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1. INTRODUCTION

A major component of non-sampling error which has been traditionally difficult to identify and to measure is response error. Response errors can affect both the accuracy and completeness of information obtained in a panel survey. Household panel surveys on the cost of medical care are subject to the same response errors common to panel surveys in general, such as those caused by proxy reporting versus self-reporting and those resulting from the use of a long recall period in remembering health events. In addition, such surveys experience a unique type of response error which stems from the complex nature of the medical care system in this country. The various private health insurance company reimbursement schemes render it difficult for a household respondent to know what the actual total and out-of-pocket cost of a medical event might be. The lag time between a medical event and the receipt of a bill may also prevent a household respondent from knowing his out of pocket costs for a particular event at a given point in time. Thus, even cooperative respondents who keep meticulous records may not be able to report the costs of medical visits until a certain amount of time has elapsed. In the case where private health insurance pays the medical provider directly without the household respondent ever seeing a bill or in the case of those persons covered by public health insurance plans such as Medicare and Medicaid, a household respondent may never know the costs of a medical event.

The National Medical Care Expenditure Survey (NMCES) is a panel survey designed to collect information on the utilization and expenditures of medical care of American families during calendar year 1977. The NMCES is based on a probability sample of 13,500 households selected so as to represent the civilian non-institutionalized population of the United States. Several procedures were built into the overall design of the NMCES which attempt to reduce response errors from household respondents; a record check of medical providers who provided care to NMCES household respondents, a check of health insurance plans to compare premium information with that given in the household and the use of a memory aid called the summary. The summary is a computer printout containing information on medical care utilization and expenditures and health insurance coverage as reported in all previous household interviews. This paper presents a discussion of these attempts and gives some available preliminary data on the effectiveness of the summary. A brief description of other methodological issues relating to the survey is also given.

2. THE NMCES

The NMCES is sponsored by the United States Public Health Service under the joint auspices of the National Center for Health Statistics (NCHS) and the National Center for Health Services Research (NCHSR). The survey is being conducted by the Research Triangle Institute (RTI) of

Research Triangle Park, North Carolina, in conjunction with two subcontractors, the National Opinion Research Center (NORC) of the University of Chicago and Abt Associates Incorporated (AAI) of Cambridge, Massachusetts.

The NMCES actually consists of three separate surveys: (1) the household interview survey, (2) the medical provider survey, and (3) the health insurance/employer survey. Respondents in the household survey were interviewed six times at approximately twelve-week intervals beginning in early 1977 and ending in mid-1978. Information was collected in a basic core questionnaire on health care expenditures and utilization, health conditions, disability, and health insurance coverage during calendar year 1977. This questionnaire was administered during the first five interviews. Besides this basic set of questions, information on demographic characteristics such as income and assets, occupation, race, ethnicity, education, current employment characteristics, and perceived health status were also asked, as well as questions on limitation of activity, access to medical care, reasons for not obtaining health care and medical deductions used in filing Federal income tax returns. The first, second and fifth household interviews were conducted in person and the other three were administered by telephone.

The medical provider survey consists of a sample of approximately 12,000 unique physicians, osteopaths, hospitals and medical facilities identified by NMCES household respondents as providing care during 1977 and for whom signed permission forms have been obtained. The medical providers were initially contacted by mail in early August 1978. The medical provider survey is designed to provide information which the household may not be able to furnish, concerning such items as diagnoses, charges for care and sources of payment. When the medical provider survey is completed sometime near the end of 1978, it will be possible to compare information from the medical providers with the same information obtained in the households on such items as out-of-pocket costs for care.

The health insurance/employer survey began in September 1978. Respondents in this phase of the NMCES consisted of those health insurance companies, employers, unions and other groups which were named by household respondents as providing health insurance coverage during 1977 and for whom permission forms signed by the policyholders had been obtained. Health insurers participating in this survey are being contacted by mail and asked to provide information on coverage and premiums. In addition to this survey of health insurers, a health insurance claims experiment will be done later on this year involving some 600 families subscribing to Blue Cross/Blue Shield in four different States. Claims and refund information from these companies will be obtained and compared with the same information as obtained from NMCES household respondents in

those States. The health insurance surveys will be finished in early 1979.

The final data tapes from the household survey will not be available for analysis until sometime in 1979 and data from the medical provider and health insurance/employer surveys will not be forthcoming for some time. However, preliminary data from the first two household interviews, the first quarter of 1977, are available and have been used in this paper.

3. THE SUMMARY

Two memory aids were used in the household survey; the calendar/diary and the summary. Calendar/diaries were distributed during the first interview to every family. Respondents were asked to have their calendar available during subsequent interviews so that the interview would proceed faster and more smoothly. Data on calendar usage will be available in 1979.

The summary was a computer printout which contained certain information on visits to medical providers, the purchase of medical supplies and health insurance coverage as reported in all panel interviews conducted prior to receipt of the summary. Two copies of each summary were produced: one copy of which was mailed to the interviewer and the other to the family for review prior to the next interview. In this way, the summary was used to verify and to check for completeness the information previously reported in the household.

The summary represents a new concept in survey research. The only other times such a memory aid was used were during the NMCES pretest conducted in 1976 and the pilot study for the NMCES, the Medical Economics and Research Study in 1975. In both surveys, the summary was generated by hand not by computer. Thus, the data processing needed for the implementation of the summary in the NMCES was never pretested.

An example of a summary used in the NMCES is shown in Table 1. The first four sections were generated for every family member. They contained information on utilization and expenditures for: (1) dental visits, (2) hospital stays, (3) medical provider visits (i.e., physicians, chiropractors, and neighborhood clinics), and (4) other medical expenses which included prescribed medicines and miscellaneous medical expenses such as eyeglasses and crutches. The total charge for each visit or service is contained in the "Charge" column. The "amount of payment" column refers to the amount paid by each source of payment involved in the total charge.

The summary also contained two pages of information pertaining to the entire household: the flat fee page and the health insurance page. The flat fee page linked different visits which were all included under a single charge.

An example of a flat fee is a charge for pregnancy care in which the charges for pre-natal care, delivery and post-natal care are combined into a single charge. The last section of the

summary contained information on health insurance coverage for the entire family. Four types of coverage were included: (1) Federal or State plans, such as Medicare and Medicaid, (2) private dental only plans, (3) private plans, and (4) special plans such as extra-cash policies.

The summary served two purposes during the interview, that of reference and that of review. During the course of the interview, the interviewer would refer to the summary for information that would be necessary for the administration of the main questionnaire. For example, flat fee charges mentioned during the interview would have to be checked on the summary to see if the flat fee had been previously mentioned or not.

The actual review of the summary occurred after the administration of the main questionnaire. The interviewers were instructed to focus in on certain codes (i.e., "not known," "misprint," ???) which indicated that data items were incomplete or unknown. The series of charge questions for a medical provider or dental visit or hospital stay began with a question on the amount of the total charge. Questions were then asked on how much of the total charge was paid by the family and how much by some other source. Those respondents who did not know the total charge were asked if they expected to receive a bill. If so, no further charge questions were asked, as it was hoped that the bill would arrive prior to the next interview for inclusion on the next summary. If the respondent did not know the total charge and no bill was expected, the remaining charge questions were asked on how much of the total charge was shared by the family and some other source. A similar procedure was followed for other medical expenses and prescribed medicines except that no questions on expecting bills were asked of those respondents who did not know the total charge. Codes were also printed onto the summary whenever the name or location of a medical provider was missing to facilitate the collection of permission forms for the medical provider survey. The interviewers also asked respondents if all of their medical events for the particular time period had been included on the summary. The review of the summary thus served to correct previously unknown information, to correct previously obtained data, to add events which had not been reported and to delete events which should not have been reported.

Prior to the second household interview, which was done face-to-face, respondents received their first summaries with a letter explaining the purpose of the summary. This first summary review was a learning experience for both interviewers and respondents. There were indications that the tabular format with columnar headings at the top of the page caused confusion. However, it was apparent that from the types of summary corrections made later on by both respondents and interviewers that they became accustomed to reading it. The third and fourth household interviews and summary reviews were done by telephone. The fifth interview was done in the home. During this interview a very detailed line-by-line review of the summary was done to determine if any health insurance refunds were expected to cover charges still unknown at this point.

The implementation of the summary was most complicated from the data processing standpoint. The time between interviews was only thirteen weeks. During this period, information from the last interview had to be processed, updated and prepared for return to the field prior to the next interview. This meant that almost a quarter of a billion characters of data had to be converted to machine-readable form, edited and printed for mailing. This procedure was further complicated by a feature of the study design in which respondents who moved and who, for example, may have gotten married and formed a new household unit were followed and interviewed subsequently at their new location. During their next interview, information from their old summary had to be taken and generated into a new summary.

Complications also occurred because of the structure of the data collection instruments themselves. The main questionnaire changed slightly for the first few interviews. Although these changes were subjectively trivial, they created problems in a data processing system which was already complex. Another problem was due to the physical nature of the instruments. Data needed in generating the summary could come from any of three separate forms: the main questionnaire, a continuation page or a hospital stay supplement. A continuation page was used whenever space in the main questionnaire was not adequate to report all of a household's visit, medical events, or conditions. The hospital stay supplement obtained information on doctor visits and other expenses incurred in a hospital stay. Information from the continuation pages and hospital stay supplements was not processed in time for inclusion on the first summary, but did appear on subsequent summaries.

The summary was reviewed by the household four times. The final data incorporating all corrections are not available at this time. However, some information on the effectiveness of the summary can be given.

The percentage of summaries that required corrections were 69.5, 63.5, 73.9 and 90.0 for interviews 2, 3, 4 and 5 respectively. The most common types of corrections that were made were changes to the medical provider's name and address, the date of visit, the total charge, the name and amount paid by each source of payment and the health insurance coverage information. Most of the changes on the summary were made to the total charge and to the source of payment and amount paid by each source. The number of the changes was 2.20, 2.39 and 5.82 changes per summary for the second, third and fourth interview respectively.

The review of the summary also assisted in obtaining visits, medicines, etc., that were not reported in prior interviews and in deleting entirely items that were erroneously reported. However, the number of these occurrences is not now available.

Another way of evaluating the effectiveness of the summary is to compare information as it was originally collected in the household with

the same information after it was reviewed by the household. Some results have been obtained from the preliminary data available from the first interview.

The first household interviews occurred from January 10 to March 31, 1977 with the recall period from the first of January to the date of the interview. The mean recall period was 35 days corresponding to an interview date of February 4. Information from the first interview was generated onto the summary reviewed prior to the second interview. These summaries were mailed to the household some two to three months after the first interview.

Table 2 shows the changes in total charge for unique visits as reported during the first interview and as corrected by type of medical event. Information on hospitalizations was not included because of the data processing problems mentioned earlier. The most noteworthy aspect of Table 2 is that there was such a high proportion of changes in the total charge before and after the summary review for medical provider and for dental visits. A charge would not be counted if a \$5.00 reported in the first interview remained unchanged or if an unknown charge remained unknown. Total charges could be printed onto the summary as dollar amounts or as the codes; "free from provider," "not known" or "not available." The code "not available" was used whenever the respondent did not know the total charge and would probably never know it, as in the case of Medicaid programs. Examples of changes are: a change from "not known" to "not available," a change from "free from provider" to "not available," a change from "not known" to a dollar amount or a change from one dollar amount to another.

Very few changes in the total charge column occurred in the other medical expenses section which consisted mostly of prescribed medicines. This was not surprising as prescribed medicines are usually purchased outright with no billing arrangement.

A breakdown of the number of different types of changes such as the number of unknown charges changed to dollar amounts or the number of unknown charges which remained unknown is not available. However, the proportion of unknown total charges as reported during the first interview and after summary review has been calculated. In the first interview, unknown total charges were reported for 32.4 percent of the dental visits, 33.5 percent of the medical provider visits, and 54.4 percent of the other medical expenses. After review of the summary, the percent of unknown total charges decreased to 22.0 percent for dental visits, 25.8 percent for medical provider visits, and 45.5 percent for other medical expenses.

From the final household data, it will be possible to track unique visits and events across interviews and to determine the amount and types of corrections, additions and deletions which household respondents made to the data during the entire survey.

The best way of measuring the impact and cost-effectiveness of the summary can be accomplished by analyzing data from the summary experiment. Included in the experiment are 80 pairs of segments each containing about nine households. In each pair, one household was mailed a summary and one was not. In each instance, a summary was mailed to the interviewer for review during the course of the interview.

In addition to the data obtained from the household interviews and from the review of the summary, there will be an additional data set available from the medical provider survey. This medical provider data can be used in conjunction with the household data to obtain the most accurate values for charges and sources of payments. The cost-effectiveness of using household data with a summary and no medical provider survey versus not using a summary but supplementing household data with a medical provider survey may be determined.

4. OTHER METHODOLOGICAL EXPERIMENTS IN THE NMCES

A health insurance claims experiment will be conducted with Blue Cross/Blue Shield plans in

four different States (Indiana, Michigan, Kansas, and North Carolina). Claims information obtained from the insurance companies will be compared with such information obtained from the household and from the medical provider survey.

Another methodological experiment in the NMCES is an occupational self-coding procedure which was administered in the New York City area with 1,200 household respondents. Occupational self-coding accuracy will be determined by coding the occupation of persons in the experimental group in the traditional manner.

5. CONCLUSION

A number of methodological experiments have been included in the design of the NMCES. Preliminary results included herein contribute to assessing the kind and extent of response error through the use of a household summary. The instrument appears to be effective in allowing the respondents to correct errors of commission and omission in the reporting of medical utilization and expenditures. Further, other detailed experiments in the NMCES design are described.

Table 1. MEDICAL CARE AND EXPENSES SUMMARY

For: Dora Doran		From 01/01/77 to 11/18/77								
:	PROVIDER NAME	:	DATE	:	TYPE OF SERVICE	:	SOURCE	:	AMOUNT	:
:	ADDRESS	:	OF	:	OR	:	CHARGE	:	OF	:
:	CITY, STATE	:	CARE	:	ITEM PROVIDED	:	PAYMENT	:	PAYMENT	:
*** I. DENTAL VISIT EXPENSES										
NONE										
*** II. HOSPITAL VISIT EXPENSES										
ELM GENERAL HOSPITAL	05/03/77	HOSPITAL STAY					MEDICARE		NOT KNOWN	
PICADILLY, NV.						NOT KNOWN	FAMILY?		0.00	
DR. JAMES HART	05/03/77	DOCTOR VISIT IN HOSPITAL							SEE FLAT FEE A	
PICADILLY, NV.										
*** III. MEDICAL PROVIDER VISIT EXPENSES										
DR. ROBERT BEAN	01/31/77	PROVIDED SERVICE					INSURANCE?		0.00	
PICADILLY, NV.						NOT KNOWN	FAMILY		10.00	
DR. JAMES HART	05/05/77	PROVIDED SERVICE							SEE FLAT FEE A	
PICADILLY, NV.										
DR. JAMES HART	05/10/77	PROVIDED SERVICE					INSURANCE?			
PICADILLY, NV.						25.00	FAMILY		25.00	
*** IV. OTHER HEALTH CARE EXPENSE										
PREScribed MEDICINES		DIVRIL				5.00	MEDICARE		100%	
		DARVON				4.50	FAMILY		4.50	
MISC. EXPENSES		WHEELCHAIR				15.00	FAMILY		15.00	
		ACE BANDAGE				0.00	FREE FROM PROVIDER			

RU# 9345695

SUMMARY OF FLAT FEES

RU# 9345695

For: Dora Doran

COMPUTER ID#

:	FLAT FEE CODES	:	CHARGE	:	SOURCE OF PAYMENT	:	AMOUNT OF PAYMENT	:
:	FROM PRECEDING PAGES	:		:		:		:
*** FLAT FEE CODE: A NOT AVAILABLE MEDICARE 100% 010101								

PID# 9556077

HEALTH INSURANCE SUMMARY
AS OF NOVEMBER 18, 1977

RU# 9345695

For: Dora Doran

MOST KNOWLEDGE:
Dora Doran

PLANS AND INSURERS		POLICY OR CERTIFICATE NUMBER
*** I. FEDERAL OR STATE PLANS (As of 11/18/77)		
AA. MEDICARE - PART A		0401
Dora Doran		0401 9556077
BB. MEDICARE - PART B		0402
Dora Doran		0402 9556077
*** II. PRIVATE DENTAL ONLY PLANS (As of 11/18/77)		
NONE		
*** III. PRIVATE PLANS (As of 11/18/77)		
NONE		
*** IV. SPECIAL PLANS (As of 11/18/77)		
NONE		

Table 2. Percentage of Total Charges for Unique Visits Reported by the Household in Round 1 That Were Changed After Summary Review.

	Total Events Reported	Percentage With Changes in the Total Charge
Dental Visits	5,076	71.4%
Medical Provider Visits	21,327	74.9%
Other Medical Expenses (prescribed medicines, medical supplies)	9,708	6.0%