week’s sample can be used to estimate national totals, and samples are additive over time.

For the split-panel test, half of the interviewers used each version of the questionnaire. Interviewers were paired based on expected size of workload and type of area, and versions were assigned randomly to interviewers in each pair.

Sample size—During the period July 1967–June 1968, about 43,600 households were interviewed, roughly half with each version. The split panel continued through December 1968, but results were published only for the first 12 months.

Collection mode—The collection mode was a face-to-face interview.

Questionnaire versions—The questionnaire formats used for the two versions were characterized as the “condition approach” and the “person approach.” The condition approach questionnaire was essentially the one used in the survey up to that point. It had a short series of direct questions on accidents, injuries, and illnesses of short or long duration, followed by a checklist covering selected chronic conditions and impairments. For each illness, impairment, or accident identified, information

was obtained on physician visits and diagnoses, time of onset, and activity limitations.

The person approach questionnaire differed in two ways. First, questions on bed days; activity limitations; and physician contacts, without reference to any particular condition, were added at the start. Second, it was decided that the collection of prevalence data on chronic conditions would be restricted to a specific body system during each 12-month collection period. For the test period, information was collected on chronic conditions affecting the digestive system. The checklist used for this version covered these kinds of conditions in greater detail than the other version, but did not include other kinds of chronic conditions or impairments.

Validation procedures—None.

Principal results—Comparisons between the two versions were made only for chronic conditions involving the digestive system. The main results were:

Item	Condition approach	Person approach
Prevalence estimates for chronic digestive conditions	Rate per 1,000 population	
All conditions	65.6	115.7
Conditions causing activity limitation	8.5	8.3
Approximate proportions of conditions first reported in response to checklist	0.60	0.90

SOURCE: Reference 58.

The higher overall prevalence rates for the person approach questionnaire were attributed to increased reporting of conditions included on the checklist for that version but not on the checklist for the condition version.

References—NCHS Series 2, No. 48,⁵⁸ and NCHS Series 1, No. 11.¹¹

Study No. 4. NHIS respondent rule experiment

Type of study—A split-panel test of alternate respondent rules.

NOTE: A list of references follows the text.

Study population—The study population was the U.S. civilian noninstitutionalized population, April–June 1972.

Sample design—For the standard NHIS design, see description for study No. 3. For the split-panel test, the standard respondent rule was used in samples for weeks 1, 4, 5, 8, 9, 12, and 13 of the quarter, and the experimental rule was used for weeks 2, 3, 6, 7, 10, and 11.

Sample size—Interviews were completed at 5,938 households for the standard treatment and 5,169 households for the experimental treatment.

Collection mode—The collection mode was a face-to-face interview. The two respondent rules were:

- a. *Standard*—All persons aged 17 years and over who are at home when the interviewer calls are asked to respond for themselves. Proxy respondents are recommended for children under age 17 and are acceptable for related adults who are not at home or are incapable of being interviewed.
- b. *Experimental*—Every adult able and willing to respond was required to do so. Callbacks were made, as needed, to comply with this requirement.

Survey questionnaire—The standard NHIS questionnaire. *Validation procedures*—None.

Principal results—The percent of self-response by age and sex for persons 17 years and over for the two treatments was:

Age group	Standard rule	Experimental rule
	Percent	
17–18 years		
Male	17.2	15.6
Female	31.9	31.3
19–44 years		
Male	43.5	95.5
Female	82.6	97.4
45–64 years		
Male	48.4	95.4
Female	84.6	97.6
65 years and over		
Male	71.7	93.9
Female	86.9	93.7

Estimates of health variables for the two treatments (with variances shown in parentheses) were:

Health variable	Experimental rule	Standard rule	Difference
Percent with activity limitation due to chronic condition	13.6 (0.10)	12.4 (0.09)	1.2
Percent with mobility limitation due to chronic condition	3.6 (0.03)	3.1 (0.03)	0.5
Prevalence of high blood pressure per 100 persons	7.4 (0.06)	6.8 (0.06)	0.6

NOTE: A list of references follows the text.

Health variable—Con.	Experimental rule—Con.	Standard rule—Con.	Difference—Con.
Prevalence of circulatory conditions per 100 persons	26.2 (1.03)	23.7 (0.87)	2.5
Prevalence of heart conditions per 100 persons	5.6 (0.05)	5.0 (0.04)	0.6

SOURCE: Reference 53

References—Haase and Wilson,⁵⁹ Kovar and Wright,⁶⁰ and White and Massey.⁵³

Study No. 5. NHIS questionnaire revision experiment

Type of study—A split-panel test of experimental and standard versions of the NHIS questionnaire.

Study population—The study population was the U.S. civilian noninstitutionalized population, fourth quarter 1979.

Sample design—For the standard NHIS design, see study No. 3. For the experimental questionnaire, a parallel sample of households, approximately one-half the size of the regular NHIS fourth-quarter sample served as the control group. Experienced and inexperienced interviewers were assigned to the experimental and control groups in roughly equal proportions.

Sample size—Approximately 5,000 households were interviewed in the experimental group and 10,000 in the control group.

Collection mode—The mode was a face-to-face interview.

Questionnaire versions—The data objectives of the standard and experimental questionnaires were essentially identical. The purpose of the changes introduced in the experimental version was to reduce nonsampling errors attributed to interviewer collection procedures, lack of understanding of items by respondents, and processing errors. Numerous changes were made in question wording, ordering of questions, and interviewer instructions.

For chronic conditions, the probe questions were the same on both versions. However, there were some changes in interviewer procedures for using them. On the condition page itself, some items were eliminated and some interviewer instructions were added. It was not expected that these changes would affect incidence or prevalence levels.

Validation procedures—None.

Principal results—Estimated prevalence rates for selected chronic conditions were:

Condition	Experimental version	Control version
	Rate per 100 persons	
Chronic bronchitis	5	4
Heart conditions	10	8
Visual impairments	3	4
Hernia	2	2
Arthritis	13	12
Diabetes	2	2

SOURCE: Reference 62

These differences were not judged to be significant.

References—NCHS, 1982 *NHIS Clearance Supporting Statement*,⁶¹ and Givens and Moss.⁶²

External methodological experiments (Michigan series)

Study No. 6. Effects of reinforcement and sensitization

Type of study—A split-panel test of three alternative questionnaires and associated interview procedures.

Study population—The study population was white native-born women aged 17–35 years with low-to-middle income in Detroit, Michigan, 1966.

Sample design—A sample of blocks was listed and sub-sampled to obtain a sample of addresses. The eligible sample addresses were divided equally among the three procedures.

Interviews were conducted by seven interviewers, only two of whom had previous interviewing experience. Each interviewer used all three questionnaire versions. In the interview, information was obtained by self-report for the eligible women and, in most dwelling units, by proxy for one other person in the unit.

Sample size—Interviews were conducted at 429 dwelling units, divided equally among the three questionnaire versions.

Collection mode—The mode was a face-to-face interview.

Questionnaire version—Three different questionnaires and associated interviewing procedures were used. Each version used a modification of the standard NHIS questionnaire, designed to elicit information on chronic and acute conditions, symptoms, and physician calls. The three versions were called:

- a. *Reinforcement*—Respondents' reports of conditions and symptoms were reinforced by interviews (see also study No. 7). Extra words were used in introducing new sections of the questionnaire and in asking certain questions. Interviewers were instructed to use various facial expressions and gestures to encourage respondents.
- b. *Sensitization*—The symptoms questions were included at the same place in the interview, but none of the other techniques used in the reinforcement procedure was used by interviewers.

NOTE: A list of references follows the text.

c. *Control*—None of the experimental techniques of procedures a and b was used.

Validation procedures—None (for a test of reinforcement procedures with validation, see study No. 7).

Principal results—There were no significant differences between the sensitization and control procedures in the mean number of chronic conditions reported. The reinforcement procedure resulted in greater reporting levels, as shown in table II.

In each of the procedures, respondents were administered an abbreviated version of the Marlowe-Crowne scale to measure the level of their need for social approval. The effects of the Marlowe-Crowne scale scores on reporting were "complex and somewhat ambiguous." For persons highly motivated to receive social approval, the reinforcement procedure did not lead to higher self-reporting of embarrassing conditions, but did lead to higher proxy reporting.

Reference—NCHS Series 2, No. 41.⁶³

Study No. 7. Effect of reinforcement and question length

Type of study—A split-panel test of alternative questionnaires and associated interview procedures, using a 2 × 2 factorial design.

Study population—The study population was white females aged 17–60, who were residents of the greater Detroit metropolitan area, were members of a prepaid health insurance plan, and had visited one of the plan's clinics between February and July 1968.

Sample design—The initial sample was selected from the health insurance plan rolls, oversampling women with 1 or more of 13 specified chronic conditions according to plan records. Clusters of four sample persons were formed, using geographic area, age, and number of conditions as controls. Within each cluster, the four questionnaire versions were assigned at random. There were 10 interviewers, each of whom used all four versions.

Sample size—Approximately 100 women were interviewed for each of the four questionnaire versions and associated interviewing procedures.

Collection mode—The mode was face-to-face interview.

Questionnaire versions tested—The first factor tested was the use or nonuse of positive reinforcement when respondents reported an instance of illness. The reinforcement consisted of

Table II. Mean number of chronic conditions reported per person, difference, percent of increase, and level of significance, by type of report and level of embarrassment

Type of report and level of embarrassment	Mean per person			Percent increase	Level of significance
	Reinforcement	Sensitization	Difference		
Self-report	1.52	1.26	0.26	20	0.09
Low	0.68	0.46	0.22	48	0.01
Medium	0.29	0.33	0.04	-12	¹ n.s.
High	0.55	0.49	0.06	12	¹ n.s.
Proxy report	1.30	0.88	0.42	48	0.04
Low	0.40	0.35	0.05	14	¹ n.s.
Medium	0.29	0.20	0.09	45	0.10
High	0.59	0.38	0.21	55	0.03

¹n.s. = not significant.

NOTE: Conditions were classified by level of embarrassment based on a survey of 145 University of Michigan undergraduate students. For each condition, the students were asked how willing they would be to have other people know they had it, responding on a 5-point scale.

a statement by the interviewer such as: "Thank you. We're interested in that" or "Yes, that's important." The second factor was the question of length—short versus long. Typically, the short questions only named a condition, and the long questions added words that neither changed nor clarified what was wanted by the question. These two factors were tested using a 2 × 2 factorial design.

Validation procedures—Physician information for 13 selected chronic conditions was obtained for each sample person, from a form filled out by that person's physician immediately following a clinic visit. Approximately half of the respondents in each of the 4 groups were reinterviewed about 2 weeks after the initial interview.

Principal results

1. Overreporting and underreporting index scores for 13 chronic conditions by questionnaire version and level of education.

Questionnaire version and level of education	Under-reporting ¹	Over-reporting ¹	Net
12 YEARS OR MORE			
Short questions			
With reinforcement	0.575	0.069	0.506
No reinforcement	0.443	0.091	0.352
Long questions			
With reinforcement	0.463	0.074	0.389
No reinforcement	0.305	0.081	0.244
LESS THAN 12 YEARS			
Short questions			
With reinforcement	0.225	0.113	0.112
No reinforcement	0.387	0.143	0.244
Long questions			
With reinforcement	0.349	0.119	0.230
No reinforcement	0.443	0.121	0.322

¹Using conditions reported by physicians as the standard.

The general conclusion was that reinforcement improved reporting of chronic conditions for the group with less education and longer questions improved reporting for those with more education.

2. The reinterview sample was too small to draw any conclusions about cumulative effects of the two factors tested.

Indexes of inconsistency averaged over 13 chronic conditions for the eight education-treatment groups shown in item 1 ranged from 4.7 to 8.9 (computed from table 18, reference 64).

Reference—NCHS Series 2, No. 45.⁶⁴

Study No. 8. Comparison of extensive questionnaire, standard questionnaire, and diary procedure

Type of study—A split-panel test of three alternative questionnaires and associated data collection procedures.

Study population—The study population was white native-born women aged 18–65 years with low-to-middle socioeconomic status in Detroit, Michigan, 1968.

Sample design—A sample of blocks was listed and subsampled to obtain two clusters of three dwelling units in each block. The three procedures were assigned at random to the three dwelling units in each cluster. Six interviewers from the Michigan Survey Research Center staff received 2 weeks of training. Each interviewer conducted roughly the same number of interviews for each procedure.

Sample size—Interviews were conducted at 305 dwelling units, approximately 100 for each procedure.

Collection mode—The mode was face-to-face interview; for procedure 2 (see below), diaries were completed by respondents.

Questionnaire versions tested—The three procedures tested were: (1) an extensive interview designed to stimulate recall by providing respondents with multiple cognitive frames of reference, multiple cues, additional probes, and recognition of items through use of a large number of questions; (2) a diary to be completed by respondents daily for 1 week, followed by an interviewer revisit to review the diary and complete the questionnaire; and (3) a control procedure consisting of a single interview using a shorter questionnaire requesting the same major items of information and using the same questions as the then current NHIS questionnaire.

Validation procedures—None.

Principal results—For reporting of chronic conditions, there was little difference between the diary and control procedures, table III. The extensive procedure produced significantly higher reporting of chronic conditions *other than those on the checklists*. The mean impact of conditions, as measured by restricted activity, medical attendance, and traumatic effects, was lower for the larger number of chronic conditions reported under the extensive procedure.

Table III. Mean number of conditions per person and mean impact score per condition, by type of condition

Type of condition	Mean number of conditions per person			Mean impact score per condition		
	Extensive	Diary	Control	Extensive	Diary	Control
Chronic conditions on recognition list	3.54	3.29	3.25	2.02	2.23	2.32
Other chronic conditions	2.75	0.58	0.74	1.69	1.74	3.09

SOURCE: NCHS Series 2, No. 49.⁵⁶

NOTE: A list of references follows the text.

Reinterviews

Study No. 9. NHIS reinterview findings

Type of study—Reinterviews of NHIS respondents.

Study population—The study population was the U.S. civilian noninstitutionalized population, 1959–67.

Sample design—For the overall NHIS design, see description for study No. 3. Sampling units for reinterviews are interviewer weekly work assignments. During the specified period, interviews were conducted for three or four assignments per interviewer each year. For each weekly assignment, reinterviews were conducted for one sample person in each of 12 selected households.

Sample size—The annual number of completed reinterviews (persons) declined gradually from 3,478 in 1959 to 1,933 in 1967.

Collection mode—The mode was face-to-face interview and reinterview. Two different reinterview procedures were used.

Procedure I—For 20 percent of the sample households, reinterviews were conducted (by field supervisors) without access to the results of the original interview and there was no reconciliation.

Procedure II—For 80 percent of the sample households, reinterviews were conducted initially without access to the results of the original interview, as in procedure I. After this was done, however, the reinterviewer compared the responses of the two interviews. When differences occurred, the reinterviewer tried, with the aid of the respondent, to decide which results were correct. This procedure produced two sets of comparisons—without and with reconciliation.

Through June 1965, all reinterviews were conducted with sample persons, regardless of who responded to the initial interview. Subsequently, the preferred respondent was the person who supplied the data in the original interview.

Survey questionnaire—The standard NHIS questionnaire.

Principal results—Reconciled reinterviews consistently showed more persons with one or more chronic conditions. The 7½-year quarterly averages were 42.3 percent for the initial interview and 49.2 percent for the reinterview. The average number of chronic conditions per 100 persons was 82.0 for the initial interview and 107.4 (an increase of 23.6 percent) for the reconciled reinterviews. Annual indexes of inconsistency

for chronic conditions in the past 12 months based on reconciled reinterviews varied between 13.4 and 19.3, roughly in the same range as indexes calculated for unemployment in Current Population Survey reinterviews.

Data for the period 1959–61, when all reinterviews were based on self-response, suggest that underreporting in initial interviews was greater when proxy respondents were used. Data are shown in table IV.

Record checks

Study No. 10. HIP record check

Type of study—A reverse record check.

Study population—Subscribers (and their covered dependents) enrolled in the Health Insurance Plan of Greater New York (HIP) for the 12 months ending on June 30, 1957, under family coverage and affiliated with a medical group.

Sample design—A disproportionate stratified sample of subscriber families was selected for interview. Families for which HIP records showed services relating to a selected list of chronic conditions during the period April 1–September 30, 1957, were oversampled 3 to 1 compared with other families.

Sample size—The size of the sample as initially selected was not given. Interviews were obtained for 1,388 households with 3,397 HIP enrollees.

Collection mode—Sample families were interviewed face-to-face by U.S. Bureau of the Census interviewers between May 2 and July 6, 1958. Most of the interviewers were not regularly employed in NHIS; they were especially hired and trained for the study. Respondent rules were not specified, but the results showed that data for 36.7 percent of the sample persons (weighted) were obtained by self-response and the rest by proxy response.

Survey questionnaire—The survey questionnaire was similar to the questionnaire used for NHIS at the time. The “condition” approach was used. Two checklists, one with 26 chronic conditions and one with 9 impairments, were included. Selected sections of the questionnaire are included in reference 49.

Source of record check data—HIP record data on possible chronic conditions were obtained from form Med 10 completed by HIP physicians for members of sample subscriber families during the period April 1, 1957–June 30, 1958. Each line on

Table IV. Results of original interview and reconciled reinterviews for adults, by survey item and type of respondent, with net differences and index of inconsistency

Survey item, subject, and respondent on initial interview	Original interview	Reinterview	Net difference	Index of inconsistency
Percent of persons with 1 or more chronic conditions				
Adult, self-respondent	59.4	64.8	−5.4	13.1
Adult, proxy respondent	47.4	58.5	−11.1	30.3
Chronic conditions per person (12 months)				
Adult, self-respondent	1.26	1.52	−0.26	---
Adult, proxy respondent	0.84	1.25	−0.41	---

SOURCE: NCHS Series 2, No. 54.¹²

NOTE: A list of references follows the text.

the form Med 10 gives data for a single face-to-face contact between a physician and a patient, including: patient ID, date, place, type of service, and tentative or final diagnosis (a copy of the form appears in reference 48). The heading of the column for diagnosis has the instruction "Standard nomenclature preferred."

Matching procedure—All form Med 10's for interviewed persons for the period April 1, 1957–June 30, 1958, were reviewed to identify "possibly chronic conditions," which were compared with chronic conditions reported in the interviews. In the comparisons, each Med 10 possibly chronic condition was assigned to one of four match categories:

Type 1 match. A condition reported in the interview was in the same "recode No. 1" category as the Med 10 condition. This recode consisted of 278 categories, each consisting of one ISC-PHS code or more.

Type 2 match. Interview-reported conditions not in the same recode No. 1 category but in the same "recode No. 3" category. This recode consisted of 43 categories formed by groups of recode No. 1 categories.

Type 3 match. No agreement at the recode No. 3 level of detail, but the interview described a condition or symptom that could be associated with the Med 10 condition.

No match. Nothing reported in the interview corresponding in any way with the Med 10 condition.

For the analysis, each Med 10 condition was also assigned to 1 of 3 classes:

Class 1. Condition was covered exactly by terminology of interview questionnaire checklist.

Class 2. Condition was suggested by checklist terminology, but some difference in qualifiers used (repeated, chronic, and so forth).

Class 3. Condition not suggested by checklist, but judged to be chronic.

Most of the tabulations in reference 48 show reporting of Med 10 inferred conditions in the household interview separately for each of these three classes. However, except for one detailed diagnostic table, match types 1, 2, and 3 are combined.

Principal results—

1. Conditions reported on Med 10 and in survey interviews.

Recorded on Med 10	Reported in survey		
	Total	Yes	No
Total ¹	3,739	...
Yes	4,648	² 1,481	3,167
No	2,258	-

¹Weighted to allow for disproportionate sampling rates.

²Includes match codes 1, 2, and 3 (see item 2).

2. Matched conditions by type of match and class of condition.

Class of condition	Number of matched conditions	Percent by match type		
		1	2	3
Total	1,481	51.5	11.3	37.2
Class 1	826	63.3	11.0	25.7
Class 2	340	34.7	15.3	50.0
Class 3	315	38.7	7.6	53.7

3. Percent of Med 10 chronic conditions reported in survey, with and without checklists, by class.

Class	With checklist	Without checklist
1	44.1	29.8
2	27.6	16.4
3	20.4	14.6

4. Survey reporting was better for conditions with more frequent and more recent physician services.

5. Survey reporting of conditions varied substantially by diagnostic category. The ratio of household interview frequency to Med 10 frequency varied from 0.38 to 7.33.

6. Self-reporting of conditions in the survey was only slightly better than proxy reporting.

References—NCHS Series 2, No. 7;⁴⁸ Sagen, Dunham, and Simmons;⁶⁵ and Woolsey, Lawrence, and Balamuth.³⁴

Study No. 11. Kaiser-Permanente record check

Type of study—A reverse record check, with split-panel test of three questionnaire versions.

Study population—Persons 17 years and over (at time of interview) who were members of the Kaiser-Permanente Foundation Health Plan (KP) during the study period, which began in January 1960 and lasted about 3 years.

Sample design—A disproportionate stratified sample of persons was selected for interviews. Persons with more frequent visits to KP physicians were oversampled. The interview sample was allocated at random among the three questionnaires.

Sample size—The sample size was approximately 2,000 persons.

Collection mode—A face-to-face interview by U.S. Bureau of the Census interviewers during the period October 1962–January 1963. No proxy response was allowed.

Survey questionnaires—There were three versions, varying primarily in the format and administration of the sections relating to chronic conditions. Questionnaire 1 was very similar to the questionnaire used for NHIS at that time. Questionnaire 2 added several new items to the standard probes used to identify conditions prior to using the checklist and used reworded, self-administered versions of the checklists. Questionnaire 3 used the same basic approach as questionnaire 1 except for the checklists, which were the same as those used with questionnaire 2. Copies of the questionnaires are included in references 48 and 52.

Source of record data—For the study, arrangements were made with physicians of the Southern California Permanente Medical Group to complete a special Physician Visit Record

NOTE: A list of references follows the text.

(PVR) for each visit by a designated sample of KP members. The PVR's, which were kept over a 12-month period for each sample person, included a "visit diagnosis," information about communication between patient and physician, estimates of the onset and impact of conditions, and type of treatment given.

Matching procedure—The PVR's and questionnaires for the interviewed persons were sent to NCHS, where they were demographically and medically coded. The chronic conditions on the PVR's and questionnaires were identified, compared, and matched. Match code A was assigned if a condition appearing on the PVR and the questionnaire was in the same "recode 3 class." This recode consisted of 47 categories, each consisting of one ICD-NHIS 4-digit code or more. Match code B was assigned if the conditions appearing on the PVR and the questionnaire were not in the same recode 3 class, but "appeared to be associated" (reference 47). All other conditions from either source were treated as nonmatches.

Principal results—The analysis in reference 48 is limited to the match status of conditions reported on the Physician Visit Records (PVR's). Reference 52 covers gross and net differences for chronic conditions reported on the PVR's and interview questionnaires. The counts of conditions and persons in both references appear to be weighted to adjust for the varying sampling fractions used in different strata; however, neither reference is explicit on this point.

1. Conditions reported on PVR and in survey interviews⁵²

PVR	Total	Interview			
		Match code A	Yes	Match code B	No
Total ¹	7,182	. . .	4,714	. . .	2,468
Yes	5,279	1,930	. . .	881	2,468
No	1,903	. . .	1,903	. . .	-

¹Excludes conditions not treated exclusively at SCPMG and those not treated at SCGMP in the last 12 months.

2. Percent of conditions reported on PVR but omitted from survey interviews, for selected characteristics.⁴⁸

Characteristic	Percent not reported in interview
Number of physician visits in last 12 months	
1 visit.	55.7
2 visits.	47.2
3 visits.	34.7
4-5 visits	26.0
6 visits or more.	14.0
Days since last visit	
1-28 days.	22.6
28 days or more	50.7
Perceived general state of health	
Excellent	60.4
Good	44.9
Fair.	32.7
Poor.	30.4

NOTE: A list of references follows the text.

Characteristic—Con.	Percent not reported in interview—Con.
Receiving medicine or treatment	
Yes.	32.5
No	54.6
Causing pain or discomfort	
Yes.	34.2
No	52.3
Causing limitation of work or housework	
Yes.	28.8
No	54.1

Summary—The greatest effects on reporting in the interview were observed for number and recency of physician visits, perceived state of health, and impact of the condition on activities and well-being. Differences by respondent demographic characteristics, for example, age, race, sex, education, and income, were observed, but were generally smaller. Differences in physician-patient communication, as reported by physicians, had little effect on whether a condition was reported, but did affect the accuracy with which respondents were able to describe it in the interview.

3. Conditions, by extent of underreporting and overreporting^a (reference 52, p. 9)

a. Low underreporting and overreporting

- Diabetes.
- Vascular lesions of the central nervous system.
- Heart conditions.
- Diseases of the gallbladder.
- Absence of fingers and toes.

b. High underreporting, relatively low overreporting

- Benign and unspecified neoplasms.
- Mental illness of specified type.
- Skin diseases.

c. High overreporting, lower underreporting

- Hay fever.
- Asthma.
- Tuberculosis.
- Headache and migraine.
- Hypertension.
- Hemorrhoids.
- Rheumatic fever.
- Sinusitis.
- Bronchitis.
- Visual and hearing impairments.
- Speech defects.

^aUnderreported conditions were those appearing on the PVR's, but not reported in interviews; overreported conditions were reported in interviews, but not on the PVR's.

4. Results of split-panel test of 3 questionnaire versions⁴⁸

PVR conditions by match status

<i>Questionnaire version</i>	<i>Code A</i>	<i>Code B</i>	<i>Not reported in interview</i>
1	33.2	16.5	50.4
2	39.5	19.3	41.1
3	39.6	15.4	45.0

NOTE: No estimated sampling errors were available. The text states: "... the overall differences . . . were not large enough to be important." Other data showed that, for version 2, more conditions were reported prior to reaching the checklist because of the inclusion of additional impact questions.

References—NCHS Series 2, No. 23,⁴⁹ and NCHS Series 2, No. 57.⁵²

NOTE: A list of references follows the text.

Appendix II

List of conditions always regarded as chronic

Chronic condition—A condition is considered chronic if (1) the condition is described by the respondent as having been first noticed more than 3 months before the week of the interview, or (2) it is one of the following conditions always classified as chronic regardless of the onset:

Absence (loss) of breast, ear, eye, kidney, larynx (voice box), lip, limb(s), lung, nose, or tongue

Alcoholism

Allergy, any, *except* cases with onset in past 3 months *and* due to drugs, bee sting, venomous bites (such as snake and spider), chemicals (contactants, including sunburn, substances taken internally, or radiation)

Arteriosclerosis

Arthritis, any type or cause, *except* when due to current acute injury

Asthma, any type

Bronchiectasis

Calculi (stones), any part of urinary system

Cancer, any type

Cardiac condition, any type

Cataract, any type or origin

Cerebral palsy (and synonyms)

Cerebrovascular disease

Cirrhosis of liver

Clawfoot

Cleft palate

Clubfoot

Color blindness

Congenital condition, any

Coronary condition

Cyst, any site or type

Deafmutism; other total deafness

Detachment of retina

Diabetes, any form

Drug addiction or dependence

Emphysema

Epilepsy, *except* when due to current acute injury

Flatfoot, fallen arches

Glaucoma, any type or origin

Goiter

Gout, any type or cause

“Growth” (in, on) any site

Harelip

Hay fever (any synonyms)

Heart or cardiac disease, any type or cause

Hemeralopia (day blindness)

Hemorrhoids (piles)

Hernia (or “rupture”)

Hypertension, *except* that arising in current pregnancy

Mental deficiency, or retardation

Mental disorders.

Mole (pigmented, nonpigmented, benign, malignant)

Mongolism (or synonym)

Multiple sclerosis

Neoplasm

Neuroses

Nyctalopia (night blindness)

Optic nerve disorders

Paralysis agitans (Parkinson’s disease), any cause

Personality disorders

Polyyps, any site

Prostate condition, any

Psychosis, any type

Refractive errors

Retardation, mental

Retinal conditions

Retrolental fibroplasia

Rheumatic fever, active or inactive

Rheumatism (muscular) *except* due to current acute injury

Rupture meaning hernia

Specific learning disturbances

Stones (calculi) any part of urinary system

Stroke or other cerebrovascular disease

Thyroid (gland) condition, any

Trick knee

Tuberculosis, any site or stage

Tumor

Ulcer of stomach, duodenum or jejunum

Varicose veins of any site

In addition, such terms as atrophy, contracture, deformity, degeneration, dystrophy, fibrosis, sclerosis—of any site—will be coded “1,” regardless of onset and any condition coded to X00–X99 (impairments).

Appendix III

NHIS questionnaire conditions

pages^b

CONDITION 1	Person No. _____		
1. Name of condition			
<i>Mark "2-wk. ref. pd." box without asking if "DV" or "HS" in C2 as source.</i>			
2. When did [---/anyone] last see or talk to a doctor or assistant about -- (condition)?			
0 <input type="checkbox"/> Interview week (Reask 2)	5 <input type="checkbox"/> 2 yrs., less than 5 yrs		
1 <input type="checkbox"/> 2-wk. ref. pd	6 <input type="checkbox"/> 5 yrs. or more		
2 <input type="checkbox"/> Over 2 weeks, less than 6 mos.	7 <input type="checkbox"/> Dr. seen, DK when		
3 <input type="checkbox"/> 6 mos., less than 1 yr.	8 <input type="checkbox"/> DK if Dr. seen		
4 <input type="checkbox"/> 1 yr., less than 2 yrs.	9 <input type="checkbox"/> Dr. never seen		
(3b)			
3a. (Earlier you told me about -- (condition)) Did the doctor or assistant call the (condition) by a more technical or specific name?			
1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No		
9 <input type="checkbox"/> DK			
<i>Ask 3b if "Yes" in 3a, otherwise transcribe condition name from item 1 without asking:</i>			
b. What did he or she call it? _____			
<i>Specify</i>			
1 <input type="checkbox"/> Color Blindness (NC)	2 <input type="checkbox"/> Cancer (3e)		
3 <input type="checkbox"/> Normal pregnancy, normal delivery, vasectomy } (5)	4 <input type="checkbox"/> Old age (NC)		
	8 <input type="checkbox"/> Other (3c)		
c. What was the cause of -- (condition in 3b)? (Specify)			

<i>Mark box if accident or injury.</i> 0 <input type="checkbox"/> Accident injury (5)			
d. Did the (condition in 3b) result from an accident or injury?			
1 <input type="checkbox"/> Yes (5)	2 <input type="checkbox"/> No		
<i>Ask 3e if the condition name in 3b includes any of the following words:</i>			
Ailment	Cancer	Disease	Problem
Anemia	Condition	Disorder	Rupture
Asthma	Cyst	Growth	Trouble
Attack	Defect	Measles	Tumor
Bad			Ulcer
e. What kind of (condition in 3b) is it? _____			
<i>Specify</i>			
<i>Ask 3f only if allergy or stroke in 3b-e.</i>			
f. How does the [allergy/stroke] NOW affect --? (Specify)			

<i>For Stroke, fill remainder of this condition page for the first present effect. Enter in item C2 and complete a separate condition page for each additional present effect.</i>			

Ask 3g if there is an impairment (refer to Card CP2) or any of the following entries in 3b-f:

Abscess	Damage	Palsy
Ache (except head or ear)	Growth	Paralysis
Bleeding (except menstrual)	Hemorrhage	Rupture
Blood clot	Infection	Sore(ness)
Boil	Inflammation	Stiff(ness)
Cancer	Neuralgia	Tumor
Cramps (except menstrual)	Neuritis	Ulcer
Cyst	Pain	Varicose veins
		Weak(ness)

g. What part of the body is affected? _____

Specify

Show the following detail:

Head skull, scalp, face

Back/spine/vertebrae upper, middle, lower

Side left or right

Ear inner or outer; left, right, or both

Eye left, right, or both

Arm shoulder, upper, elbow, lower or wrist; left, right, or both

Hand entire hand or fingers only, left, right, or both

Leg hip, upper, knee, lower, or ankle; left, right, or both

Foot entire foot, arch, or toes only; left, right, or both

Except for eyes, ears, or internal organs, ask 3h if there are any of the following entries in 3b-f:

Infection	Sore	Soreness
-----------	------	----------

h. What part of the (part of body in 3b-g) is affected by the [infection/sore/soreness] - the skin, muscle, bone, or some other part?

Specify

Ask if there are any of the following entries in 3b-f:

Tumor	Cyst	Growth
-------	------	--------

4. Is this [tumor/cyst/growth] malignant or benign?

1 Malignant 2 Benign 9 DK

5

a. When was -- (condition in 3b/3f) first noticed?

1 2-wk. ref. pd.

2 Over 2 weeks to 3 months

3 Over 3 months to 1 year

4 Over 1 year to 5 years

5 Over 5 years

b. When did -- (name of injury in 3b)?

Ask probes as necessary:

(Was it on or since (first date of 2-week ref. period) or was it before that date?)

(Was it less than 3 months or more than 3 months ago?)

(Was it less than 1 year or more than 1 year ago?)

(Was it less than 5 years or more than 5 years ago?)

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^bThe questionnaire includes additional identical pages for recording up to seven conditions. If more are reported, additional questionnaires are used.

K1 Refer to RD and C2.
 "Yes" in "RD" box AND more than 1 condition in C2 (6)
 Other (K2)

6a. During the 2 weeks outlined in red on that calendar, did -- (condition) cause -- to cut down on the things -- usually does?
 Yes No (K2)

b. During that period, how many days did -- cut down for more than half of the day?
 00 None (K2) _____ Days

7. During those 2 weeks, how many days did -- stay in bed for more than half of the day because of this condition?
 00 None _____ Days

Ask if "Wa/Wb" box marked in C1:

8. During those 2 weeks, how many days did -- miss more than half of the day from -- job or business because of this condition?
 00 None _____ Days

Ask if age 5-17:

9. During those 2 weeks, how many days did -- miss more than half of the day from school because of this condition?
 00 None _____ Days

K2 Condition has "CL LTR" in C2 as source (10)
 Condition does not have "CL LTR" in C2 as source (K4)

10. About how many days since (12-month date) a year ago, has this condition kept -- in bed more than half of the day? (Include days while an overnight patient in a hospital.)
 000 None _____ Days

11. Was -- ever hospitalized for -- (condition in 3)?
 1 Yes 2 No

K3 Missing extremity or organ (K4)
 Other (12)

12a. Does -- still have this condition?
 1 Yes (K4) No

b. Is this condition completely cured or is it under control?
 2 Cured 8 Other (Specify) _____
 3 Under control (K4) _____ (K4)

c. About how long did -- have this condition before it was cured?
 Less than 1 month OR _____ Number } Months
 } Years

d. Was this condition present at any time during the past 12 months?
 1 Yes 2 No

K4 0 Not an accident/injury (NC)
 1 First accident/injury for this person (14)
 8 Other (13)

13. Is this (condition in 3b) the result of the same accident you already told me about?
 Yes (Record condition page number where accident questions first completed.) → _____ Page No. (NC)
 No

14. Where did the accident happen?
 1 At home (inside house)
 2 At home (adjacent premises)
 3 Street and highway (includes roadway and public sidewalk)
 4 Farm
 5 Industrial place (includes premises)
 6 School (includes premises)
 7 Place of recreation and sports, except at school
 8 Other (Specify) _____

Mark box if under 18. Under 18 (16)

15a. Was -- under 18 when the accident happened?
 1 Yes (16) No

b. Was -- in the Armed Forces when the accident happened?
 2 Yes (16) No

c. Was -- at work at -- job or business when the accident happened?
 3 Yes 4 No

16a. Was a car, truck, bus, or other motor vehicle involved in the accident in any way?
 1 Yes 2 No (17)

b. Was more than one vehicle involved?
 1 Yes 2 No

c. Was [it/either one] moving at the time?
 1 Yes 2 No

17a. At the time of the accident what part of the body was hurt? What kind of injury was it? Anything else?

Part(s) of body *	Kind of injury

Ask if box 3, 4, or 5 marked in Q.5:

b. What part of the body is affected now? How is -- (part of body) affected? Is -- affected in any other way?

Part(s) of body *	Present effects **

* Enter part of body in same detail as for 3g.
 ** If multiple present effects, enter in C2 each one that is not the same as 3b or C2 and complete a separate condition page for it.

Appendix IV

NHIS questionnaire checklists

questions

H. CONDITION LISTS 1 AND 2

Read to respondent(s) and ask list specified in A2:

Now I am going to read a list of medical conditions. Tell me if anyone in the family has any of these conditions, even if you have mentioned them before.

1		2	
<p>1a. Does anyone in the family {read names} NOW have – If "Yes," ask 1b and c.</p> <p>b. Who is this?</p> <p>c. Does anyone else NOW have – Enter condition and letter in appropriate person's column.</p>		<p>2a. Does anyone in the family {read names} NOW have – If "Yes," ask 2b and c.</p> <p>b. Who is this?</p> <p>c. Does anyone else NOW have – Enter condition and letter in appropriate person's column.</p> <p>A–L are conditions affecting {Hearing Vision Speech}</p> <p>Conditions O–W are impairments.</p> <p>Conditions Y and Z affect the nervous system.</p>	
<p>A. PERMANENT stiffness or any deformity of the foot, leg, fingers, arm, or back? (Permanent stiffness – joints will not move at all.)</p> <p>B. Paralysis of any kind?</p>		<p>A. Deafness in one or both ears?</p> <p>B. Any other trouble hearing with one or both ears?</p> <p>C. Tinnitus or ringing in the ears?</p> <p>D. Blindness in one or both eyes?</p> <p>E. Cataracts?</p> <p>F. Glaucoma?</p> <p>G. Color blindness?</p> <p>H. A detached retina or any other condition of the retina?</p> <p>I. Any other trouble seeing with one or both eyes EVEN when wearing glasses?</p> <p>J. A cleft palate or Harelip?</p> <p>K. Stammering or Stuttering?</p> <p>L. Any other speech defect?</p> <p>M. A missing finger, hand, or arm; toe, foot, or leg?</p> <p>N. A missing (breast), kidney, or lung?</p>	
<p>1d. DURING THE PAST 12 MONTHS, did anyone in the family have – If "Yes," ask 1e and f.</p> <p>e. Who was this?</p> <p>f. DURING THE PAST 12 MONTHS, did anyone else have – Enter condition and letter in appropriate person's column. Conditions C–N and V are conditions affecting the bone and muscle. Conditions O–U and W–Z are conditions affecting the skin.</p>		<p>O. Palsy or Cerebral palsy? (ser'a-bral)</p> <p>P. Paralysis of any kind?</p> <p>Q. Curvature of the spine?</p> <p>R. REPEATED trouble with back or spine?</p> <p>S. Any TROUBLE with fallen arches or flatfeet?</p> <p>T. A clubfoot?</p> <p>U. PERMANENT stiffness or any deformity of the foot, leg, or back? (Permanent stiffness – joints will not move at all.)</p> <p>V. PERMANENT stiffness or any deformity of the fingers, hand, or arm?</p> <p>W. Mental retardation?</p> <p>X. Any condition caused by an accident or injury which happened more than 3 months ago? If "Yes," ask: What is the condition?</p> <p>Y. Epilepsy?</p> <p>Z. REPEATED convulsions, seizures, or blackouts?</p>	
C. Arthritis of any kind or Rheumatism?	Reask 1d P. Eczema or Psoriasis? (ek'sa-ma) or (so-rye-uh-sis)		
D. Gout?	Q. TROUBLE with dry or itching skin?		
E. Lumbago?	R. TROUBLE with acne?		
F. Osteomyelitis? (os-tee-oh-my-uh-lye'tis)	S. A skin ulcer?		
G. A bone cyst or bone spur?	T. Any kind of skin allergy?		
H. Any other disease of the bone or cartilage?	U. Dermatitis or any other skin trouble?		
I. A trick knee?	V. TROUBLE with fallen arches, flatfeet, or clubfoot?		
J. A slipped or ruptured disc?	W. TROUBLE with ingrown toenails or fingernails?		
K. Curvature of the spine?	X. TROUBLE with bunions, corns, or calluses?		
L. REPEATED trouble with neck, back, or spine?	Y. Any disease of the hair or scalp?		
M. Bursitis or Synovitis? (sin-o-vye'tis)	Z. Any disease of the lymph or sweat glands?		
N. Any disease of the muscles or tendons?			
O. A tumor, cyst, or growth of the skin?			

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*Only one of the six checklists is used for each sample household.

H. CONDITION LISTS 3 AND 4

Read to respondent(s) and ask list specified in A2:

Now I am going to read a list of medical conditions. Tell me if anyone in the family has had any of these conditions, even if you have mentioned them before.

3	<p>3a. DURING THE PAST 12 MONTHS, did anyone in the family <u>{read names}</u> have – If "Yes," ask 3b and c.</p> <p>b. Who was this?</p> <p>c. DURING THE PAST 12 MONTHS, did anyone else have – Enter condition and letter in appropriate person's column. Make no entry in item C2 for cold; flu; red, sore, or strep throat; or "virus" even if reported in this list. Conditions affecting the digestive system.</p>		4	<p>4a. DURING THE PAST 12 MONTHS, did anyone in the family <u>{read names}</u> have – If "Yes," ask 4b and c.</p> <p>b. Who was this?</p> <p>c. DURING THE PAST 12 MONTHS, did anyone else have – Enter condition and letter in appropriate person's column.</p>	
	A. Gallstones?	Reask 3a N. Any other stomach trouble?		A. A goiter or other thyroid trouble?	} Glandular disorders
	B. Any other gallbladder trouble?	O. Enteritis?		B. Diabetes?	
	C. Cirrhosis of the liver?	P. Diverticulitis? (Dye-ver-tic-yoo-lye'tis)		C. Cystic fibrosis?	
	D. Fatty liver?	Q. Colitis?		D. Anemia?	
	E. Hepatitis?	R. A spastic colon?		E. Epilepsy?	} Condition affecting the nervous system
	F. Yellow jaundice?	S. FREQUENT constipation?		F. Multiple sclerosis?	
	G. Any other liver trouble?	T. Any other bowel trouble?		G. Migraine?	
	H. Any disease of the pancreas?	U. Any other intestinal trouble?		H. Neuralgia or Neuritis?	
	I. An ulcer?	V. Cancer of the stomach, colon, or rectum?		I. Sciatica? (si-at i-kuh)	} Genito-urinary conditions
	J. A hernia or rupture?	W. During the past 12 months, did anyone (else) in the family have any other condition of the digestive system? If "Yes," ask: Who was this? – What was the condition? Enter in item C2. THEN reask W.		J. Nephritis?	
	K. Any disease of the esophagus?			K. Kidney stones?	
	L. Gastritis?			L. Any other kidney trouble?	
M. FREQUENT indigestion?		M. Bladder trouble?			
		N. Prostate trouble?			
		O. Any disease of the uterus or ovary?			
		P. Any other female trouble?			
		Q. Cancer of any kind?			

H. CONDITION LISTS 5 AND 6

Read to respondent(s) and ask list specified in A2.

Now I am going to read a list of medical conditions. Tell me if anyone in the family has had any of these conditions, even if you have mentioned them before.

<p>5</p> <p>5a. Has anyone in the family (<u>read names</u>) EVER had – If "Yes," ask 5b and c.</p> <p>5b. Who was this?</p> <p>5c. Has anyone else EVER had – Enter condition and letter in appropriate person's column. Conditions affecting the heart and circulatory system.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">A. Rheumatic fever?</td> <td style="width: 50%; padding: 2px;">G. A stroke or a Cerebrovascular accident? (ser'a-bro vas ku-lar)</td> </tr> <tr> <td style="padding: 2px;">B. Rheumatic heart disease?</td> <td style="padding: 2px;">H. A hemorrhage of the brain?</td> </tr> <tr> <td style="padding: 2px;">C. Hardening of the arteries or Arteriosclerosis?</td> <td style="padding: 2px;">I. Angina pectoris? (pek'to-ris)</td> </tr> <tr> <td style="padding: 2px;">D. Congenital heart disease?</td> <td style="padding: 2px;">J. A myocardial infarction?</td> </tr> <tr> <td style="padding: 2px;">E. Coronary heart disease?</td> <td style="padding: 2px;">K. Any other heart attack?</td> </tr> </table> <p>5d. DURING THE PAST 12 MONTHS, did anyone in the family have – If "Yes," ask 5e and f.</p> <p>5e. Who was this?</p> <p>5f. DURING THE PAST 12 MONTHS, did anyone else have – Enter condition and letter in appropriate person's column. Conditions affecting the heart and circulatory system.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">L. Damaged heart valves?</td> <td style="width: 50%; padding: 2px;">R. Gangrene?</td> </tr> <tr> <td style="padding: 2px;">M. Tachycardia or Rapid heart?</td> <td style="padding: 2px;">S. Varicose veins?</td> </tr> <tr> <td style="padding: 2px;">N. A heart murmur?</td> <td style="padding: 2px;">T. Hemorrhoids or Piles?</td> </tr> <tr> <td style="padding: 2px;">O. Any other heart trouble?</td> <td style="padding: 2px;">U. Phlebitis or Thrombophlebitis?</td> </tr> <tr> <td style="padding: 2px;">P. An aneurysm? (an yoo-rizm)</td> <td style="padding: 2px;">V. Any other condition affecting blood circulation?</td> </tr> <tr> <td style="padding: 2px;">Q. Any blood clots?</td> <td></td> </tr> </table>	A. Rheumatic fever?	G. A stroke or a Cerebrovascular accident? (ser'a-bro vas ku-lar)	B. Rheumatic heart disease?	H. A hemorrhage of the brain?	C. Hardening of the arteries or Arteriosclerosis?	I. Angina pectoris? (pek'to-ris)	D. Congenital heart disease?	J. A myocardial infarction?	E. Coronary heart disease?	K. Any other heart attack?	L. Damaged heart valves?	R. Gangrene?	M. Tachycardia or Rapid heart?	S. Varicose veins?	N. A heart murmur?	T. Hemorrhoids or Piles?	O. Any other heart trouble?	U. Phlebitis or Thrombophlebitis?	P. An aneurysm? (an yoo-rizm)	V. Any other condition affecting blood circulation?	Q. Any blood clots?		<p>6</p> <p>6a. DURING THE PAST 12 MONTHS, did anyone in the family (<u>read names</u>) have – If "Yes," ask 6b and c.</p> <p>6b. Who was this?</p> <p>6c. DURING THE PAST 12 MONTHS, did anyone else have – Enter condition and letter in appropriate person's column. Make no entry in item C2 for cold, flu, red, sore, or strep throat, or "virus" even if reported in this list. Conditions affecting the respiratory system.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">A. Bronchitis?</td> <td style="width: 50%; padding: 2px;">Reask 6a. K. Emphysema?</td> </tr> <tr> <td style="padding: 2px;">B. Bronchiectasis? (brong ke-ek tah-sis)</td> <td style="padding: 2px;">L. Pleurisy?</td> </tr> <tr> <td style="padding: 2px;">C. Asthma?</td> <td style="padding: 2px;">M. Tuberculosis?</td> </tr> <tr> <td style="padding: 2px;">D. Hay fever?</td> <td style="padding: 2px;">N. An abscess of the lung?</td> </tr> <tr> <td style="padding: 2px;">E. 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How many times did -- have (<u>condition</u>) in the past 12 months? If 2 or more times, enter condition in item C2. If only 1 time, ask:</p> <p>2. How long did it last? If 1 month or longer, enter in item C2. If less than 1 month, do not record. If tonsils or adenoids were removed during past 12 months, enter the condition causing removal in item C2.</p>	A. Bronchitis?	Reask 6a. K. Emphysema?	B. Bronchiectasis? (brong ke-ek tah-sis)	L. Pleurisy?	C. Asthma?	M. Tuberculosis?	D. Hay fever?	N. An abscess of the lung?	E. A nasal polyp?	O. A tumor, cyst, or growth of the throat, larynx, or trachea?	F. Sinus trouble?	P. Any work-related respiratory condition such as dust on the lungs, silicosis or pneu-mo-co-ni-o-sis?	G. A deflected or deviated nasal septum?	Q. During the past 12 months did anyone (else) in the family have any other respiratory, lung, or pulmonary condition? If "Yes," ask: Who was this? What was the condition? Enter in item C2, THEN reask Q.	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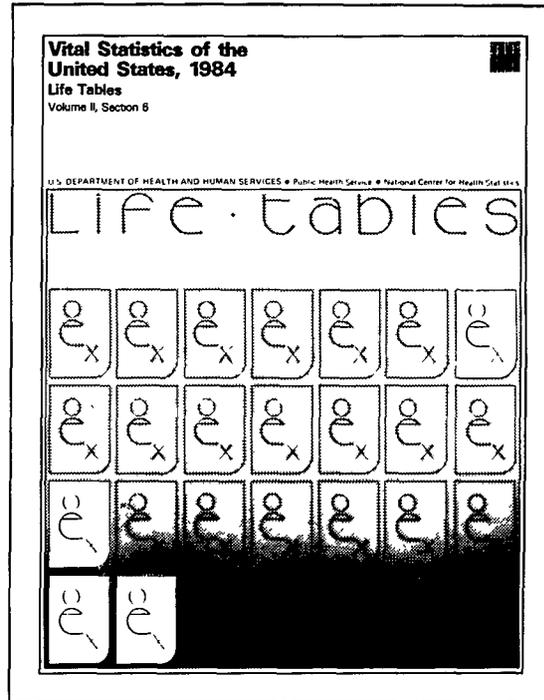
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