THE EFFECT OF HOUSEHOLD RECORDS ON RESPONSE ERROR IN REPORTING PRESCRITION DRUG EXPENDITURES BY ELDERLY RESPONDENTS

Marc L. Berk and Claudia L. Schur, Project HOPE
W. Sherman Edwards, Westat, Inc.
Marc L. Berk, Project HOPE, Two Wisconsin Circle
Chevy Chase, MD 20815

Abstract

Recalling detailed information about health expenditures is a difficult task for most survey respondents. This problem may be even more serious in surveys of the elderly than in general population surveys. During the recent debate over the Medicare Catastrophic Coverage Act, an effort was made to evaluate the quality of prescription drug reporting.

The Project HOPE Prescription Drug Expenditure Verification Survey (PDEVS) was designed to obtain information about the accuracy of reporting of prescription drug expenditures for elderly persons. Interviewers encouraged respondents to refer to used medicine bottles, checkbooks, and receipts from their pharmacies during the interview. PDEVS data indicate that a high proportion of elderly persons used such household records. Nevertheless, the vast majority of respondents were unable to report accurately either the number of prescription drug refills they had during a six-month period or their expenditures for drugs. Multivariate analyses indicate that respondents who use checkbooks to recall events were generally able to report more accurately than other respondents. Use of other memory aids was less effective in increasing recall accuracy. Indeed, survey results indicate that respondents who used medicine bottles to recall use of prescription drugs actually reported less accurately than those who did not.

Background

The ability of household respondents to accurately report health expenditures has been a major issue of concern to policymakers. Survey designers have used a number of techniques to increase reporting accuracy though systematic evaluation of these procedures is precluded by the absence of validation data. In response to legislative initiatives, there has been a particular need to understand the data quality of reports of expenditures for prescribed medicines by elderly persons. While the elderly are important from a policy perspective, researchers are concerned about their ability to report since "the effect of aging on response performance is increasing failure to retrieve information from memory," (Groves, 1989:441).

In 1989 Project HOPE conducted the Prescription Drug Expenditure Verification Survey (PDEVS). The survey was designed to measure the ability of respondents in household surveys to accurately report their use of and expenditures for prescription drugs. Project HOPE, along with its subcontractor the Roper Organization, conducted the PDEVS between April and December of 1989. The study involved interviews with elderly persons in five locations using procedures adapted from the 1987 National Medical Expenditure Survey (NMES). Interviews were conducted in Council Bluffs (Iowa), Detroit, Memphis, Philadelphia, and Phoenix. The PDEVS attempted to collect use and expenditure information for drugs used during the first six months of 1989.

Two household interviews were conducted in the PDEVS. The first was conducted in person, and the second primarily by telephone, although interviewers could conduct the second round in person whenever it appeared advisable to do so. Approximately 20 percent of the Round Two interviews were conducted in person. At the conclusion of the household interview, respondents were requested to sign a permission form authorizing each of the pharmacies where their prescriptions had been filled to provide the Roper Organization with the names and cost of all prescription drug medications obtained during the survey reference period. Respondents who claimed not to have used prescription drugs during the reference period were asked to sign a form authorizing their "usual" pharmacy to provide us with information that they may have failed to recall. After completion of the second round of household interviews all pharmacies were contacted in person to obtain information on prescription drugs purchased by each respondent between January 1 and June 30, 1989, the study reference period.

Recall of expenditures for prescription drugs can be a difficult task for a respondent. The PDEVS questionnaire, like the national surveys that collect medical expenditures, broke the task into three components. First, the respondent was asked to report all prescription drugs obtained during the reference period. Then, for each drug, the respondent was asked how many times he or she obtained the drug during the reference period. Finally, the respondent was asked for the total charge and sources and amounts of payment for all the times the drug was obtained. Even with this partial decomposition of the overall recall task, each of the sub-components remains complex and requires different kinds of cognitive activity, and each activity may be enhanced in different ways by the use of records.

For example, recalling what drugs were obtained may begin with a mental or actual review of the medicine cabinet to determine what medicine containers are on hand and making a judgement about whether each one was obtained during the reference period (this information may or may not be on the bottle or other container). A careful respondent may then consider other kinds of medicine containers that may be stored in separate places. The very careful respondent may then attempt to recall any medicines taken within the reference period whose container was discarded, and make a judgement about whether the medicine was obtained during the reference period. It is easy to imagine a number of points where this process might fail or be aborted, resulting in failure to report medicines or reporting medicines actually obtained outside the reference period. Using records as aids to or substitutes for recall may or may not improve the accuracy of reports. Sudman and Bradburn (1974) argue that the use of aids may have a differential effect on under and overreporting so that "although aided recall may reduce omission, it may increase, or at least not decrease, telescoping effects and may thus lead to overreporting."

Recalling the number of times a drug was obtained is a different kind of cognitive activity from recalling whether it was obtained. If the medicine was obtained over a long period, the respondent might recall each purchase individually and count the number within the reference period. Or, the respondent may have stored in memory directly the number of items obtained for some reason. This information may also be written on the prescription itself. If the

medicine has been obtained regularly over a long period of time, the respondent may be more likely to use a rate-based estimation of the number of times obtained during the reference period, e.g., "I get that about once a month, so four times in the last four months." Direct recall, recall and count, or rate-based estimation are all subject to memory error (Blair and Burton, 1987). Receipts may be helpful in determining whether particular purchases were within the reference period, as may check stubs or cancelled checks. However, it may be difficult to associate a check written to a pharmacy with a particular drug or set of drugs, and reliance on checkbooks or receipts may result in failure to report a purchase with cash or where a receipt was not obtained.

Finally, estimating the cost of prescription drugs may be a very complex activity. If several purchases were made during the reference period, the per-purchase cost may be constant or may vary. A check or receipt amount may include items other than the particular drug being asked about. Or, respondents may never have known the full cost of a drug.

Reporting expenditures may be subject to other kinds of response error besides that associated with recall. For example, some respondents may have a different definition of what counts as "medicine prescribed by a doctor" than was intended by study designers. Or, respondents may not fully hear or may misinterpret the questions about total charges for all times obtained and report instead the unit (per-purchase) cost. Interviewers may also contribute to response error, for example, by making inaccurate computations when helping respondents determine total charges.

This paper begins an analysis of this complex set of response processes in the PDEVS by investigating the relationship between different kinds of household records and levels of agreement between interview reports and pharmacy records. Two parameters are examined - the number of individual drug purchases and total expenditures per person.

Surveys such as the 1977 National Medical Care Expenditure Survey, the 1980 National Medical Care Utilization and Expenditure Survey, and the 1987 National Medical Expenditure Survey place considerable emphasis on encouraging respondents to use records as a method of aiding recall. Respondents are strongly encouraged to use prescription drug bottles, receipts from pharmacies, and review of checkbooks as methods of increasing the accuracy of heir reporting. The Project HOPE Drug Expenditure Verification Survey similarly encouraged the use of such reporting aids. The PDEVS, however, unlike other surveys, also included a verification component. As a result, it offers us the unique opportunity to study the effects of such devices in reporting accuracy.

Findings

Interviewer efforts to encourage respondent use of memory aids were clearly successful. Three-quarters of respondents used either medicine bottles, checkbooks, or pharmacy receipts to assist their recall and many respondents used more than one of these (Table 1). Persons aged 65-69 were somewhat less likely to use memory aids than were older persons. Nonwhites and whites used medicine bottles with similar frequency, although whites were more likely to use their checkbook and pharmacy receipts. While there was no difference in use of medicine bottles or checkbooks according to the sex of the respondent, about 35 percent of males used pharmacy receipts compared to only 30 percent of females.

Persons in fair or poor health were more likely to use memory aids; 82 percent of persons whose self-reported health status was fair or poor used medicine bottles compared to 59 percent whose health status was good or excellent. Those in fair or poor health status were also more likely to refer to receipts from pharmacies. Thirty-one percent of those in excellent or good health did not use any of the three memory aids studied compared to only 12 percent of those in fair or poor health. There was generally little association between education and use of memory aids, although persons with less than 12 years of education were somewhat less likely than other persons to use pharmacy receipts.

The data presented in Table 2 indicate that few respondents were able to report accurately regardless of what type of memory aid was used. About 14 percent of those who used checkbooks, 11 percent of those who used receipts, and 12 percent of those who referred to medicine bottles were able to report the correct number of prescription drugs filled by their pharmacies; these differences are not statistically significant. There was, however, a small difference in the pattern of reporting. Specifically, respondents who used checkbooks were somewhat more likely to overreport the number of prescription drug refills than to underreport them compared to those who used bottles or receipts.

Table 3 presents a multivariate model to predict the accuracy of the count of prescription drugs made by elderly respondents. This measure of accuracy is the absolute difference between the number of drug prescriptions and refills reported on the household survey with that reported in the survey of pharmacies. Health status was the only demographic variable significantly associated with reporting accuracy. It is interesting to note that, while those in poor health status were more likely to use memory aids, the multivariate model suggests that persons in poor health status reported far less accurately than those in better health. This can probably be explained by the fact that persons in poor health had many more drug-related events to remember and, thus, were required to perform a more difficult task.

The regression equation further shows that the use of memory aids can significantly affect data quality. Specifically, the results suggest that respondents who use checkbooks reported more accurately than those who did not and, conversely, those who used medicine bottles reported less accurately than other persons. One possible explanation is that respondents use bottles to recall which drugs they use and then rely on "rate-based estimation" to estimate the number of times the drug is used and how many times the prescription has been refilled. Almost all respondents discard drug bottles once they have used all their medication and they, therefore, rely only on their current prescription bottles as a method of recall. Rate-based estimation may be too simplistic a method of recalling events and may give respondents a false sense of security about the difficulty of remembering medical events.

We note that, while many of the expenditure surveys noted above encourage use of memory aids, little attention has been focused on what particular aids respondents use and the subsequent effect on data quality. Our findings suggest that some memory aids are better than others and, indeed, some -- such as medicine bottles -- may actually decrease accuracy of reporting. This does not necessarily mean that medicine bottles should not be used to assist recall. However, survey designers may consider incorporating additional probes for

medicines in other kinds of containers or whose containers have been discarded.

Groves notes that "the failure of respondents to give accurate survey reports may arise both because they fail to engage in appropriate cognitive activities at the time of response and because they do not possess the relevant knowledge," (Groves, 1989:410). It is possible that the household records we have examined serve as a source of knowledge but also serve to decrease the cognitive effort that respondents make in recalling events for which memory aids are not useful. Thus, while some events may be better reported, events for which bottles are no longer available (i.e., acute illness) may be subject to significant underreporting.

When we examine accuracy of prescription drug expenditure reporting, we continue to find that respondents are unable to report accurately regardless of which memory aid is used. Nevertheless, here again, we do see some difference between the effect of different types of memory aids. Over 22 percent of those who use checkbooks were able to report their expenditures within 10 percent while less than 14 percent of those who used medicine bottles were able to report with this degree of accuracy (Table 4). In addition, we also find that misreporting was more random when the checkbook was used than when the medicine bottle was used. Thus, approximately 39 percent of those respondents who used checkbooks overreported - similar to the number who underreported their drug expenditures. Conversely, of those respondents using bottles as a memory aid, over 57 percent underreported prescription drug expenditures compared to fewer than 30 percent who overreported.

When a multivariate model is used (Table 5) we see that the use of the checkbook had a clear and dramatic effect on the accuracy of prescription drug reporting. Indeed, when controlling for other factors, the difference between the household report and the pharmacy report was over $57 less when a checkbook was used than when it was not. When a multivariate analysis is conducted neither bottles nor receipts appear to have an effect on the accuracy of drug expenditure reporting.

Conclusions

Study results indicate that interviewers were highly successful in getting respondents to use household records during the household survey. The use of data from the verification survey, however, indicates that survey researchers will have to think much more carefully about the use of memory aids in assisting respondent recall. Not all memory aids are alike and there are clearly differential effects according to which particular type of record is used. The most common memory aid used in studies of prescription drug expenditures is the medicine bottle. Our analysis indicates use of medicine bottles does not increase reporting accuracy and, indeed, there is significant evidence to suggest that it decreases the accuracy of reports ofprescription drug counts. The use of the checkbook appears far more beneficial to the accurate reporting of both prescription drug expenditures and counts of prescription drugs.

References

Berk, L., Schur, C., and Mohr, P. "Using Survey Data to Estimate Prescription Drug Costs." Health Affairs, 9:146-156, Fall 1990.

Blair E. and Burton S. "Cognitive Processes Used by Survey Respondents to Answer Behavioral Frequency Questions." Journal of Consumer Research, 14:280-288.

Groves, R., 1989. Survey Errors and Survey Costs. New York:John Wiley.

Sudman, S., and Bradburn, N., 1974. Response Effects in Surveys. Chicago: Aldine.

Footnotes

[1] The PDEVS was restricted to persons aged 65 years or older. Seven hundred and thirty respondents (71 percent) completed the Round One interview while 648 respondents (89 percent) completed the Round Two interview. Approximately 96 percent of all persons surveyedagreed to complete permission forms authorizing us to contact their pharmacies. Data were obtained from all mentioned pharmacies for 87 percent of respondents to the household survey. The design of PDEVS is further discussed in Berk et al., 1990).

[2] Accurate reporting is defined here as reporting the number of prescription drugs used within 10 percent (above or below) that reported by the pharmacy. Estimates of use and expenditures presented in this paper have been annualized by doubling the six-month estimate.

Table 1

Use of Household Records by Demographic Characteristics

Percent

	(N)	Used Medicine Bottles	Used Checkbook	Used Pharmacy Receipts	Used None of These
All	543	66%	10%	32%	25%
Age					
65-69	(152)	56%	7%	28%	34%
70-79	(276)	70	11	38	21
80 +	(115)	70	13	24	24
Race					
White	(438)	66	12	33	25
Nonwhite	(105)	67	4	28	27
Sex					
Male	(212)	67	10	35	23
Female	(331)	66	10	30	27
Health Status					
Excellent/ Good	(364)	59	10	29	31
Fair/Poor	(179)	82	9	39	12
Education					
>12 Years	(251)	69	10	29	26
12 Years	(182)	63	10	35	24
<12 Years	(110)	64	11	35	25
Total		66	10	32	25

Source: 1989 Prescription Drug Expenditure Verification Survey.

Table 2

**Accuracy of Prescription Drug Count Reporting
By Use of Household Records***

	(N)	Overreported Number of Prescriptions Filled	Reported Accurately (Within 10%)	Underreported Number of Prescriptions Filled
Used Bottles	(327)	31.8	11.9	56.3
Used Receipts	(159)	30.8	11.3	57.9
Used Checkbooks	(50)	36.0	14.0	50.6
Used no Memory Aids	(54)	14.8	13.0	72.2

*Table excludes persons for whom use was not reported in both the household and pharmacy survey.

Source: Prescription Drug Expenditure Verification Survey.

Table 3

Regression Estimate for Accuracy of Prescription Drug Counts[1]

	Estimated Coefficient	T-Statistic
Age	.006	.14
Education	.045	.89
Race (1 = Nonwhite)	-0.53	.60
Health Status (1 =Fair/Poor)	3.13	4.33**
Sex (1= Female)	0.44	.63
Used Checkbook	-2.58	2.43*
Used bottles	1.75	2.07*
Used receipts	-0.10	.15
Intercept	1.8	.60

Statistics

Mean of dependent variable	5.2
Adjusted R^2	.06
Observations	419
F = 4.2**	

** significant at .01
* significant at .05

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[1]Accuracy is defined as the absolute difference between the household reported counts of drugs and the count of purchases obtained from pharmacies.

Table 4

Accuracy of Prescription Drug Expenditure Reporting by Use of Household Records

Percent

	(N)	Overreported by over 30 percent	Overreported by 11-30 percent	Correctly Reported within 10 percent	Underreported by 1-30 percent	Underreported by over 30 percent
Used Bottles	(317)	23.7	5.7	13.6	14.6	47.4
Used Receipts	(151)	23.8	6.6	17.9	13.6	38.4
Used Checkbook	(49)	30.6	8.2	22.5	2.0	36.7
Did not Use Memory Aids	(19)	26.3	-	15.8	10.5	47.4
Total *	(385)	24.2	5.2	14.3	13.8	42.6

* Household record categories are not mutually exclusive

* Table includes only persons for whom drugs use was reported in both the household and pharmacy surveys. In addition there were 35 respondents who claimed to not have used prescription drugs but more pharmacy records indicated use. Conversely there were 16 respondents who reported drug expenditures that were not reported by their designated pharmacies.

Table 5

Regression Estimate for Accuracy of Prescription Drug Expenditures

	Estimated Coefficient	T-Statistic
Age	-0.82	.84
Education (in years)	0.71	.58
Race (1 = nonwhite)	8.08	.38
Health Status (1 = Fair/Poor)	70.85	4.07**
Sex (1 = Female)	-7.00	0.41
Used checkbook	-57.40	2.24*
Used bottles	30.40	1.49
Used receipts	-2.71	.61
Intercept	133.74	1.7

Mean of dependent variable –	$120.38
Adjusted R^2	0.05
Observations	419
F	3.79**

** significant at .01
 * significant at .05