

## **Linking the National Medical Expenditure Survey With the National Health Interview Survey Analysis of Field Trials**

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This report presents the results of field trials that tested and evaluated alternative strategies for using the National Health Interview Survey as the sampling frame for the National Medical Expenditure Survey. Several design factors were tested, including two types of sampling units, two modes of initial contact, and two modes of interview. The criteria used in the evaluation were response rates, refusal rates, level of effort, and costs associated with the different design factors. The findings indicate that the experimental treatments had little impact on response rates but differed in level of effort and data quality.

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# Foreword

This is the fourth report presenting results of research on the effects of integrating the designs of the National Center for Health Statistics (NCHS) national household sample surveys, which heretofore were designed as independent surveys. Design integration is accomplished by using the files of the National Health Interview Survey (NHIS), the largest and only continuing NCHS population survey, as the sampling frame for other population surveys. Research findings with respect to linking the 1987 National Survey of Family Growth (NSFG) were presented in two earlier reports in this publication series; findings with respect to linking the National Medical Expenditure Survey (NMES) were presented in a third. Design alternatives for integrating the National Medical Expenditure Survey with the National Health Interview Survey, Series 2, No. 101.

Through statistical modeling techniques, the earlier report indicated that significant economies would be realized by linking NMES to NHIS if NMES put a premium on small-domain estimates. This report presents the results of a field experiment concerning the linkage of NMES to NHIS in which the effects

of several design options on response rates, refusal rates, level of effort, and associated costs were measured. The findings indicate that it is operationally feasible to link the two surveys and that it would be possible to increase cost efficiency through design option selection.

Dr. Monroe Sirken, Associate Director, Office of Research and Methodology, developed the Integrated Survey Design program at NCHS. The success of the project was dependent upon the cooperative efforts of two U.S. Public Health Service agencies, the National Center for Health Statistics and the National Center for Health Services Research and Health Care Technology Assessment (NCHSR). I am grateful for the contributions of Dr. Marc Berk of NCHSR. He and I provided technical oversight to Westat, the contractor that performed this study.

Andrew A. White  
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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
-

# Linking the National Medical Expenditure Survey With the National Health Interview Survey

## Analysis of Field Trials

by Nancy A. Mathiowetz and E. Patrick Ward, Westat, Inc.

## Chapter 1 Summary

The National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics (NCHS), is a continuous survey of approximately 48,000 households annually. NCHS, in conjunction with other Government agencies, also conducts three other independently designed population-based surveys to collect data relating to the health of the U.S. population: the National Medical Expenditure Survey (NMES), the National Survey of Family Growth (NSFG), and the National Health and Nutrition Examination Survey (NHANES). A major concern in conducting four independent population surveys is the cost of sampling and the screening that must be completed to identify the eligible respondents for each survey. In particular, potentially high screening costs have tended to inhibit attempts to oversample subgroups for which separate analyses would be desirable. One way to reduce these costs would be to use the relatively large NHIS sample to identify respondents of particular interest, thereby limiting, if not altogether eliminating, the need for a separate screening operation to identify these respondents.

Until recently, the sample design of NHIS involved an area and list frame based on decennial census information. As decennial census information is confidential, the NHIS sample could not be used as a sampling frame for other population-based surveys. In 1985, the NHIS sample was redesigned as an area probability sample. With this change, it became possible to consider using the NHIS as the sampling frame for other population-based surveys.

This report presents results of an experimental study designed to investigate the feasibility of integrating the design of the NHIS with that of the National Medical Expenditure Survey (NMES) scheduled to be conducted in 1987 and 1988. In addition to obtaining information about the general population, a major analytic objective of NMES will be to assess the utilization of health care by certain demographic subdomains. Health care obtained by the elderly, the poor, and persons who are functionally disabled will be of particular interest in NMES. Obtaining adequate samples of these groups for NMES would normally require that field work begin with a large and costly screening operation. The scope of that operation could be reduced, however, if the respondents sought for NMES were identified from the NHIS sample. In collaboration with the National Center for Health Services Research and Health

Care Technology Assessment (NCHSR), NCHS began investigating procedures for using the NHIS as the sample frame for NMES. This report presents the results of an experiment designed to investigate several different ways of integrating the designs of the NHIS and NMES.

### Experimental design

The NHIS/NMES linkage feasibility study consisted of two rounds of data collection. The design for the first round included two experimental factors, one based on alternative approaches to defining the sample unit for the linked surveys and the other on alternative modes for making initial contact with the respondents selected for the feasibility study. Sample units selected from the NHIS were defined for the feasibility study in one of two ways: as households or as housing units. The household sample was treated as a sample of households, or persons, in which interviews were attempted with all members of the NHIS household, regardless of their current address. Individuals who had moved since the NHIS interview were traced, and attempts were made to interview them at their new location. The housing unit sample was treated as a sample of addresses. Individuals residing at the selected addresses at the time of the feasibility study were interviewed, regardless of their participation in the NHIS.

Within the two types of sample units, cases were randomly assigned for different modes of initial contact. Half of the cases were initially contacted by telephone to arrange an appointment for the interview. The remaining cases were first contacted in person by the interviewer. All cases were sent an advance letter prior to the interviewer's first contact, and all of the first-round interviews were conducted in person.

The sample selected from the NHIS consists of 560 units that had participated in the NHIS and 44 NHIS nonresponse cases. The nonresponse cases were all assigned to the household sample and designated for in-person initial contact.

For the second or followup round of the feasibility study, the cases were designated for interviewing by telephone, from a centralized telephone interviewing facility, or in person, by local interviewers who had participated in the first round of data collection.

Several demographic measures are used throughout the

analysis to evaluate potential differential effects of the experimental factors on population subgroups. The three factors of interest are race (black, Hispanic, and white and other), poverty status (poor or near poor, defined as family income below 125 percent of the poverty level, and all other), and age (presence of at least one individual in the household age 65 years and over). In an attempt to parallel the analytic interests of NMES, several relatively rare groups are overrepresented in the NMES feasibility study sample. Most notably, the study includes an oversample of black elderly, Hispanic, and white elderly persons below 125 percent of the poverty level.

The analysis of the round 1 data collection focuses on three dependent measures: response rates, refusal rates, and level of effort. A discussion of the response rate and refusal rate calculations is presented in chapter 4. The mean number of in-person calls per completed interview is used as the primary measure for level of effort and for evaluating the most cost-efficient approach to a linked design.

The analysis of mode of data collection is limited to the second round of data collection. All respondents who completed the round 1 interview were recontacted 3 months later for a second interview. Half of the cases were assigned to be interviewed in person for the second interview; the remaining cases were administered by interviewers calling from a centralized telephone facility. Because the cost of telephone interviews is significantly lower than the cost of in-person interviews, this experiment was designed to evaluate whether the telephone mode of data collection results in lower response rates or data quality. The analysis focuses on response rates and item non-response rates. The latter measure is used as a proxy for data quality.

The NHIS/NMES linkage feasibility study differs in several ways from the two prior medical expenditure surveys, the National Medical Care Expenditure Survey (NMCES) and the National Medical Care Utilization and Expenditure Survey (NMCUES), and from the procedures that would be used for a design that linked the proposed NMES and the NHIS. First, the sample for the feasibility study was limited to eight sites, seven of which are large metropolitan areas. Selection of the metropolitan areas was necessary to meet sample size requirements, especially for black and Hispanic persons. These metropolitan areas are traditionally very difficult areas in which to interview, and their selection may have resulted in lower response rates than would be expected for a national design.

Second, the selection of NHIS cases for the feasibility study was made through a manual operation in which project

staff reviewed completed NHIS instruments. For future surveys, selection of a linked sample from computer data files rather than from the hard copy questionnaires would allow greater control of the selection process and provide greater flexibility as to the number and diversity of sampled sites.

Finally, the feasibility study questionnaire was significantly shorter, 50 minutes as compared with 90 minutes, and somewhat less complicated than those used in the two predecessor surveys. This factor may have led to higher response rates than might be expected with a longer questionnaire. Although these differences between the feasibility experiment and a future linked design should be considered when drawing inferences from the present study, the differences do not detract from the comparisons within the various treatments.

## Findings

The overall response rates for the household sample and the housing unit sample, not including the NHIS nonresponse cases, were not significantly different, 86.0 versus 88.4 percent, respectively. The direction of the difference, however, provides some indication that higher response rates might be expected with a housing unit sample. The lower response rate for a household sample is, for the most part, the result of unlocatable movers.

Mode of initial contact did appear to affect response rates when the data were pooled across the types of sample units. The response rate for units contacted initially in person was 90.1 percent; the rate for those contacted first by telephone was 84.4 percent. When examined separately within the household and housing unit samples, however, the differences in response rate and refusal rate experienced with the telephone and in-person contact groups were not significant. Mode of initial contact did have a significant effect on the overall level of effort associated with a completed interview. Within both the household and the housing unit samples, the telephone mode of initial contact resulted in a significant reduction in the number of in-person calls per completed interview.

Neither of the experimental treatments appeared to interact with any of the subdomains of interest.

The round 2 analysis, comparing the use of a telephone for data collection with in-person interviewing, indicated no difference in response rates or refusal rates. The quality of data collected on the telephone, however, as measured by the rates of item nonresponse for selected questionnaire items, was somewhat poorer than that for the in-person interviews.



## Chapter 2

# Introduction

The National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics, is a continuous survey of approximately 48,000 households annually. The National Center for Health Statistics, in conjunction with other Government agencies, also conducts three other independently designed population-based surveys to collect data relating to the health of the U.S. population: the National Medical Expenditure Survey, the National Survey of Family Growth, and the National Health and Nutrition Examination Survey. A major concern in conducting four independent population surveys is the cost of sampling and the screening that must be completed to identify the eligible respondents for each survey. In particular, potentially high screening costs have tended to inhibit attempts to oversample subgroups for which separate analyses would be desirable. One way to reduce these costs would be to use the relatively large NHIS sample to identify respondents of particular interest, thereby limiting, if not altogether eliminating, the need for a separate screening operation to identify these respondents.

Until recently, the sample design of NHIS involved an area and list frame based on decennial census information. As decennial census information is confidential, the NHIS sample could not be used as a sampling frame for other population-based surveys. In 1985, the NHIS sample was redesigned as an area probability sample. With this change, it became possible to consider using the NHIS as the sampling frame for other population-based surveys.

This report presents results of an experimental study designed to investigate the feasibility of integrating the design of the NHIS with that of the National Medical Expenditure Survey (NMES) scheduled to be conducted in 1987 and 1988. In addition to obtaining information about the general population, a major analytic objective of NMES will be to assess the utilization of health care by certain demographic subdomains. Health care obtained by the elderly, the poor, and persons who are functionally disabled will be of particular interest in NMES. Obtaining adequate samples of these groups for NMES would normally require that field work begin with a large and costly screening operation. The scope of that operation could be reduced, however, if the respondents sought for NMES were identified from the NHIS sample. In collaboration with the National Center for Health Services Research and Health Care Technology Assessment (NCHSR), NCHS began investigating procedures for using the NHIS as the sample frame for NMES. This report presents the results of an experiment designed to investigate several different ways of integrating the designs of the NHIS and NMES.

The NMES feasibility study is composed of two surveys: the household survey component and the medical provider

component, in which providers of health care reported by the household survey respondents are contacted for information to supplement that reported by the household. The household survey component is the focus of the present report.

The household survey component consists of two rounds of data collection. Two experimental factors are compared in round 1: mode of initial contact and type of sample unit (household versus housing unit). All of the units selected for the sample were sent an advance letter that briefly explained the study. Mode of initial contact was randomly assigned to the sample units, with 50 percent of the cases initially contacted by telephone to set up an appointment for an interview. The remaining 50 percent were initially contacted in person, with the interviewer visiting the sampled address and attempting to conduct the interview on the first visit.

Type of sample unit was randomly allocated within the mode of initial contact experiment, resulting in a two-way classification of all cases. As noted above, two different sample units were investigated, households and housing units. The households were treated as groups of sampled persons, all of whom were to be located and interviewed at their current addresses, including groups and individual group members who had moved since the time of the NHIS interview. The housing unit cases were treated as a sample of addresses: The interviewers were to contact and interview the current occupants of the selected addresses, even if the persons who had participated in the earlier NHIS no longer lived there.

The sample consists of respondents and nonrespondents to NHIS. NHIS respondent cases were allocated according to the scheme described above. NHIS nonrespondent cases were all assigned to the household, in-person mode of initial contact. The choice to assign nonrespondent cases to this particular cell was made for two reasons. First, as no information other than the unit address was available from the NHIS, it was not possible to assign the cases to the telephone mode of initial contact. Second, assigning the nonrespondent cases to the housing unit sample would have limited experience with NHIS nonrespondents to those cases that had not moved between the NHIS and the feasibility study. Placing all of the NHIS nonrespondents in the household sample provided a chance to gain experience with the difficulties of tracing movers about whom only minimal information was available.

Cases for which a completed interview was obtained during round 1 were recontacted 3 months later for a second interview. Prior to the round 1 interview, cases were assigned to either a telephone or in-person mode of data collection for round 2. The purpose of this experiment was to determine relative cost savings associated with telephone interviews in light of potential effects on response rates and data quality.

# Chapter 3

## Sample design

### Introduction

The National Medical Expenditure Survey (NMES) feasibility study was designed to address two issues relating to the conduct of a full national study: first, the response rates that could be achieved and the level of effort or costs required to carry out the study using the National Health Interview Survey as a sample frame; and second, the impact of alternative field procedures on the effort to carry out the linked survey. The sample design for the feasibility study was intended to provide a broad demographic distribution for addressing the study's analytic goals and to reflect the Government's interest in oversampling black, Hispanic, elderly, and poor persons in a future medical expenditure survey.

The sample design for the feasibility study is summarized in table 1. The column headed "Design size" shows the sample sizes intended for each of the population groups of interest in the study. As the table shows, black, Hispanic, and elderly persons and low-income households in all of the race and ethnicity classifications are oversampled.

The demographic classifications shown in table 1 are based on the persons enumerated as members of the NHIS sample units at the time of the NHIS interview. So that each sampled unit could be classified according to only one category of race and age, the NHIS units were classified according to the following criteria:

- For race and ethnicity, if any member of the household was classified as Hispanic at the time of the NHIS interview, the household was classified as Hispanic. Non-Hispanic sample units were classified as black if any member of the NHIS household was black. All remaining households were classified as other.
- For age, if any member of the household was 65 years old or over when the unit was sampled for the feasibility study, the household was classified in the elderly group, shown as 65 and over in the table. All other households were classified as non-elderly (less than 65).
- The income classification is based on a single summary item in the NHIS questionnaire that asks for family income. The 1984 poverty thresholds were used to classify households as low income (less than 125 percent of the threshold for a family of a given size) or other (equal to or greater than 125 percent of the threshold).

### Sample frame

The sample frame for the feasibility study consisted of the NHIS weekly samples of dwelling units in eight sites for the weeks from January 13, 1985, to April 30, 1985. The eight sites were Baltimore, Chicago, Detroit, Los Angeles, Mil-

waukee, San Antonio, San Francisco, and Tippecanoe County, Indiana. Further specification of the areas included in the study is contained in appendix III.

Site selection for the study was based on the need to meet the requirements for the different population groups specified in the study's sample design within a limited number of sites. Specifically, the need to locate Hispanic and black elderly households, both above and below 125 percent of the poverty line, led to the selection of several large metropolitan areas, including Chicago, Detroit, Los Angeles, and San Antonio.

The last column in table 1, entitled "Sample size," indicates the number of households actually identified for the feasibility study within each of the demographic groups of interest. The deviation from the sizes contemplated in the design is the result of a reduction in the number of NHIS sample weeks available for inclusion in the feasibility sample. Originally, the feasibility sample was to include NHIS cases spanning the period from January 13, 1985, to June 1, 1985. Processing of NHIS cases, however, made it necessary to restrict the sample for the feasibility study to interviews conducted before May 1, 1985.

The sample design for the feasibility study called for the inclusion of NHIS nonresponse cases, shown as the last group in table 1. These cases, which included refusals, vacant housing units, and other nonresponse, were included in the study to reduce the bias associated with NHIS nonresponse. NHIS generally achieves a very high response rate with few refusals. For each of its replicate samples, however, the survey has a relatively short field period of approximately 2 weeks. As a result, a large proportion of the survey's nonresponse is attributable to cases classified as not at home. With a longer field period, many of these cases could, presumably, be converted to completed interviews.

The inclusion of NHIS nonresponse cases has implications for the calculation of response rates for a linked survey. If the linked sample were limited to NHIS respondents, the response rate for the linked survey would have to include a factor to reflect the NHIS nonresponse. This calculation would parallel response rate calculations for studies in which screening and interviewing are conducted as separate operations, with an overall response rate calculated as the product of the screener response rate and the extended interview response rate. If, on the other hand, NHIS nonresponse cases are included in selections for the linked sample, the response rate calculations for the linked survey require no additional adjustment to reflect the NHIS response rate. NHIS nonresponse cases were included in the sample designed for the NMES feasibility study. To provide a basis of experience in dealing with these nonresponse cases, the design called for oversampling NHIS nonresponse cases. The NHIS usually experiences nonresponse of about 3

percent; NHIS nonresponse cases made up about 7 percent of the feasibility study sample.

## Sampling issues

The NHIS interview is a one-time interview in which data are collected for all civilian members of households. To the extent possible, all adult members of a household are encouraged to participate in the interview as self-reporters, although the questionnaire is designed so that one adult can report for the entire household.

The NMES is a panel survey designed to collect utilization and expenditure data for a specific calendar year. As with the NHIS, all adult members of a household are encouraged to participate in the interview. There are, however, several differences between the two surveys that have implications for an effort to use the NHIS sample as the sample frame for the NMES.

The NHIS is a household survey in which all persons related to each other and living at a sampled residence at the time of the interview are counted as one household. For the NHIS, adults living together who report themselves as married are treated as related, irrespective of the legal status of the marriage. Unrelated individuals and groups of persons who are related to one another but not to other groups of related persons in the same dwelling unit are interviewed separately. Students 17 years and over who live away from home while attending school are eligible to be interviewed at their school residence. Even students who consider their parents' home to be their usual residence are considered household members at their school residence if at school at the time of the NHIS interview.

Similar to the NHIS, the NMES treats all persons at a sampled address who are related to one another as a single reporting unit. Unrelated individuals are interviewed separately. The surveys differ, however, in their treatment of adults living together as married, who are not legally married. In such cases, a single household as defined by the NHIS would be separated into two reporting units for the NMES.

For NMES, unmarried students between the ages of 17 and 22 years who are living away from home are eligible for sampling only through their parents' residence, rather than their school residence. They are interviewed separately, but are linked to their parents' reporting unit for purposes of family level analysis.

The two surveys also differ in their treatment of persons on active duty with the Armed Forces. For the NHIS, members of the Armed Forces are considered household members if they usually sleep at the dwelling unit selected for the NHIS, but the NHIS does not collect health information about them. The NMES, in contrast, does collect health information on members of the Armed Forces who live in the same dwelling unit with civilian relatives. The NMES does not, however, treat active duty personnel as key persons; if they move away from the reporting unit during the period of the survey, they are not followed and interviewed at their new addresses.

Although these issues of definition are relatively minor, they must be taken into account in any design that links the two

studies. For the NMES feasibility study, interviews that could be identified as having been conducted with students in college dormitories or with households all of whose members were on active duty with the Armed Forces were excluded from selection.

Other issues that must be addressed when using the NHIS as a sample frame include possible multiple probabilities of selection, proper identification of reporting unit members, and manual versus computerized selection of sample cases. Each of these issues will be discussed separately.

When using the NHIS as the sample frame for another study, the possibility exists that some dwelling units will have multiple probabilities of selection, depending upon the number of families residing at the dwelling unit. At the time of the NHIS interview, data are collected for groups of related individuals residing at the address. Individuals who are not related are interviewed separately, using a separate questionnaire. The questionnaires for a sample address are not stored together, nor is a link made at the time the analytic data files are constructed. The cases can be linked, however, by the identification number associated with the address. The process of sample selection for the feasibility study was completed manually without consideration as to possible duplication in the selection of addresses. This factor should be considered in any future selection of a linked sample of addresses or housing units.

Another issue concerns the proper enumeration of individuals to be included in the NMES sample. Proper enumeration is especially problematic for NHIS nonresponse cases included in a household sample. The issue arises because of the need to distinguish who was living at the address at the time of the NHIS interview and who has lived at the address at any time since the NMES reference date. An example may be the best way to illustrate the problem.

On May 10th, an interviewer approaches an address selected from the NHIS nonrespondent cases and designated as an NMES household sample case. According to the household sample rules, all members of the household at the time of the NHIS interview are to be followed and interviewed for the NMES. Thus, the first instruction to the interviewer is to enumerate the persons who were at the household at the time the NHIS interviewer attempted to conduct the NHIS. (Assume this date to be February 1.) Assuming that all of the NHIS household members still reside at the address, the interviewer must next determine whether anyone else lived in the household between the beginning of the NMES reference date and the date of the interview. The possible permutations in movements in and out of a household make the design of a screener instrument to capture all of the eligible individuals quite difficult.

Finally, the selection of the cases for the present study was completed manually by reviewing the NHIS questionnaires and selecting, from among all of those completed at the eight sample sites, the numbers of households needed to meet the feasibility study sample size requirements. In part, the manual selection was due to the lag time between completion of the NHIS interviews and construction of the NHIS data files. The manual selection provided little control over the selection of cases and was extremely labor intensive. This approach should be avoided in future linked designs.

**Table 1. Sample distribution, design, and cases selected**

<i>Race and ethnicity</i> <sup>1</sup>	<i>Age</i> <sup>1</sup>	<i>Income</i> <sup>2</sup>	<i>Design size</i>	<i>Sample size</i>
	<u>Years</u>		<u>Number</u>	
Total.....	...		600	604
Black.....	Under 65	Below	60	63
		Above	60	65
Hispanic.....	65 and over	All	80	75
	All	Below	60	49
White and other.....		Above	60	71
	Under 65	Below	60	60
NHIS nonrespondents.....	65 and over	Above	60	59
	---	Below	60	29
		Above	60	89
		---	40	44

<sup>1</sup>Race, ethnicity, and age classifications indicate at least 1 person in the household in that category. The order of preference for race and ethnicity was Hispanic, black, and other and for age preference individuals age 65 years and over.

<sup>2</sup>Two income categories were defined: Less than 125 percent of the poverty level as defined by U.S. Bureau of the Census and greater than or equal to 125 percent of the poverty level.

# Chapter 4

## Study design

### Design of study operations

The pilot study was designed to evaluate alternative procedures for carrying out a National Medical Expenditure Survey (NMES) with respondents selected from the list of households previously sampled for the National Health Interview Survey (NHIS). As noted in chapter 3, the sample selected for the pilot study consisted of 560 units that had cooperated in the NHIS interview and 44 units that were contacted for, but did not participate in, the NHIS. To test alternative approaches to carrying out a linked study, the 560 units that had cooperated in the NHIS were randomly assigned to treatment groups based on the two experimental factors, mode of initial contact and type of sample unit.

#### Mode of initial contact

The mode of initial contact experiment consisted of two treatment groups—telephone and in person. Units were assigned for the interviewer to make the initial contact attempt by visiting the address in person or by making a telephone call to request an appointment for the interview. All sampled units received an advance letter mailed to the NHIS reporting unit address. The experiment with initial mode of interviewer contact was designed to measure the potential reductions in cost associated with the use of the telephone to schedule an appointment for the interview and attendant effects on response rates.

#### Sample unit

Within each of the two modes of initial contact groups, sample units were randomly allocated to two groups defined by type of sample unit. Half of the units were treated as households, that is, as groups of related persons, all of whom were to be interviewed. Individuals and entire NHIS families who had moved since the NHIS interview were to be located at their new addresses. Interviews were conducted if their new residences were within reasonable distance of any of the study interview sites. The other sample units were treated as housing units, that is, as a sample of addresses. For these, the sampled unit was assumed to be the address at which the NHIS interview had taken place. Interviewers were to contact and interview the current residents at these addresses, even if the persons who had participated in the NHIS no longer lived there. No tracing of respondents to new addresses was required for this part of the sample.

There are advantages and disadvantages with each type of sample unit. The household sample, in which the NHIS respondents are traced and interviewed regardless of address,

has the advantage of interviewing the target population groups of interest. However, locating movers has both monetary and response rate costs. The housing unit sample does not incur the costs associated with tracking and interviewing movers, but does have the disadvantage that target population groups may not be interviewed in desired proportions. Because the group of people occupying an address at the time of the NMES interview may be different from the group that was there for the NHIS interview and have different demographic characteristics, with the housing unit approach it may be difficult to meet precision levels for certain demographic groups without oversampling. The feasibility study was designed to assess these tradeoffs.

The cross-classification of the 560 NHIS participant sample units across the two experimental factors resulted in four equal treatment groups:

- Household cases designated for in-person initial contact.
- Household cases designated for telephone initial contact.
- Housing unit cases designated for in-person initial contact.
- Housing unit cases designated for telephone initial contact.

The allocation of cases to the four experimental treatments resulted in equal representation of demographic characteristics (age, race, income) across the groups.

All of the units selected from the list of NHIS nonrespondents were assigned to the household, in-person initial contact group. Because no NHIS interviews had been completed with members of this sample, names and telephone numbers were not available for them and designation for initial contact by telephone would have been inappropriate. The basic reason for including a sample of NHIS nonrespondents in the pilot study—to learn about the problems of interviewing a sample of nonrespondents in a linked survey—governed the decision to treat them all as part of the pilot study household sample. For this part of the sample, the only operational difference between the household and housing unit cases would have arisen when the NHIS reporting unit no longer lived at the NHIS address. For a housing unit case, this would have meant simply that the interviewer attempted to interview the new residents—someone other than the NHIS nonrespondents. With the assignment of all of the nonresponse units to the household sample, interviewers were required to attempt to locate the new addresses of any nonrespondents who had moved since the NHIS.

#### Round 2

For the second round of the feasibility study, all reporting units were treated as households. Entire families or individual

members of families who completed the first round of interviewing and who moved before the beginning of the second round were to be traced to their new addresses and interviewed there. The round 2 sample was divided, however, into two groups defined by mode of interviewing. During the sample allocations at the start of the survey, half of the cases were designated for in-person interviewing in round 2 and half for interviewing from the contractor's centralized telephone interviewing facility. Deviations from the assigned mode of data collection were allowed for respondents with no home telephone and for respondents who reported, during the round 1 interview, a hearing impairment or other condition that would limit their ability to participate by telephone. During the round 2 interviewing, additional exceptions were made to convert telephone refusals and when the telephone interviewers discovered a previously unreported hearing impairment or other limiting condition.

#### Self-administered questionnaire

Shortly before round 2, an additional measure of burden was placed on respondents in a subset of the cooperating round 1 reporting units. A self-administered questionnaire containing items about general health status, health-related habits, and attitudes toward medical care providers was mailed to each of the adult members of 180 reporting units. These respondents were asked to complete the questionnaires and, if assigned for in-person interviewing in round 2, to hold the completed instrument for the round 2 interviewer, or, if assigned for telephone interviewing, to mail the completed instrument to the data collection contractor.

A remuneration experiment was conducted with the sample selected to receive the self-administered questionnaires. Respondents in approximately a third of the 180 households were sent a \$5.00 check (per person) with the original request to complete the self-administered questionnaire. Another third of the households received a letter promising a \$5.00 check upon completion of the questionnaire; no mention of remuneration was made to the final third of the sample, but persons in this group who completed the form did receive the same remuneration as those in the other groups. To simplify administration of the experiment, the same payment procedure was assigned for all respondents within a study site. The results of this experiment are presented in Berk and others.<sup>1</sup>

#### Experimental independent measures

The features of the experimental design described in the preceding sections are the primary factors to be evaluated in the feasibility study. The three primary factors are the following:

- Initial contact by telephone or in person for the round 1 interview.
- Designation of the sample unit selected from the NHIS frame as a household or housing unit.
- Interviewing for round 2 by telephone or in person.

<sup>1</sup>M. L. Berk, E. P. Ward, A. A. White, and N. A. Mathiowetz: The Effect of Prepaid and Promised Incentives: Results of a Controlled Experiment. Paper presented at the Annual Meetings of the American Statistical Association, Chicago, 1986.

#### Independent demographic measures

The demographic measures that served as the basis for the sample selection are considered as independent variables in the analysis of the feasibility study data. These variables are used to examine the possibility that the linked approach as a whole or any of the experimental factors impact differently on different demographic subgroups.

The demographic measures in this report were derived from information in the NHIS questionnaires. As described in chapter 2, information on the NHIS households and their individual members was used to create the reporting unit level demographic variables for the study.

#### Dependent measures

Two measures, response rate and level of effort, are used to evaluate the effects of the design features.

##### Response rates

In general, response rates were calculated by dividing the number of completed interviews by the number of cases in the sample, adjusted as appropriate to eliminate ineligible or out-of-scope cases. Reporting units whose members were all on active duty with the Armed Forces or all of whose members had died since the NHIS interview are ineligible for NMES and, therefore, were excluded from the denominator of the response rate formula.

The formula used to calculate response rates varied slightly between the household and housing unit samples. The study protocol called for interviewers to trace members of reporting units in the household sample and interview them at their new addresses. For this sample, therefore, nonresponse cases resulting from persons or entire reporting units who moved and could not be located were retained in the denominator of the response rate. Individuals or families located but not interviewed because they now lived outside any of the study areas were, however, excluded from the numerator and the denominator. For cases in the housing unit sample in which residential addresses were the sampled units, no tracing was required; dwelling units that were unoccupied at the time of the NMES interview attempt were considered vacant and were dropped from the denominator of the response rate fraction.

The sampling rules also led to the exclusion of several student reporting units. The NHIS sample includes students living in college dormitories; for the NMES, students between the ages of 17 and 22 years who are unmarried and living away from home are sampled as members of the reporting unit at their parents' address. Several units selected for the feasibility study were made up solely of students living at school who, therefore, were ineligible according to the NMES selection rules. These reporting units were treated as ineligible for the interview and subtracted from the denominator of the response rate.

In summary, the response rate for household cases was calculated as follows:

$$R_H = \frac{N_c}{n - (N_m + N_d + N_a + N_s)}$$

where  $N_c$  = number of completed interviews

$n$  = total sample

$N_m$  = number of households moved out of interview area

$N_d$  = number of reporting units all of whose members have died

$N_a$  = number of reporting units all of whose members are on active duty with the Armed Forces

$N_s$  = number of reporting units all of whose members are ineligible students

The response rate for housing unit cases was calculated as follows:

$$R_{\text{HU}} = \frac{N_c}{n - (N_v + N_d + N_a + N_s)}$$

where  $N_v$  = the number of vacant dwelling units.

#### Weighted response rates

In this report no effort was made to weight the response rates of the feasibility study or to draw inferences regarding the response rates that would be attained in a full-scale NMES linked to the NHIS. The composition of the feasibility study was driven largely by the need to identify reporting units with the desired demographic characteristics from among the NHIS cases available at the time the sample was drawn. The resulting sample is drawn largely from the urbanized areas in which the rarer population groups—low-income families with elderly black or Hispanic members—could be found in the numbers needed for the survey.

#### Refusal rates

A second measure of cooperation, refusal rates, is used throughout the analysis. Although response rates are considered

the traditional measure for comparing the effectiveness of different methodologies, refusal rates provide the researcher with a quantification of refusals alone. The refusal rate is calculated as the number of refusals divided by the appropriate denominator discussed above.

#### Level of effort

The second set of measures considered as dependent variables in the analysis refers to the level of effort required to complete the data collection. For round 1, two levels of effort measures are used. The first measure is the number of personal visits per completed interview. The second measure is a cost measure, involving both interviewer labor and travel expenses per completed interview. The dominant factor in the level of effort analysis is the interviewer labor associated with a personal visit. Although there are costs associated with telephone calls, the travel and actual interviewing time required for the in-person round 1 interviewing far outweighs the other cost factors.

The measures relating to the number of telephone and in-person contacts were taken from the Record of Calls form completed by the interviewer to document each attempt to interview an assigned reporting unit. The information relating to interviewer hours and expenses was taken from the interviewers' weekly Time and Expense Reports. As noted in appendix 1, at any given time during the data collection period, assignments to an interviewer were limited to cases in one of the four experimental assignment groups: household in person, household telephone, housing unit in person, and housing unit telephone. Interviewers completed an assignment and reported the hours and expenses associated with the assignment before receiving a different assignment. All interviewers completed assignments within each of the four experimental groups.

# Chapter 5

## Analytic findings

As noted in chapter 2, the feasibility study was designed to address two sets of questions. The first set of questions concerns the optimal design of a linked survey and focuses on the definition of the sample units and the best means for recontacting participants of the NHIS. The second set of questions concerns the methodology for conducting subsequent rounds of NMES, specifically mode of data collection for conducting the medical expenditure interview and method for obtaining high completion rates for a self-administered questionnaire.

The analysis is presented separately for rounds 1 and 2 of the data collection. The primary analytical variables to be used in evaluating different approaches to linking NHIS and NMES are response rates, refusal rates, level of effort, and associated costs for the first round of data collection. The analysis for round 2 data collection, in which the sample was divided between respondents interviewed in person and respondents interviewed by telephone, focuses on a comparison of data quality for the two modes.

### Round 1

#### Response rates: Type of sample unit

The decision to define the NMES sample as a sample of households from the NHIS versus a sample of housing units involves a possible tradeoff between costs and precision. A sample of households, where the individuals identified at the time of the NHIS are located and interviewed, regardless of where they have moved to, provides the means by which demographic groups of particular interest can be easily identified and interviewed. In this type of sample, the NHIS can be viewed as a screener interview for other surveys. Household members who move during the period between the two surveys, however, must be traced to their new address, resulting in somewhat higher costs associated with conducting the interview, and, when tracing is unsuccessful, in some sample loss.

The advantage of the housing unit sample is that it does not require tracing of NHIS respondents who move between the time of the two surveys. The sample is selected as a sample of addresses; whoever resides at the address at the time of the NMES interview is included in the survey. The disadvantage of such a design lies in the need to oversample housing units to compensate for possible sample loss for specific demographic groups of interest.

As described in chapter 4, the 560 NHIS respondents selected for the feasibility study were randomly allocated to the two types of sample units. All NHIS nonrespondent cases

( $N = 44$ ) were assigned to the household sample, thereby maximizing the experience of tracing households for which there was little or no information.

Table 2 presents the response rates and the refusal rates for the household and housing unit samples and for the NHIS nonrespondents. (See chapter 4 for discussion of calculation of response and refusal rates.) The response rate for the household sample includes in the denominator cases in which the NHIS respondents could not be located.

The table indicates no significant difference between the household and housing unit samples with respect to either the response rate ( $t = 0.83, p > 0.4$ ) or the refusal rate ( $t = -0.35, p > 0.7$ ). The different sample sizes for the response and refusal rate calculations for the household sample result from other nonresponse cases included in the denominator for the response rate calculation and not included in the refusal rate calculation.

As expected, the response rate for the NHIS nonrespondents is significantly lower than the response rates for the other two groups ( $p < 0.01$ ). However, with a longer field period it is possible to successfully interview a portion of the NHIS nonrespondents.

Table 3 presents the response rates for the two sample types by demographic classification based on the NHIS interview. The total row includes the NHIS nonrespondents in the household sample, accounting for the significantly lower response rate for that cell when compared with the housing unit samples. However, within each of the demographic subgroups, there were no significant differences between the household sample and the housing unit sample. The lack of significant differences in comparing the respective response rates is in part a result of relatively small sample sizes, even for categories such as total black or Hispanic. As a means of determining whether a pattern of higher response rates exists for one of the sample types, a sign test was computed. This test also indicated no significant trend in higher response rates for one of the sample unit types across the various demographic groups.

Table 3 also provides a means of comparing the response rates for different demographic subgroups. Once again, the comparison of all the demographic subgroups is somewhat trivial because of the small cell sizes. However, looking only at the totals for the three race categories (black, Hispanic, and white and other), a one-way analysis of variance test resulted in significant differences between the three groups ( $F = 3.32; p < 0.05$ ). Multiple comparisons of all possible pairs, based on a 95-percent confidence interval using the Scheffe technique for multiple comparisons, indicated that the response rate of



the white and other category was significantly lower than the rate in either the black or Hispanic category. This finding is consistent across the household sample and the housing unit sample.

Although response rate calculations are traditionally used for comparing the relative effectiveness of experimental treatments, it is also useful to examine refusal rates to determine whether the type of sample unit resulted in more refusals for any particular demographic subgroup. Table 4 presents refusal rates for the household and housing unit samples by NHIS demographic classification. The findings parallel the response rate analysis in that no significant differences between the two types of sample units were detected for any of the demographic groups. The table also indicates that the refusal rate for the white and other category is significantly higher than that for either the black or Hispanic category.

#### Response rates: Mode of initial contact

The effectiveness of sending an advance letter to sample members prior to a personal interview has been well documented. However, little research has been conducted to measure the effects on response rates of using a telephone contact prior to a personal interview. Two studies conducted in the late 1960's provide conflicting results. Sudman<sup>2</sup> indicated no difference in interview response rates for respondents initially contacted by telephone and those initially contacted in person. However, in a later study, Brunner and Carroll<sup>3</sup> report a 35-percent point difference for the two modes, with the lower response rate associated with respondents initially contacted by telephone. A study by Bergsten, Weeks, and Bryan<sup>4</sup> to evaluate the effectiveness of using an advance telephone contact for a sample of medicare recipients at least 65 years of age resulted in no significant difference in interview response rate for respondents initially contacted by telephone and those initially contacted in person.

In light of these findings, a mode of initial contact experiment was included in the NMES feasibility study to evaluate the most effective approach to recontacting NHIS respondents. As noted in chapter 4, all NHIS nonrespondents were assigned to the in-person mode of initial contact.

Table 5 presents the response and refusal rates for the two modes of initial contact. Because mode of initial contact was randomly assigned within each type of sample unit, the rates presented in table 5 are collapsed across the household and housing unit samples. The table clearly indicates that using the telephone for initially contacting NHIS respondents resulted in significantly lower response rates or, conversely, significantly higher refusal rates. Final refusals were not accepted over the telephone; if the respondent refused at the time of the initial

telephone contact, in-person refusal conversion techniques were tried.

Tables 6 and 7 present the response and refusal rates by NHIS classification for the two modes of initial contact. Similar to the comparisons for the type of sample unit, there were no significant differences between the two modes of contact within any of the demographic subgroups. However, a sign test indicated a significant trend of lower response rates for the telephone mode of initial contact. This finding parallels the overall comparison of lower response rates for the telephone mode. However, it is interesting to note that among Hispanics the trend is reversed; for Hispanic persons below and above 125 percent of poverty level, there is no difference between the two modes.

To evaluate the effect of mode of initial contact for the two types of sample unit, an analysis of variance was conducted. Four categories representing the cross between the type of sample and the mode of initial contact were used as the factor of interest. Tables 8 and 9 present the results of the analysis for response and refusal rates, respectively. The experimental design did not have a significant effect on explaining the variance in either of the tables. As one would expect with a nonsignificant *F*-test, none of the pairwise comparisons was significant.

#### Level of effort

The decision concerning an optimal design for a linked survey is not limited to a comparison of response rates. It includes a consideration of the level of effort and costs associated with each of the design options. One means by which to examine level of effort is to compare number of in-person calls per completed interview for the four cells of the experimental design. Given the additional calls necessary for tracing movers in the household sample, it is hypothesized that the household sample would require more calls per completed interview than the housing unit sample. The advantage of an advance telephone call is to set an appointment with the respondent, thereby reducing the number of personal visits per completed interview.

The analysis presented here is limited to mean in-person calls per completed interview. The cost of a telephone contact with a respondent, although not equal to zero, is insignificant when compared with the cost of an in-person contact. The latter costs include not only the interviewer's time during the interview, but also the labor costs and expenses associated with travel to and from an interview.

The findings in table 10 support the hypothesis that the use of a telephone call significantly reduces the number of in-person contacts per completed interview. The reduction in personal visits was evident both for the household sample and the housing unit sample. Collapsing across the type of mode of initial contact, the Scheffe comparisons indicate no difference in level of effort associated with the type of sample unit.

As in the response rate analysis, it is useful to examine level of effort measures for the different demographic groups of interest. Table 11 presents the mean number of in-person visits per completed interview by sample type and NHIS classification. Looking first at the total column, two patterns appear to emerge. First, the mean number of in-person visits for individuals 65 years of age and over (both black and white and

<sup>2</sup>S. Sudman: New uses of telephone methods in survey research. *Journal of Marketing Research* 3:163-166, 1966.

<sup>3</sup>A. Brunner and S. J. Carroll: The effect of prior telephone notification on the refusal in fixed address surveys. *Journal of Advertising Research* 9:42-44, 1969.

<sup>4</sup>J. W. Bergsten, M. F. Weeks, and F. A. Bryan: Effects of an advance telephone call in a personal interview survey. *Public Opinion Quarterly* 48:650-657, 1984.

other persons) is significantly lower than for households composed entirely of individuals less than 65 years of age. Second, in all cases except white and other persons under the age of 65 years, cases classified as below 125 percent of the poverty line required fewer visits per completed interview than those households classified as equal to or above 125 percent of the poverty line.

A comparison of the level of effort for the two sample types within each of the demographic subgroups indicates no difference between the sample groups using a nonparametric sign test. Ten of the comparisons indicate higher level of effort for the household sample; five of the comparisons indicate higher level of effort for the housing unit sample.

Table 12 presents the mean number of in-person calls per completed interview by mode of initial contact and NHIS classification. The table provides further support for the significant reduction in level of effort possible with the use of an advance telephone call. Within every one of the demographic subgroups, the number of in-person calls was reduced by permitting the interviewers to place an advance phone call to schedule an appointment (and in the case of the household sample, to determine whether the NHIS respondents still lived at the NHIS address).

#### Interviewer hours

Contrary to the findings in the level of effort analysis, an evaluation of the effect of mode of initial contact on interviewer hours and travel expenses did not indicate consistent reductions across both types of sample unit. Within the household sample, both interviewer hours and interviewing costs (mileage and related costs) were significantly lower for those cases in which the initial contact was completed by telephone. The total interviewing hours per completed interview for the household sample were reduced from 8.47 hours for the in-person mode of initial contact to 6.19 hours for the telephone mode of initial contact, a reduction of 27 percent. Associated travel costs were reduced 43 percent for the household sample. Within the housing unit sample, the total number of interviewer hours per completed interview was 12 percent higher for the cases initially contacted by telephone than for those contacted in person. However, associated travel costs were reduced by 9 percent with the use of the telephone.

These findings are quite puzzling, but may be explained, in part, by the nature of the household and housing unit samples. Two factors probably contributed to some exaggeration of the difference between modes of contact for the household sample. First, the hour and expense figures for the household sample include cases in which the NHIS respondents moved between the time of the two surveys. When the NHIS respondents have moved between the time of the two surveys, an advance telephone call may be particularly beneficial. Second, the household sample included all the NHIS nonrespondents, who were all initially contacted in person. In calculating the hours per completed interview, all interviewer time associated with a group of cases, including time spent on cases that become non-response, is divided by the number of completed interviews. Thus, the inclusion of the NHIS nonrespondents, the part of

the sample with the highest rate of nonresponse, in the household, in-person cell inflated the number of hours and costs associated with these interviews. It was possible to examine the NHIS nonresponse cases separately for the level of effort analysis; the cases are not separated from other household, in-person cases in the interviewer time and expense reports.

However, it is difficult to speculate as to why, in the housing unit sample, the telephone mode of data collection resulted in a somewhat higher number of interviewer hours. Both the level of effort analysis and the associated cost comparison indicate that the telephone mode of initial contact reduced the overall field effort.

#### Discussion of findings

The findings from this experiment indicate that for NHIS respondent cases there appears to be no difference in either response rates or level of effort associated with selecting a sample of households or housing units. Given the lack of differences in the two sample types, the decision as to which type of sample design is optimal should be made on other factors. These factors would include the amount of time for the field operation (to permit tracing for a household sample), the need to identify rare population groups, and, as discussed in chapter 3, the need to develop screener instruments that accurately identify the members of a reporting unit.

The findings with respect to mode of initial contact present a more confusing picture. The evidence indicates that using the telephone to recontact NHIS respondents has a detrimental effect on response rates. This finding was only evident when the cases were collapsed across the type of sample unit. An analysis of variance in which the factor of interest is the four-category classification of the cases according to the two experimental design factors resulted in no significant difference in either the response or refusal rate. The latter finding is due, in part, to the reduced sample size resulting in the four-category classification.

The analysis of the level of effort indicated significant reductions associated with the use of an advance telephone call. Within the household sample, the mean number of in-person calls dropped from 2.94 for cases initially contacted in person to 1.64 for telephone contacts. The means for the housing unit sample were 2.69 and 1.71, respectively.

The goal of the present research is not to make the decision concerning the optimal design for linking the two surveys, but rather to provide a means for making such decisions. The findings clearly indicate a significant reduction in the number of in-person visits associated with use of an advance telephone call, a reduction of approximately 40 percent. However, this reduction must be evaluated against the possible increase in non-response. The findings from this experiment indicate a possible drop in response rate of approximately 5 percent with the use of an advance telephone call. However, it is important to remember the limitations of the sample for the present study when drawing inferences to a national design. The tradeoff between the reduced costs associated with use of an advance telephone call and possible decreases in response rates is a decision that must be made by the designers of a particular survey.

## Round 2

### Response rate comparisons by mode of data collection

Most panel surveys are designed to follow up on respondents in subsequent rounds of data collection using the same mode of interviewing as was used for the initial interview. However, some designs, notably the National Medical Care Expenditure Survey (NMCES) and the National Medical Care Utilization and Expenditure Survey (NMCUES), have used both in-person and telephone modes of data collection for interviews following the first round interview. Evaluation of the mode of interview for these studies has always been confounded with the round of data collection, so that it is impossible to separate panel effects and seasonal effects from possible mode effects. As a means to assess the possible impact on response rates and data quality for forthcoming medical expenditure surveys, a mode of data collection experiment was conducted during the second round of interviewing.

Only cases in which a completed interview was obtained during round 1 were recontacted for the round 2 interview. Prior to the round 1 interview, all cases were randomly allocated to either an in-person interview or a telephone interview in round 2. On the basis of information reported during the round 1 interview, several cases were switched from the telephone mode to the in-person mode before round 2 began. Cases were switched if the household had no telephone or if the round 1 respondents reported a problem that would preclude participation by telephone. During round 2, additional cases were switched from telephone to in-person interviews when previously unreported problems, most often hearing problems, were encountered and when refusal conversion seemed possible.

The response and refusal rates for the two modes of data collection are presented in table 13. The difference between the response or refusal rates for the two modes is not significant. The response rate for the telephone mode includes 47 cases originally assigned to the telephone mode but which were eventually completed in person. For 28 of these cases, the mode of interview was changed before round 2 began. The remaining 19 were changed during round 2. If an in-person interview had not been possible, either for the cases in which a telephone interview would not be feasible or for refusal conversion, the response rate for the telephone mode of data collection would have been 78.3 percent, a rate significantly lower than the in-person response rate.

The use of a flexible rule concerning mode of interview for round 2 resulted in a higher response rate than would have been achieved had switches to in-person interviews not been allowed. As will be seen in the next section, the switch cases also have different rates of health care utilization, indicating that a loss of these cases would have resulted in biased estimates of utilization.

### Data quality measures

The absence of data from a source other than the respondent, such as the medical provider or insurance claim data, does

not permit evaluation concerning the quality of respondents' reports. However, apart from validation data, the responses obtained from the two modes of data collection can be compared to assess whether there are differences. This comparison can be done by comparing distributions of responses or examining the frequency of missing data. A comparison of response distributions does not permit evaluation as to which mode is better. However, because missing data are usually viewed negatively, a comparison of rates of missing data may provide some guidance as to which mode provides better quality data.

The feasibility study collected information about four types of medical care utilization: emergency room visits; outpatient department visits; hospitalizations; and other medical provider visits, such as visits to a doctor's office or to a health maintenance organization for a general checkup. The percent of persons reporting at least one of these types of utilization by type of event and mode of data collection is presented in table 14. Cases that were switched from the telephone mode to the in-person mode are presented separately in row three. It is important to note that the percent is based on the number of individuals, not the number of households, with at least one reported event. To the extent that one respondent reported for all members of a household, the reports should not be viewed as independent observations.

For three of the types of medical events, emergency room visits, hospitalizations, and medical provider visits, there was no significant difference between the proportion of persons reporting at least one event for the in-person interview and those for whom data were collected by telephone. However, for outpatient department visits, a significantly larger proportion of individuals interviewed by telephone reported using the facilities of an outpatient department. The significant findings persist even when switch cases, which were assigned for the telephone mode of data collection, are collapsed with the telephone cases.

The second data quality measure, item nonresponse rates, is presented in table 15 for four data items associated with visits to medical providers. The missing data rate for the telephone mode of data collection is significantly higher for only one of the variables, date of the visit.

### Discussion of findings

The response rate and refusal rate analysis indicate that with the ability to switch cases to in-person interview, the telephone mode of data collection is as successful as an in-person interview. Use of a telephone interview in subsequent rounds of a panel study design appears to be an effective means for reducing interview costs. However, the cost of maintaining a small group of field interviewers for those cases that cannot be completed by telephone should not be ignored.

It is difficult to assess the ramifications of the data quality analysis without the use of validation data. The higher item nonresponse rate indicates some loss in data quality associated with the telephone mode of data collection, but because only one comparison resulted in a significant difference between the two modes, it is difficult to draw inferences concerning the overall level of quality obtained from telephone interviews.

## Conclusions

The experimental linkage study was designed to address key issues related to linking the NMES and the NHIS samples. The findings presented in this chapter provide guidelines on the most efficient data collection procedures for a linked design with respect to sample type and mode of initial contact and also some guidelines concerning mode of data collection for subsequent rounds of data collection. The major findings are summarized below.

- The overall response rates for the household sample and the housing unit sample, not including the NHIS nonresponse cases, were not significantly different (86.0 versus 88.4 percent). The direction of the difference provides some indication that somewhat lower response rates might be expected with a household sample. The lower response rate for the household sample is, for the most part, the result of unlocatable movers. Of the 280 cases initially assigned to the household sample, approximately 20 percent of the movers were not locatable. If the time between the two surveys is approximately 1 year, approximately 14 percent of the sample would have moved. Given this mobility rate, coupled with a 20-percent unlocatable rate, the response rate would probably be 2–3 percentage points lower for a household sample than for a housing unit sample. However, the higher response rate for the housing unit sample is not without costs. Because the NHIS cases are treated as a sample of addresses for a housing unit sample, and, therefore, can move between the time of the two surveys, there are costs involved in oversampling groups of analytic interest to achieve precision requirements at the person level. In 15 of the 280 cases assigned to the housing unit sample, the unit was occupied by someone other than the NHIS respondents. Of these 15 cases, 10 housing units were occupied by individuals that did not correspond to the demographic group for which the unit had been sampled. For example, an NHIS unit classified as white, age 65 years and over, and below the poverty line had been replaced at the time of the NMES feasibility study by a unit classified as white, under age 65 years, and above 125 percent of the poverty line.
- Mode of initial contact did appear to affect response rates when the data were pooled across the types of sample units (90.1 versus 84.4 percent). However, a one-way analysis of variance, using a four-category factor resulting from a cross-classification of the two experimental factors, indicated no significant difference in either the response or refusal rate among the four categories. However, as noted in tables 10–12, mode of initial contact did have a significant effect on the overall level of effort associated with a completed interview. Within both the household and the housing unit samples, the telephone mode of initial contact resulted in a reduction of more than 40 percent in the number of in-person calls per completed interview.
- Neither of the experimental treatments appeared to interact with any of the demographic subdomains of interest.
- The round 2 analysis, comparing the use of a telephone for data collection with in-person interviewing, indicated no difference in response or refusal rates. The lack of significant differences was due to relaxed rules concerning assignment of cases to the telephone treatment. Forty-seven cases, of which 19 were refusal conversions originally assigned to the telephone mode, were completed as in-person interviews. Without the availability of field interviewers, the response rate for the telephone cases would have been 78.3 percent, significantly lower than the in-person response rate. There was some indication that the quality of data collection on the telephone, as measured by the rates of item nonresponse, was poorer than the in-person interviews.

**Table 2. Round 1 response rates and refusal rates by sample type**

[Numbers in parentheses represent cell sizes]

<i>Sample type</i>	<i>Response rate</i> <sup>1</sup>	<i>Refusal rate</i>
	Percent	
NHIS respondents:		
Household sample .....	86.0 (272)	8.2 (268)
Housing unit sample .....	88.4 (276)	9.1 (276)
NHIS nonrespondents .....	35.7 (42)	40.0 (40)

<sup>1</sup>See text for response rate formula.

NOTE: Table excludes new reporting units discovered during round 1.

**Table 3. Round 1 response rates by sample type and NHIS classification**

[Numbers in parentheses represent cell sizes]

<i>NHIS classification</i>	<i>Total</i>	<i>Household sample</i>	<i>Housing unit sample</i>
	Percent		
Total .....	<sup>1</sup> 83.6 (590)	<sup>2</sup> 86.0 (272)	88.4 (276)
Black .....	90.1 (202)	90.1 (101)	90.1 (101)
Under 65 years .....	88.2 (127)	87.5 (64)	88.9 (63)
Less than 125 percent of poverty .....	87.1 (62)	90.3 (31)	83.9 (31)
125 percent of poverty and greater .....	89.2 (65)	84.9 (33)	93.8 (32)
65 years and over .....	93.3 (75)	94.6 (37)	92.1 (38)
Hispanic .....	90.7 (118)	88.1 (59)	93.2 (59)
Less than 125 percent of poverty .....	91.8 (49)	92.0 (25)	91.7 (24)
125 percent of poverty and greater .....	89.9 (69)	85.3 (34)	94.3 (35)
White and other .....	82.9 (228)	81.3 (112)	84.5 (116)
Under 65 years .....	82.7 (110)	84.6 (52)	81.0 (58)
Less than 125 percent of poverty .....	83.3 (54)	84.0 (25)	82.8 (29)
125 percent of poverty and greater .....	82.1 (56)	85.2 (27)	79.3 (29)
65 years and over .....	82.9 (117)	78.0 (59)	87.9 (58)
Less than 125 percent of poverty .....	75.9 (29)	73.3 (15)	78.6 (14)
125 percent of poverty and greater .....	85.2 (88)	79.6 (44)	90.9 (44)
NHIS nonrespondents .....	35.7 (42)	35.7 (42)	...

<sup>1</sup>Includes NHIS nonrespondents. NHIS nonrespondents include refusals, other nonresponse, and dwelling units that were vacant at the time of the NHIS interview. All NHIS nonresponse cases were assigned to the household, in-person treatment group.<sup>2</sup>Excludes NHIS nonrespondents. The response rate including nonrespondents is 79.3 percent.

NOTES: Table excludes new reporting units discovered during round 1. See text for response rate calculation.

**Table 4. Round 1 refusal rates by sample type and NHIS classification**

[Numbers in parentheses represent cell sizes]

<i>NHIS classification</i>	<i>Total</i>	<i>Household sample</i>	<i>Housing unit sample</i>
	Percent		
Total .....	10.8 (584)	8.1 (272)	9.1 (276)
Black .....	7.4 (202)	6.9 (101)	7.9 (101)
Under 65 years .....	7.9 (127)	7.8 (64)	7.9 (63)
Less than 125 percent of poverty .....	6.5 (62)	3.2 (31)	9.7 (31)
125 percent of poverty and greater .....	9.2 (65)	12.1 (33)	6.3 (32)
65 years and over .....	6.7 (75)	5.4 (37)	7.9 (38)
Hispanic .....	5.9 (118)	5.1 (59)	6.8 (59)
Less than 125 percent of poverty .....	6.1 (49)	4.0 (25)	8.3 (24)
125 percent of poverty and greater .....	5.8 (69)	5.9 (34)	5.7 (35)
White and other .....	11.2 (224)	11.1 (108)	11.2 (116)
Under 65 years .....	7.3 (109)	3.9 (51)	10.3 (58)
Less than 125 percent of poverty .....	5.6 (54)	4.0 (25)	6.9 (29)
125 percent of poverty and greater .....	9.1 (55)	3.9 (26)	13.8 (29)
65 years and over .....	14.9 (114)	17.9 (56)	12.1 (58)
Less than 125 percent of poverty .....	21.4 (28)	21.4 (14)	21.4 (14)
125 percent of poverty and greater .....	12.8 (86)	16.7 (42)	9.1 (44)
NHIS nonrespondents .....	40.0 (40)	40.0 (40)	... (40)

<sup>1</sup>Includes NHIS nonrespondents. NHIS nonrespondents include refusals, other nonresponse, and dwelling units that were vacant at the time of the NHIS interview. All NHIS nonresponse cases were assigned to the household, in-person treatment group.

<sup>2</sup>Excludes NHIS nonrespondents. The refusal rate including nonrespondents is 12.3 percent.

NOTES: Table excludes new reporting units discovered during round 1. See text for refusal rate calculation.

**Table 5. Round 1 response rates and refusal rates by mode of initial contact**

[Numbers in parentheses represent cell sizes]

<i>Sample type</i>	<i>Response rate<sup>1</sup></i>	<i>Refusal rate</i>
	Percent	
NHIS respondents:		
In person .....	90.1 (273)	6.3 (272)
Telephone .....	<sup>2</sup> 84.4 (275)	<sup>3</sup> 11.0 (272)
NHIS nonrespondents .....	<sup>2</sup> 35.7 (42)	<sup>3</sup> 40.0 (40)

<sup>1</sup>See text for response rate formula.

<sup>2</sup>Response rate significantly lower than in-person refusal rate,  $p < .05$ .

<sup>3</sup>Refusal rate significantly higher than in-person refusal rate,  $p < .05$ .

NOTE: Table excludes new reporting units discovered during round 1.

**Table 6. Round 1 response rates by mode of initial contact and NHIS classification**

[Numbers in parentheses represent cell sizes]

<i>NHIS classification</i>	<i>Total</i>	<i>In person</i>	<i>Telephone</i>
		Percent	
Total .....	<sup>1</sup> 83.6 (590)	<sup>2</sup> 90.1 (273)	84.4 (275)
Black .....	90.1 (202)	94.0 (100)	86.3 (102)
Under 65 years .....	88.2 (127)	92.1 (63)	84.4 (64)
Less than 125 percent of poverty .....	87.1 (62)	93.3 (30)	81.2 (32)
125 percent of poverty and greater .....	89.2 (65)	90.9 (33)	87.5 (32)
65 years and over .....	93.3 (75)	97.3 (37)	89.5 (38)
Hispanic .....	90.7 (118)	89.7 (58)	91.7 (60)
Less than 125 percent of poverty .....	91.8 (49)	91.7 (24)	92.0 (25)
125 percent of poverty and greater .....	89.9 (69)	88.2 (34)	91.4 (35)
White and other .....	82.9 (228)	87.0 (115)	78.8 (113)
Under 65 years .....	82.7 (110)	87.0 (54)	78.6 (56)
Less than 125 percent of poverty .....	83.3 (54)	88.5 (26)	78.6 (28)
125 percent of poverty and greater .....	82.1 (56)	85.7 (28)	78.6 (28)
65 years and over .....	82.9 (117)	86.7 (60)	79.0 (57)
Less than 125 percent of poverty .....	75.9 (29)	86.7 (15)	64.3 (14)
125 percent of poverty and greater .....	85.2 (88)	86.7 (45)	83.7 (43)
NHIS nonrespondents .....	35.7 (42)	35.7 (42)	...

<sup>1</sup>Includes NHIS nonrespondents. NHIS nonrespondents include refusals, other nonresponse, and dwelling units that were vacant at the time of the NHIS interview. All NHIS nonresponse cases were assigned to the household, in-person treatment group.

<sup>2</sup>Excludes NHIS nonrespondents. The response rate including nonrespondents is 82.9 percent.

NOTES: Table excludes new reporting units discovered during round 1. See text for response rate calculation.

**Table 7. Round 1 refusal rates by mode of initial contact and NHIS classification**

[Numbers in parentheses represent cell sizes]

<i>NHIS classification</i>	<i>Total</i>	<i>In person</i>	<i>Telephone</i>
		Percent	
Total .....	110.8 (584)	26.3 (272)	11.0 (272)
Black .....	7.4 (202)	4.0 (100)	10.8 (102)
Under 65 years .....	7.9 (127)	4.8 (63)	10.9 (64)
Less than 125 percent of poverty .....	6.5 (62)	3.3 (30)	9.4 (32)
125 percent of poverty and greater .....	9.2 (65)	6.1 (33)	12.5 (32)
65 years and over .....	6.7 (75)	2.7 (37)	10.5 (38)
Hispanic .....	5.9 (118)	5.2 (58)	6.7 (60)
Less than 125 percent of poverty .....	6.1 (49)	4.2 (24)	8.0 (25)
125 percent of poverty and greater .....	5.8 (69)	5.9 (34)	5.7 (35)
White and other .....	11.2 (224)	8.8 (114)	13.6 (110)
Under 65 years .....	7.3 (109)	5.6 (54)	9.1 (55)
Less than 125 percent of poverty .....	5.6 (54)	3.9 (26)	7.1 (28)
125 percent of poverty and greater .....	9.1 (55)	7.1 (28)	11.1 (27)
65 years and over .....	14.9 (114)	11.9 (59)	18.2 (55)
Less than 125 percent of poverty .....	21.4 (28)	13.3 (15)	30.8 (13)
125 percent of poverty and greater .....	12.8 (86)	11.4 (44)	14.3 (42)
NHIS nonrespondents .....	40.0 (40)	40.0 (40)	... ...

<sup>1</sup>Includes NHIS nonrespondents. NHIS nonrespondents include refusals, other nonresponse, and dwelling units that were vacant at the time of the NHIS interview. All NHIS nonresponse cases were assigned to the household, in-person treatment group.

<sup>2</sup>Excludes NHIS nonrespondents. The refusal rate including nonrespondents is 10.6 percent.

NOTES: Table excludes new reporting units discovered during round 1. See text for refusal rate calculation.

**Table 8. One-way analysis of variance: Response rate by experimental design (NHIS respondents)**

<i>Source</i>	<i>Degrees of freedom</i>	<i>Sum of squares</i>	<i>Mean squares</i>	<i>F ratio</i>	<i>Probability</i>
Total .....	547	61.0584	...	...	...
Between .....	3	0.5519	0.184	1.65	0.176
Within .....	544	60.5065	0.112	...	...

  

<i>Group</i>	<i>Mean</i>	<i>95-percent confidence interval</i>
In person, household .....	0.8832	0.8287–0.9377
Telephone, household .....	0.8370	0.7739–0.9001
In person, housing unit .....	0.9191	0.8727–0.9655
Telephone, housing unit .....	0.8500	0.7901–0.9099

NOTE: No 2 groups significantly different at 0.05 level (Scheffe multiple comparison).



**Table 9. One-way analysis of variance: Refusal rate by experimental design (NHIS respondents)**

<i>Source</i>	<i>Degrees of freedom</i>	<i>Sum of squares</i>	<i>Mean squares</i>	<i>F ratio</i>	<i>Probability</i>
Total .....	543	42.9393	...	...	...
Between .....	3	0.3189	0.1063	1.35	0.258
Within .....	540	42.6204	0.0789	...	...

  

<i>Group</i>	<i>Mean</i>	<i>95-percent confidence interval</i>
In person, household .....	0.0588	0.0188–0.0989
Telephone, household .....	0.1061	0.0528–0.1593
In person, housing unit .....	0.0662	0.0239–0.1085
Telephone, housing unit .....	0.1143	0.0609–0.1676

NOTE: No 2 groups significantly different at 0.05 level (Scheffe multiple comparison).

**Table 10. One-way analysis of variance: Mean in-person calls per completed interview by experimental design (NHIS respondents)**

<i>Source</i>	<i>Degrees of freedom</i>	<i>Sum of squares</i>	<i>Mean squares</i>	<i>F ratio</i>	<i>Probability</i>
Total .....	557	1819.8710	...	...	...
Between .....	3	187.6144	62.5381	21.23	0.0
Within .....	554	1632.2566	2.9463	...	...

  

<i>Group</i>	<i>Mean</i>	<i>95-percent confidence interval</i>
In person, household (HHIP) .....	2.94	2.61–3.27
Telephone, household (HHT) .....	1.64	1.42–1.86
In person, housing unit (HUIP) .....	2.69	2.34–3.04
Telephone, housing unit (HUT) .....	1.71	1.48–1.93

NOTE: Pairs of significant differences at 0.05 level (Scheffe multiple comparisons):

1. HHIP: HHT.
2. HHIP: HUT.
3. HUIP: HHT.
4. HUIP: HUT.

**Table 11. Round 1 mean number of in-person visits per completed interview by sample type and NHIS classification**

<i>NHIS classification</i>	<i>Total</i>	<i>Household sample</i>	<i>Housing unit sample</i>
	Number		
Total .....	12.32	22.46	2.20
Black .....	2.07	2.17	1.98
Under 65 years .....	2.33	2.51	2.16
Less than 125 percent of poverty .....	2.16	2.06	2.25
125 percent of poverty and greater .....	2.50	2.94	2.06
65 years and over .....	1.64	1.59	1.68
Hispanic .....	2.53	2.55	2.51
Less than 125 percent of poverty .....	2.38	2.52	2.22
125 percent of poverty and greater .....	2.63	2.57	2.69
White and other .....	2.25	2.69	2.24
Under 65 years .....	2.64	2.76	2.53
Less than 125 percent of poverty .....	2.58	2.69	2.47
125 percent of poverty and greater .....	2.71	2.83	2.60
65 years and over .....	1.84	1.75	1.93
Less than 125 percent of poverty .....	2.10	1.67	2.58
125 percent of poverty and greater .....	1.75	1.78	1.73
NHIS nonrespondents .....	3.25	3.25	...

<sup>1</sup>Includes NHIS nonrespondents. NHIS nonrespondents include refusals, other nonresponse, and dwelling units that were vacant at the time of the NHIS interview. All NHIS nonresponse cases were assigned to the household, in-person treatment group.

<sup>2</sup>Excludes NHIS nonrespondents. The mean number of in-person visits including NHIS nonrespondents is 2.50.

NOTE: Table excludes new reporting units discovered during round 1.

**Table 12. Round 1 mean number of in-person calls per completed interview by mode of initial contact and NHIS classification**

<i>NHIS classification</i>	<i>Total</i>	<i>In-person</i>	<i>Telephone</i>
Total .....	12.32	2.81	1.67
Black .....	2.07	2.45	1.70
Under 65 years .....	2.33	2.69	1.97
Less than 125 percent of poverty .....	2.16	2.45	1.88
125 percent of poverty and greater .....	2.50	2.91	2.06
65 years and over .....	1.64	2.03	1.26
Hispanic .....	2.53	3.08	1.97
Less than 125 percent of poverty .....	2.38	2.71	2.04
125 percent of poverty and greater .....	2.63	3.33	1.91
White and other .....	2.25	3.00	1.50
Under 65 years .....	2.64	3.69	1.63
Less than 125 percent of poverty .....	2.58	3.38	1.80
125 percent of poverty and greater .....	2.71	4.00	1.47
65 years and over .....	1.84	2.30	1.36
Less than 125 percent of poverty .....	2.10	2.60	1.57
125 percent of poverty and greater .....	1.75	2.20	1.30
NHIS nonrespondents .....	3.25	3.25	...

<sup>1</sup>Includes NHIS nonrespondents. NHIS nonrespondents include refusals, other nonresponse, and dwelling units that were vacant at the time of the NHIS interview. All NHIS nonresponse cases were assigned to the household, in-person treatment group.

<sup>2</sup>Excludes NHIS nonrespondents. The mean number of in-person visits including nonrespondents is 2.88.

NOTE: Table excludes new reporting units discovered during round 1.

**Table 13. Round 2 response rates and refusal rates by mode of data collection**

[Numbers in parentheses represent cell sizes]

<i>Mode of interview</i>	<i>Response rate</i>	<i>Refusal rate</i>
In person .....	96.0 (249)	2.0 (248)
Telephone .....	95.1 (243)	2.5 (243)

NOTE: See text for response rate calculation.

**Table 14. Round 2 percent of respondents with at least 1 medical event by type of event and mode of interview<sup>1</sup>**

<i>Mode of interview</i>	<i>Type of medical event</i>			
	<i>Emergency room visit</i>	<i>Outpatient department visit</i>	<i>Hospitalization</i>	<i>Medical provider visit</i>
	Percent			
In person ( <i>n</i> = 694) .....	6.5	4.8	4.6	35.9
Telephone ( <i>n</i> = 533) .....	6.0	<sup>2</sup> 8.6	4.1	32.8
Switch cases ( <i>n</i> = 136) .....	<sup>2</sup> 2.2	<sup>3</sup> 2.2	2.9	<sup>2</sup> 27.9

<sup>1</sup>136 cases originally assigned to the telephone were completed in person. These cases are included in the switch row and consist of cases for which a telephone interview was not feasible and cases that would have resulted in nonresponse if limited to the telephone mode.

<sup>2</sup>Percent significantly different from percent reported for in-person interviews, *p* < 0.05.

<sup>3</sup>Percent significantly different from percent reported for telephone interviews, *p* < 0.05.

**Table 15. Round 2 item nonresponse rates for selected questions by mode of interview<sup>1</sup>**

<i>Mode of interview</i>	<i>Type of medical event</i>			<i>Total charge</i>
	<i>Month of visit</i>	<i>Date of visit</i>	<i>Type of facility</i>	
			Percent	
In person ( <i>n</i> = 525).....	0.0	9.4	0.0	30.9
Telephone ( <i>n</i> = 383).....	5.7	<sup>2</sup> 18.5	0.5	37.1
Switch cases ( <i>n</i> = 91).....	<sup>2</sup> 1.1	<sup>3</sup> 9.9	0.0	<sup>2</sup> 13.2

<sup>1</sup>136 cases originally assigned to the telephone were completed in person. These cases are included in the switch row and consist of cases for which a telephone interview was not feasible and cases that would have resulted in nonresponse if limited to the telephone mode.

<sup>2</sup>Percent significantly different from percent reported for in-person interviews, *p* < 0.05.

<sup>3</sup>Percent significantly different from percent reported for telephone interviews, *p* < 0.05.

# Appendixes

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# Appendix I

## Questionnaires and other data collection materials

### Screener questionnaire

Six versions of a screening instrument were developed for round 1 data collection:

- Household sample, in-person initial contact.
- Household sample, telephone initial contact.
- Housing unit sample, in-person initial contact.
- Housing unit sample, telephone initial contact.
- National Health Interview Survey (NHIS) nonresponse sample, in-person initial contact.
- New reporting unit, discovered in household sample, located at new address.

The primary differences between screeners for the housing unit sample and the other screeners resulted from the differing definitions of sample units. In the housing unit sample, if any members of the original NHIS household had moved between the NHIS interview and the first contact for the pilot study, the missing members were excluded from the sample. In the household sample, members of the original NHIS household who had moved were retained in the sample as new reporting units, tracked to their new address, and screened and interviewed there.

In the housing unit sample, if the entire NHIS reporting unit had moved since the NHIS interview, the original NHIS reporting unit was dropped from the pilot study and any new family residing at the NHIS address was enumerated and interviewed. If the dwelling unit was vacant, no replacement was sought. In the household sample, if the entire NHIS reporting unit had moved, all members were tracked and interviewed at their new addresses.

In the housing unit sample only, a person or group of related persons residing at the NHIS address who were not related to the original NHIS family were enumerated and interviewed as secondary reporting units. Because the NHIS family was the sampling unit for the household sample, persons living at the NHIS address but unrelated to the NHIS family were not asked about in the household sample screeners.

The requirement for different modes of initial contact was accommodated in the introductory questions of the various versions of the screener. During an initial telephone contact, the interviewer would verify that he or she had reached the sampled family or sampled address and make an appointment for a visit to administer the screener and core questionnaire. For the initial in-person contact cases, the interviewer could complete the screener and core questionnaire on the same visit as the initial contact. Because of the requirement for tracing, the screeners for the household sample also included a short

series of questions asking for locating information for families that had moved.

The body of the screening interview consisted of reviewing and updating the NHIS household composition. The questions in the different versions of the screener were varied to adapt the National Medical Care Expenditure Survey (NMCES) and the National Medical Care Utilization and Expenditure Survey (NMCUES) rules of household membership to the feasibility study's household and housing unit approaches to sampling from the list of NHIS participants.

A single version of the screener was developed for use in round 2. All sample units participating in round 1 were contacted for round 2. All round 2 reporting units were treated as households; individuals or entire units who had moved since round 1 were tracked and interviewed at a new address. The round 2 screener obtained locating information on individuals who had moved and identified new persons who had joined the household since the round 1 interview.

### Core questionnaire

An abbreviated version of the core questionnaire used in the earlier NMCES and NMCUES was developed for the feasibility study. Because the main purpose of the study was to test the design features of linking to the NHIS, some sections of the earlier questionnaires were not included in the feasibility study version. Specifically, sections dealing with dental visits, other medical expenses, nonprescription medicines, and detailed questions on reported medical conditions were excluded. The portions retained were intended to provide a level of respondent burden comparable to that of the earlier surveys. These included a series of questions on days spent in bed or missed from work because of illness or injury; a series of probes to identify visits to medical care providers during the period covered by the survey; sets of questions about care received and charges for each reported hospital in-patient stay and visits to an emergency facility, hospital out-patient department, or other medical care provider; and a series of questions about general background, employment, and health insurance.

The same version of the core questionnaire was used during both rounds of data collection. Many of the questions on background and employment, however, were not asked in round 2 unless a new reporting unit or new household member was added during round 2.

### Assignment materials

Each interviewer's assignment for round 1 consisted of a group of cases of the same sample unit type and mode of initial

contact (for example, all cases in a single assignment would be cases assigned to the housing unit sample, initial telephone contact). This was done to ease interviewer burden and to facilitate association of cost data with the different sample types. An average assignment consisted of 10–15 cases, clustered geographically as much as possible.

The materials needed for an interview, listed below, were inserted into a reporting unit folder for each case:

- *Interview information sheet*—a page containing case identifying and locating information.
- *Respondent remuneration check*—a \$5.00 check made out to the reference person and a receipt/request for a new check form.
- *Control card*—a computer-generated form listing all NHIS household members. This was used during the screener interview to update household composition and during the core interview to record the number of medical visits and to list the medical conditions reported for each household member.
- *Screener questionnaire*—the appropriate version of questionnaire (household in-person, housing unit in-person, and so forth) for the sample type. A label on the questionnaire identified the case.
- *Advance letter*—a copy of the letter introducing the study that was mailed to the sampled household or housing unit before the interviewer's first visit.
- *Calendar*—a calendar to be given to the respondent at the end of the round 1 core interview to record dates of medical visits. The respondent was asked to keep bills or receipts for these visits with the calendar. During the round 2 interview, the respondent could refer to the calendar in response to questions on dates and charges.

The reporting unit folder that held these materials had recordkeeping forms printed on its covers:

- *Tracking Form*—this form was printed only on the folders used for the household sample cases. The interviewer recorded information about each tracking contact he or she made whenever the need for tracking arose.
- *Noninterview Report Form*—this form, completed whenever an interviewer was unable to complete a case, was used to document reasons for nonresponse.
- *Record of Calls*—information about each attempt at contact or actual contact with a sampled case was recorded on this form. The interviewer recorded the date, day, time, type of contact (in-person or telephone), person contacted, and outcome for each attempted or actual contact.

Each week the interviewer recorded hours worked and expenses incurred on a Time and Expense Report. A separate Time and Expense Report was completed for each type of assignment (household in-person, housing unit in-person, and so forth) worked in a given week. Interviewers who worked on more than one type of assignment during a week allocated their time across the appropriate Time and Expense Reports. The Time and Expense Report was the source of the cost data presented in this report.

For round 2 data collection, cases were randomly assigned to one of two modes of interviewing, telephone or in person.

Cases assigned for in-person interviewing were grouped into assignments based on geographical location and round 1 interviewer. When possible, the interviewer who completed the case in round 1 was assigned the case for round 2. For the cases selected for telephone interviewing, work was grouped by time zone and by the round 1 respondent's suggested best time to contact, which had been obtained at the end of the round 1 interview.

As in round 1, materials for each case were inserted into a reporting unit folder. In addition to the materials supplied for round 1, the round 2 package included a list of the names of the reporting unit members who reported medical provider visits in round 1, the name and address of each medical provider, and a permission form to be signed by or on behalf of each person for each of his or her providers. The permission forms authorized the survey to collect additional information about the reported medical visits directly from the providers. Field interviewers obtained signatures on the forms at the end of the round 2 interview; telephone interviewers explained the purpose of the forms to their round 2 respondents and forwarded the forms for mailing. A Tracking Form, Noninterview Report Form, and Record of Calls were printed on the round 2 reporting unit folder.

About 2 weeks prior to the start of round 2 data collection, self-administered questionnaires (SAQ's) were mailed to adult respondents in 180 selected households. SAQ respondents in the telephone contact group were asked to return the completed SAQ by mail. SAQ respondents in the in-person contact group were asked to hold the completed SAQ until the interviewer visited their home for the round 2 interview.

## Interviewer manuals

An interviewer manual was developed for each round of data collection. The manuals served two purposes: They were the source documents for interviewer training and reference documents for the interviewers' use during the data collection field period.

For round 1, part I of the manual provided a background of the study and a review of general interviewing techniques such as obtaining respondent cooperation, recording answers, and editing completed work. Part II described the study's field and administrative procedures and presented question-by-question specifications for the screeners and core questionnaire.

Two interviewer manuals were developed for round 2 data collection—one for the field interviewers and one for the telephone interviewers. Because the field interviewers for round 2 had also interviewed during round 1, the manual developed for round 2 covered only the procedures that were new to round 2. Specifically, it covered the round 2 screener, changes in procedures for administering the core interview, methods of obtaining permission forms and preparing new permission forms, and procedures for the SAQ experiment. The round 2 telephone interviewer's manual was a comprehensive manual combining most of the round 1 field interviewer's manual and the procedures specific to round 2 interviewing. The interviewers conducting the round 2 telephone interviewing had not interviewed during round 1 and, therefore, needed a complete instructional manual.

# Appendix II

## Data collection for rounds 1 and 2

### Interviewer recruitment

Field interviewers were recruited about 1 month before the start of round 1 data collection with the intention that about half of the round 1 field interviewers would be retained for round 2 in-person data collection. Telephone interviewers were assigned from the contractor's centralized telephone facility and trained during the week prior to data collection for round 2. For purposes of field management, a field supervisor was hired prior to round 1 data collection to recruit field interviewers in all sites and to supervise them for both rounds of field data collection.

In selecting the field interviewing staff, candidates with experience in interviewing during the earlier National Medical Care Expenditure Survey and National Medical Care Utilization and Expenditure Survey or on other medical studies were sought. In addition, candidates were sought who matched the racial and ethnic characteristics of the majority of cases in the primary sampling unit (PSU) to be surveyed. Twenty-two field interviewers were recruited for round 1 data collection; an additional three were recruited as backup interviewers to troubleshoot in sites where production was slow. Fourteen of these interviewers were retained for round 2 data collection. Four telephone interviewers were assigned for the round 2 telephone data collection. The interviewers provided coverage for day, evening, and weekend hours.

### Training

Training for the first round of data collection was conducted August 25–29, 1985. A total of 25 field interviewers, including the three designated as backups, were trained in sessions conducted in Rockville, Md. Interviewers were trained in the procedures and data collection instruments through lectures in large and small group settings, role playing, and exercises. As a final part of the training, interviewers were required to complete two practice interviews before beginning work on the survey. Interviewers who experienced difficulty at training did not begin actual work until their practice interviews were reviewed by the field supervisor. All of the regular interviewers completed at least one assignment during the round 1 data collection.

Two training sessions were held to prepare interviewers for round 2. Fourteen of the round 1 field interviewers were trained December 4–5 for the round 2 in-person data collection. Four telephone interviewers were trained December 9–13 to handle the cases designated for telephone interviewing during round 2. Although no major problems were encountered

in either session, additional practice was needed before the telephone interviewers were ready to begin work. Their training was scheduled to last four evening sessions. At the end of the fourth evening, the interviewers had completed two practice interviews but were not sufficiently comfortable with the material to begin the actual interviewing. Therefore, they completed several additional practice interviews before making their first calls to respondents.

Training for the round 2 field interviewers included a review of the instruments repeated from the round 1 interview and an explanation of the round 2 screener and of the procedures used for the first time in round 2 to obtain signed medical provider permission forms. The telephone interviewers, however, received a training similar to that of round 1 field interviewers. In addition to the procedures unique to round 2 data collection, their training included a detailed introduction to the basic survey instruments.

### Organization of data collection

For both rounds of the survey, a study operations manager was responsible for overall supervision of data collection. For the in-person interviewing the operations manager was supported by a field supervisor located in one of the sample PSU's. The field supervisor recruited the field interviewing staff, determined interviewer assignments, and monitored production. Field interviewers reported on a weekly basis to the field supervisor, who, in turn, reported weekly to the operations manager.

For both rounds, all in-person interviews completed were mailed by the interviewers directly to the home office where they were edited by receipt control staff. Forms listing errors detected during the edit were sent to the field supervisor who reviewed them with the interviewers. Nonresponse cases, such as refusals, no response at door, and language problems, were mailed to the field supervisor who reviewed them for possible reassignment.

The round 2 telephone interviewers were supervised by a telephone center supervisor. The telephone center supervisor assigned cases, reported on production, and monitored a percent of interviews conducted by each of the interviewers. The telephone center supervisor reported weekly to the study operations manager.

### Schedule and flow of work

Data collection for round 1 was performed from September 9 through November 8, 1985. All field interviewers were given

an initial assignment of work at the end of training. Assignments were made based on the geographic location of the cases in relation to the interviewer's home and the racial and ethnic composition of the area. Each assignment consisted of a group of cases of a given type—household in person, household telephone, housing unit in person, or housing unit telephone. The types of cases given to each interviewer were staggered so that if an interviewer's first assignment consisted of household in-person cases, the second would consist of one of the other types of cases. The types of cases in an interviewer's assignment were controlled in an effort to reduce the likelihood of an interviewer's using the wrong contact procedure for a case and to simplify the recordkeeping needed to complete cases of the different assignment types.

Round 2 data collection for in-person cases began on December 9 and data collection for the telephone cases began on December 14. Data collection for the second round of interviewing for both telephone and field cases ended on February 28, 1986. As much as possible, field interviewers were given the same households they interviewed for round 1. Households that were interviewed in round 1 by interviewers not retained for round 2 were assigned to round 2 field interviewers based on geographic location, race, and ethnicity.

To monitor production and response rates, reports were generated from an automated survey control system (ASCS). The ASCS is based on a survey control file, which includes a computer record for each sampled case and for each interviewer. From the information in these two files, the system can provide summary reports on the progress of individual interviewers or on overall survey progress. Information in the system was updated by the field supervisor and central office clerical staff. Through a computer terminal in his or her office, the supervisor entered information on cases assigned, nonresponse, and hours worked and expenses incurred by each interviewer. Receipt clerks entered disposition codes for completed cases received at the home office. Production and response rate reports were generated from the ASCS on a weekly basis for use by the field supervisor and home office project staff.

### **Nonresponse conversion**

During both rounds of data collection, cases in which a final result was not obtained during an interviewer's first visits to a sampled household (the interviewer did not obtain a completed interview or a definitive nonresponse result) were followed up in two stages. During the first stage of local or personal followup, the field supervisor allowed the interviewers to pursue selected nonresponse cases in which it appeared that a return trip by the same interviewer had a good chance of obtaining a successful outcome. Typical cases in this group were (a) ones in which the interviewer had exhausted the allowed number of contact attempts for a household but had some information suggesting that an additional trip would be successful or (b) ones in which the interviewer had received an initial refusal but there were extenuating circumstances suggesting that another attempt by the same interviewer might be successful. In such

cases, followup was considered part of the interviewer's basic assignment.

The second stage of followup was performed during the last weeks of the field period for both rounds. For this followup, all cases that had not been completed were reviewed, and those that offered a reasonable chance for success were reassigned, wherever possible, to a new interviewer. For round 1, a conversion letter was prepared and mailed to a selection of the initial refusal cases.

### **Procedural difficulties related to linkage**

In general, the field and telephone efforts for both rounds of data collection ran smoothly. Most of the problems that did arise were relatively easy to resolve or work around. Some of the difficulties experienced were caused by the special procedures required for methodological studies such as this.

One problem was the lack of geographic clustering of the assignments. Once the cases were distributed to the four sample types (household in person, household telephone, housing unit in person, and housing unit telephone) within each PSU, relatively few cases of the same sample type remained in any area. For interviewer assignments, therefore, cases from several areas within a PSU had to be combined to create an adequate interviewer workload. This increased the average traveltime and expense above what it would have been had an interviewer been able to work all of the cases in a given area during the same period.

During the first weeks of data collection for round 1, interviewers experienced resistance to participation from many of the families who had cooperated with the U.S. Bureau of the Census interviewer for the National Health Interview Survey (NHIS) interview. Although the NMES interviewers were eventually able to overcome the resistance of many of these respondents, the overall level of resistance received from persons who had previously cooperated with the NHIS interviewer was greater than expected. A few of the nonrespondents (11 of 68) gave reasons that tied their refusal to the experience of the NHIS.

Also during round 1 data collection, several of the interviewers commented that they had experienced difficulty with the telephone contact method, particularly when contacting elderly respondents. Elderly respondents, they felt, tended to be wary of strangers calling on the telephone but were more receptive to in-person visits, when they could see the interviewer before opening the door.

During round 2, the field interviewers experienced a much lower refusal rate than the telephone interviewers and felt that there were fewer difficulties contacting the households. The telephone interviewers, however, did experience a higher refusal rate as well as problems administering the interview over the telephone with elderly respondents. The telephone interviewers commented that the elderly respondents were more often hard of hearing or became easily tired during the interview. When these problems inhibited the telephone interviewer's chance of completing the interview, the case was reassigned to the field for an in-person contact.



# Appendix III

## Interviewing sites

Table I describes the eight interviewing sites selected for the feasibility study. It includes the U.S. Bureau of the Census primary sampling unit number and a list of the counties constituting the primary sampling unit.

**Table I. Areas of feasibility study with primary sampling unit numbers and counties**

<i>Area</i>	<i>Primary sampling unit No.</i>	<i>County</i>
Milwaukee. . . . .	300	Milwaukee Ozaukee Washington Waukesha
Chicago. . . . .	308 398	Cook County—central city DuPage Grundy Kane Lake Kendall McHenry Will
Detroit. . . . .	309	Lapeer Livingston Macomb Oakland St. Clair Wayne
Tippecanoe, Indiana. . .	344	Tippecanoe
Baltimore. . . . .	510	Anne Arundel Baltimore Carroll Harford Howard Queen Annes Baltimore City
San Antonio . . . . .	516	Bexar Comal Guadalupe
Los Angeles . . . . .	702	Los Angeles—central city Los Angeles—remainder of county
San Francisco. . . . .	703	Alameda Contra Costa Marin San Francisco San Mateo

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