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1. INTRODUCTION

A major problem in survey research is the effect of response errors on the accuracy and completeness of information obtained from household interviews. One component of response errors unique to studies on the cost of medical care is due to the complex structure of medical care expenses in this country. This kind of response error can occur in cases where even the most cooperative household respondents who keep meticulous records may not be able to answer questions on the cost of their medical care, because health insurance payments, reimbursements, and the like may lag months after a medical event. It might, therefore, take many household interviews to resolve the cost of a medical visit.

The National Medical Care Expenditure Survey (NMCES) is sponsored by the United States Public Health Service under the joint auspices of the National Center for Health Statistics and the National Center for Health Services Research. A probability sample of 13,500 households was selected for the NMCES so as to represent the civilian noninstitutionalized population of the United States.

The survey is being conducted by the Research Triangle Institute of North Carolina, in conjunction with its two subcontractors, the National Opinion Research Center of the University of Chicago and Abt Associates, Inc. of Cambridge, Massachusetts.

The NMCES and its pilot study, the Medical Economics Research Study (MERS), both addressed the problem of response error in panel studies with the use of a memory aid called the household summary. The household summary is a computer printout containing information on visits to medical providers from previous panel interviews and expenses associated with those visits. It also includes information on hospitalizations, prescribed medicines and miscellaneous medical expenses such as crutches and eyeglasses. The summary is used to verify and to check for completeness the information previously reported by the household.

This paper addresses the use of the household summary during the NMCES pretest conducted in 1976.

2. REVIEW OF RELATED LITERATURE

An example of a memory aid similar to the household summary is used in the Current Medicare Survey (CMS) administered by the Social Security Administration. The CMS provides information which can be used to produce national estimates on the kinds and costs of medical services used by Medicare subscribers.

The study consists of 16 interviews, some of which are personal and some of which are conducted by telephone, each of which is separated by an

interval of one month. After every interview a document entitled the "Followup of Estimates and Omissions" is mailed to the interviewer prior to the next interview if necessary. The "Followup of Estimates and Omissions" is generated whenever estimates or "don't knows" were given as answers to questions on medical charges and/or whenever an item was omitted during a prior interview. During the next interview, the interviewer asks about the omitted and unknown information. If the household respondent does not know an answer after two more interviews, the questions are not asked again.

The only other example of an aid resembling the household summary found in the literature, was used in the MERS, the pilot for the NMCES. That household summary was very similar in content to the one used for the NMCES pretest. The final results of the pilot study have not, as of yet, been published.¹ However, preliminary results indicated that the use of a summary improved the quality of household data thus proving to be a feasible memory aid in studies on the cost of medical care.

3. METHODOLOGY OF THE NATIONAL MEDICAL CARE EXPENDITURE SURVEY PRETEST

The NMCES pretest was designed to test procedures for collecting information on medical care expenditures from household respondents and their medical providers. In the household portion of the pretest, all aspects of the national study were pretested, including the basic questionnaire, procedures for administering the household summary, the use of a diary for recording medical events, and the collection of signed permission forms for the Medical Provider Survey (MPS).

The household pretest was a two round panel study administered in two sites--Dayton, Ohio and Charlotte, North Carolina in the fall of 1976. All household interviews were conducted in person.

The MPS pretest began in August 1977 and is scheduled to end in October 1977. Those physicians and hospitals for whom a signed permission form has been obtained from household respondents will be asked questions about medical care which they provided. The medical providers will be contacted initially by mail, with telephone and personal followup procedures used whenever necessary.

The NMCES began on a national level in January 1977. A description of all aspects of the entire NMCES and pretest is given by Julia D. Oliver at these proceedings.²

In the NMCES pretest, approximately 160 households in each pretest site of Dayton, Ohio and Charlotte, North Carolina participated.

During the first interview, questions were asked about disability days, days lost from work due to illness, the costs and services provided during hospitalizations and visits to physicians, dentists, and all other medical providers, the

costs of prescribed medicines and other medical expenses (e.g., crutches and eyeglasses) and health insurance coverage.

After this first household interview, the respondents were informed that they would be contacted again for another interview in 8 weeks. Before the next interview, they were told that they would receive in the mail a computerized summary containing information on medical costs and visits that they had just reported in the first interview. In addition, they were instructed on the use of a diary to record medical expenses incurred before the next interview.

Data from the first interview were coded, keyed and edited before being generated into household summaries. Two copies of each summary were produced--one copy for the household respondent and one copy for the interviewer. Also included in the packet mailed to the respondent was a letter explaining how to read the computerized format. An example of the household summary is shown in Illustration 1.

After the administration of the questionnaire during the second interview, the summary was reviewed jointly by both the respondent and the interviewer. In most cases, the same person was the respondent for both interviews.

All interviewers were instructed to specifically ask about error codes appearing on the summary. Error codes (i.e., "not known," "not available") were programmed onto the summary whenever missing, illegible, or outrageous information, such as a \$50,000 dental bill, were reported, during the first interview. In the course of the summary review, the interviewer would ask the respondent if that information was now available. Some interviewers reviewed the summary line by line, asking if each item was correct. Others reviewed only the error codes specifically and then asked respondents if the rest of the summary was correct.

Corrections were made on the interviewers' copy of the summary, which was returned to data processing. Previously unreported information, questions which were originally misunderstood or omitted, incorrect answers given by proxy respondents, keying, coding, and interviewer errors were reconciled on the summary. In this way, information from the first interview was validated and checked for completeness with the household respondent.

The summary review only took a few minutes on the average and never exceeded ten minutes. Respondents reacted favorably to the summary, in general, commenting that seeing their own data made the survey seem more legitimate and worthwhile.

Many respondents had difficulty in reading and understanding the computerized format, but most understood the summary after it was explained to them by the interviewer. The summary was read to those respondents who were illiterate, had poor eyesight, or who were, for some other reason,

unable to review the summary by themselves.

During the pretest, the summary was only reviewed once. The summary is being reviewed several times during the national study, during every interview after the initial one. The summary in the national study will be cumulative, with the last household summary containing information from all prior interviews.

4. FINDINGS

The analysis is primarily concerned with the number and types of changes made regarding information from the first interview and how these changes affect out-of-pocket expenses for medical care.

The variables which were analyzed for changes on the summary were: (1) name, address, source of payment, amount paid by each source of payment, and total charge for visits to physicians, dentist and other medical providers (not M.D.'s) and hospitalizations; (2) name, source of payment, amount paid by each source of payment and total charge for prescribed medicines and other medical expenses (i.e., eye glasses, crutches).

The variables which were not analyzed include date of visit and demographic information. Changes in the date of a medical event were far too few to warrant any analysis. If the respondent knew a date during the first interview, it was rarely changed during the summary review 8 weeks later. Similarly, if a respondent did not know the date during the earlier interview, it was unlikely to be remembered later.

Demographic information such as education, income and race was collected during the second interview, but was not available for this analysis. However, the name, address, age and sex of each respondent was printed onto the summary and corrected if necessary. The number of these changes was insignificant, but the effect of seeing an incorrect name, age or sex, appearing on the summary, disturbed the respondents more than anything else.

The results of the summary review were separated into two main groups: those entries which were changed and those entries which remained the same. The changes were then regrouped into reports of new visits (additions), deletions of previously reported visits, updating of information (corrections) and changes caused by previous omissions of questions. The latter referred to a built-in feature of the questionnaire where if a bill was to be expected, questions about the source or amount of payment were not asked.

Those items which remained the same were classified into two categories, those items which the respondent knew in the first interview and verified 8 weeks later and those items which the respondent did not know during the first interview and still did not know at the time of the summary review. The number of changes reflect the impact of the summary review.

Table 1 gives the frequency of different medical events which occurred during the first interview of the pretest and combines results for both Dayton and Charlotte.

Table 2 shows the number and percentage of changes made on the summary for certain key variables in both pretest sites. Changes were highest for those variables involving dollar amounts, "amount of payment for each source" (19.7 percent) and "total charge" (21.0 percent). The fewest number of changes were made for names (7.5 percent) of medical providers or items, such as the name of a prescribed medicine and the address of medical providers (6.0 percent). Most of these changes were corrections in spelling.

Another way of looking at changes on the summary is to view the number of charges per line of data. A line of data on the summary closely approximates a medical event and contains an average of 4 key variables (name, address, source of payment, amount paid by each source, and total charge). The average number of changes per line of data is 0.6 ($826 \div 1,398$), with 2.6 changes per household ($826 \div 317$) and 1.0 changes per person ($826 \div 819$).

Table 3 shows the number and type of new and deleted visits and items picked up by the summary review. The net change of all medical events was shown to be 24, with 34 additional and 10 deleted items and visits resulting after the summary review. Nine of the ten deletions resulted because the visit or event appeared on the wrong family member's page of the summary. The net change (24) represented 2.2 percent of all 1,116 reported items and visits.

Table 4 shows the changes made in out-of-pocket expenses for dental visits, physician visits and prescribed medicines as a result of the summary review. Changes in the amount paid by the family were made in 15.0 percent of physician visits, 34.3 percent of dental visits and 13.4 percent of prescribed medicines.

Table 5 shows the average out-of-pocket expense for different medical events for the first interview compared with the subsequent summary review, and the number of out-of-pocket expenses which were known and not known at the two times. At the time of the first interview, 174 (23.7 percent) of all out-of-pocket expenses were unknown. After the summary review, only 61 (8.3 percent) of these expenses still remained unknown.

The ratios and net differences of the average out-of-pocket expense for different items as reported in the two time periods is given in Table 6. Average out-of-pocket costs per household dropped \$2.82 for dental visits, \$0.05 for prescribed medicines, \$0.91 for other medical provider visits and \$1.56 for other medical expenses. Some costs increased, e.g., \$5.48 for physician visits, \$58.50 for hospitalizations and \$4.66 (a 31 percent increase) for all medical events.

Table 7 is similar to Table 5, except that it shows the average expense paid by private insurance for different medical events as given during the first interview and after the summary review. In this case, 59.0 percent of all amounts paid by insurance were unknown during the first interview and 38.8 percent remained unknown after the summary review.

Table 8 shows that the net ratio (1.04) of the average amount paid by insurance as reported in the two time periods is much less than that reported for out-of-pocket expenses (1.31)

The net differences are also given in Table 8 for insurance payments reported before and after the summary review. There was a decrease in the amount paid by insurance of \$1.67 for dental visits, \$0.80 for physician visits and \$1.21 for prescribed medicines. There was an increase of \$149.12 for hospitalizations and \$2.26 for the total of all medical events. However, after the review of the summary, there are still many insurance payments which remain unknown.

Information on the names and addresses of physicians after the summary review was compiled in Table 9. While the data are not directly related to medical expenditures, it is crucial for the MPS when it will be necessary to contact all the physicians. Only in a few instances (2.8 percent) will both the name and address of a physician be unknown.

5. CONCLUSIONS

The household summary was a valuable tool for obtaining missed visits and for correcting and completing information on the cost of medical care. A question which remains unanswered is the length of an optimum period of time for summary review, which would be both long enough to allow for unknown variables to be resolved and short enough so that recall would not be a problem. An issue which can be resolved after the entire pretest is the relative effectiveness of the household summary versus going directly to the providers in obtaining accurate cost data.

REFERENCES

1. "Medical Economics Survey Field Operations and Costs, January through October, 1975." Westat Research, Rockville, Md., 1212175.
2. Oliver, Julia D. "The Design and Methodology of the National Medical Care Expenditure Survey." American Statistical Association, Contributed Paper Session, Chicago, Illinois (August 1977).

Illustration 1

MEDICAL CARE AND EXPENSES SUMMARY									
FOR: HEALTHY, JACOB J.	MALE	AGE 66	FROM: 01/15/75	TO: 05/21/76					
: PROVIDER NAME	: DATE	: TYPE OF SERVICE	:	:	BILL WAS OR WILL BE PAID BY	:	:	:	:
: ADDRESS	: OF	: SPECIALITY OR	:	:	SOURCE OF	:	AMOUNT OF	:	:
: CITY, STATE	: CARE	: ITEM PROVIDED	: AMOUNT	:	PAYMENT	:	PAYMENT	:	:
*** I. DENTAL CARE EXPENSES									
PULLEM X. Y. DDS	03 04 76	EXTRACTION			FAMILY		\$ 14.00		
123 MAIN STREET									
CHICAGO, ILL.			\$ 32.00		AETNA		\$ 18.00		
*** II. HOSPITAL VISIT EXPENSES									
NONE									
*** III. DOCTOR VISIT EXPENSES									
SMITH, JOHN D. MD	05 12 76	GEN PRACT		NOT AVAIL	MEDICARE		NOT AVAIL		
22 MAIN STREET									
CHICAGO, ILL.									
*** III. OTHER HEALTH CARE EXPENSES									
NONE									

TABLE 1. Number of Medical Events, by Type

	Number of Events	Average Number of Events/Household
Dental Visits	174	0.55
Hospitalizations	15	0.05
Physician Visits	443	1.40
Prescribed Medicine	399	1.26
Other Medical Providers' Visits	58	0.18
Other Medical Expenses	27	0.08
Total	1,116	3.52

TABLE 2. Total Changes Made on the Summary

Variable	Number of Items	Number of Items Not Changed			Number of Changes				
		Item Known	Item Unknown	Total	Corrections	Additions	Deletions	Previous Omissions of Ques.	Total
Name of Provider/Item	1,116 (100%)	933 (83.6%)	99 (8.9%)	1,032 (92.5%)	40 (3.6%)	34 (3.0%)	10 (0.9%)	0	84 (7.5%)
Address of Provider	696 (100%)	625 (89.8%)	29 (4.2%)	654 (94.0%)	15 (2.2%)	20 (2.9%)	7 (1.0%)	0	42 (6.0%)
Source of Payment	1,272 (100%)	973 (76.5%)	83 (6.5%)	1,056 (83.0%)	91 (7.2%)	34 (2.7%)	12 (0.9%)	69 (5.4%)	216 (17.0%)
Amt. of Payment by Source	1,272 (100%)	733 (57.6%)	289 (22.7%)	1,022 (80.3%)	133 (10.4%)	34 (2.7%)	12 (0.9%)	58 (4.6%)	250 (19.7%)
Total Charge	1,116 (100%)	661 (59.2%)	221 (19.8%)	882 (79.0%)	123 (11.0%)	34 (3.0%)	10 (0.9%)	57 (5.1%)	234 (21.0%)
Totals	5,472			4,646 (84.9%)					826 (15.1%)

TABLE 3. Number of New and Deleted Medical Events

Type of Event	Number of New Events	Number of Deleted Events	Net Change
Dental Visits	12	4	8
Physician Visits	5	2	3
Prescribed Medicines	13	4	9
Visits to Other Medical Providers	4	0	4
Other Medical Expenses	0	0	0
Hospitalizations	0	0	0
Totals	34	10	24

TABLE 4. Changes in Out-of-Pocket Expenses for Dental Visits, Physician Visits and Prescribed Medicine

	Number of Items=n	Number of Items Not Changed			Number of Changes				
		Item Known	Item Unknown	Total	Corrections	Additions	Deletions	Previous Omissions of Ques.	Total
Dental Visits	131 (100%)	80 (61.1%)	6 (4.6%)	86 (65.7%)	31 (23.7%)	10 (7.6%)	2 (1.5%)	2 (1.5%)	45 (34.3%)
Physician Visits	232 (100%)	176 (75.9%)	21 (9.1%)	197 (85.0%)	27 (11.6%)	3 (1.3%)	2 (0.9%)	3 (1.3%)	35 (15.0%)
Prescribed Medicine	312 (100%)	245 (78.3%)	26 (8.3%)	271 (86.6%)	22 (7.0%)	13 (4.2%)	4 (1.3%)	2 (0.6%)	41 (13.4%)

TABLE 5. Average Out-of-Pocket Expenses by Medical Event

Medical Event	As Reported in the First Interview			After Summary Review		
	n(K)	n(DK)	Average Cost per Household	n(K)	n(DK)	Average Cost per Household
Dental Visits	86	45	\$36.16	125	6	\$33.34
Physician Visits	180	57	\$16.97	214	23	\$22.45
Prescribed Medicine	246	59	\$ 5.76	277	28	\$ 5.71
Other Medical Providers Visits	25	5	\$17.04	30	0	\$16.13
Other Medical Expenses	22	4	\$22.42	24	2	\$20.86
Hospitalizations	2	4	\$21.75	4	2	\$80.25
All Medical Events	561	174	\$15.21	674	61	\$19.87
n(K) = Number of out-of-pocket expenses known						
n(DK) = Number of out-of-pocket expenses unknown						

TABLE 9. Name and Address of Medical Doctor After Summary Review

	Number	Percent
Both Name and Address Known	378	86.7
Only Name Known	3	0.7
Only Address Known	43	9.9
Neither Name nor Address Known	12	2.8
Totals	436	100.0%

TABLE 6. Comparisons of Average Out-of-Pocket Expenses Between the First Interview and the Summary Review

	(Average Out-of-Pocket Expense After the Summary Review) ÷ (Average Out of Pocket Expense Reported in the First Interview)	Net Change in Out-of-Pocket Expenses After the Summary Review
Dental Visits	.93	- \$ 2.82
Physician Visits	1.32	+ \$ 5.48
Prescribed Medicines	0.99	- \$ 0.05
Other Medical Providers Visits	.94	- \$ 0.91
Other Medical Expenses	0.93	- \$ 1.56
Hospitalizations	3.69 *	+ \$58.50 *
All Medical Events	1.31	+ \$ 4.66
* n-very small		

TABLE 7. Average Amount Paid by Insurance by Medical Event

Medical Event	As Reported in the First Interview			After Summary Review		
	n(K)	n(DK)	Average Cost per Household	n(K)	n(DK)	Average Cost per Household
Dental Visits	11	24	\$42.50	24	11	\$40.83
Physician Visits	41	44	\$32.50	53	32	\$31.70
Prescribed Medicines	18	34	\$ 5.22	28	24	\$ 4.01
Other Medical Provider Visits	0	3	-	2	1	\$26.25
Other Medical Expenses	2	1	\$16.88	2	1	\$16.88
Hospitalizations	5	5	\$416.81	6	4	\$565.93
All Medical Events	77	111	\$52.12	115	73	\$54.38
n(k) = Number of out-of-pocket expenses known						
n(DK) = Number of out-of-pocket expenses unknown						

TABLE 8. Comparisons of Average Insurance Payments Between the First Interview and the Summary Review

	(Average Insurance Payment After the Summary Review) ÷ (Average Insurance Payment Reported in the First Interview)	Net Change in Out-of-Pocket Expenses After the Summary Review
Dental Visits	0.96	- \$ 1.67
Physician Visits	0.98	- \$ 0.80
Prescribed Medicines	0.77	- \$ 1.21
Other Medical Providers Visits	**	**
Other Medical Expenses	1.00 *	0 *
Hospitalizations	1.36 *	+\$149.12
All Medical Events	1.04	+ \$ 2.26
* n-very small		
** not available		