

A TALE OF TWO QUESTIONS: BENEFITS OF ASKING MORE THAN ONE QUESTION

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Abstract In the last two months have you had a physical examination? The ability of 660 people to accurately report on their own recent health procedures was assessed by comparing the recollections of patients to information extracted from their medical records. A major finding was that when people were asked whether they had a specific procedure in a given reference period (e.g., physical exam within the last two months), overreporting occurred. A simple technique reduced overreporting: The technique entailed asking people about the procedure twice, first in connection with a different reference period (e.g., physical exam within the last six months) and then in connection with the reference period of interest (e.g., physical exam within the last two months). Our data support a "Precision" hypothesis: The advantage of the two-time frame questioning procedure is that it conveys to the respondent that the interviewer wants greater precision in dating than the single-time frame question implies.

"In the last two months, have you had a physical examination? How about an eye exam?" When people try to answer questions like these,

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they are relying on retrospective memory and they often make mistakes (Baddeley, 1979; Strube, 1987). Sometimes they forget a procedure, and erroneously say "no" when they should say "yes." But forgetting is not the only error to worry about. Sometimes people recall an earlier episode (from, say, four months ago) as if it occurred more recently than it did. When a person reports an eye exam as having occurred during the previous two months when it actually occurred four months ago, a "forward telescoping" error has occurred. The data collected by survey researchers can be rendered misleading if forward telescoping is significant. (See also Garofalo and Hindelang, 1977; Loftus and Marburger, 1983.) Forward telescoping has been found to be a more serious problem than, say, backward telescoping, or the recalling of events as being further in the past than they actually were (Means et al., 1987; Sudman and Bradburn, 1973).

Bounded interviews are one solution to the problem of forward telescoping. In a bounded interview, the interviewer has the responses that were obtained from a prior interview conducted six months before the current interview. If the respondent in the current interview reports a recollection similar to one reported previously, the interviewer can probe further to determine whether the recollection now being reported is the same or is a new one, and if it is the same, it can be excluded from the current interview data. This technique has proven successful in surveys of household alterations and repairs (Neter and Waksberg, 1984). A major disadvantage of this technique is that it requires at least two interviews, and the data from the initial interview are used only to provide bounding information for subsequent interviews. Thus, it is wasteful of data.

The bounded interview technique was modified by Sudman, Finn, and Lannom (1984) for use in a single interview. These investigators first asked respondents about an earlier period and then about a more current period, all within a single interview session. This bounded recall procedure reduced telescoping in reports of health behavior and of snack food expenditures. While Sudman et al. were heartened by the apparent success of their simple technique, they explicitly warned that simultaneous validation information was essential to understanding the impact of bounding on errors of recall (p. 524).

A similar technique for potentially reducing forward telescoping was reported by Crespi and Swinehart (1982). Respondents were asked which of several medical procedures they had (blood pressure checked, physical exam, eye exam, etc.) in the past two months. Some respondents were first asked whether they had each procedure during the past six months, and then were asked the two-month question. When the six-month question was asked first, affirmative responses to the two-month question averaged 12% less than when the two-month

question was asked alone. For example, when asked the six-month question first, 11% claimed to have had an eye exam in the last two months, 32% claimed to have had their blood pressure checked, 20% claimed to have had a physical exam. However, if the two-month question was asked alone, these figures were higher: 23%, 48%, and 32% respectively. In short, the two-time frame questioning procedure produced quite different estimates of the extent to which respondents engaged in the various health-related activities.

While the two-time frame procedure reduced the number of affirmative responses, did it lead to more accurate reporting? Crespi and Swinehart did not verify respondents' reports, but they had several reasons for believing that the lower reports were more accurate. Nonetheless, like Sudman et al. (1984), Crespi and Swinehart appealed to future researchers to reinvestigate their method with personal memories that could be verified.

It is natural to ask why people report fewer activities within a two-month period if they are first asked about activities within six months. There are a number of hypotheses. First, it is possible that events from three to four months ago are "captured" by the six-month question and thus do not need to be reported in response to the two-month question. For example, when asked the two-month question, Mary Smith remembers that she went to a wedding a few months ago and was struck in the eye by the bride's flying bouquet. She reports the eye exam that resulted from this mishap. If, however, she had first been asked the six-month question, she would have presumably already reported the exam. Now in response to the two-month question, she has further time to contemplate the event and realize it occurred more than two months before. Second, the need to demonstrate a socially desirable concern for health matters can be satisfied when respondents answer the six-month question and they do not need to demonstrate this concern again for the two-month question. Put another way, respondents want to be able to tell you about these sorts of events; they feel they are assisting the interview when they can provide a positive example of what you are asking about, and the six-month question gives them a chance to do this. Finally, it is possible that the two-time frame procedure conveys that the interviewer wants greater precision in dating than the single-time frame question might imply. When Mary Smith is asked the two-month question about eye exams after having just been asked the six-month question, she realizes that the interviewer cares about the precise dating of her experiences.

Our experiment was designed, in part, to explore the two-time frame procedure as a potentially useful means of increasing the accuracy of reported memories. In addition, we hoped to learn something about why people were reporting fewer activities when asked two

questions rather than one. Crespi and Swinchart showed that people reported fewer activities in the two-month period when asked about a longer reference period first. Would people also report fewer activities when asked about a shorter reference period first? If the percentage reporting an activity were reduced when a shorter reference period came first, what explanations could account for this result? The precision hypothesis would predict that respondents who were first asked about one month, and then about two months, might sense a greater demand for precision and respond more accurately to the two-month question than respondents asked only about two months. The telescoping or social desirability explanations for the two-time frame effect would predict that asking about a shorter reference period first would not improve accuracy over a single-time frame question.

In sum, the purpose of this research was to determine whether a two-time frame procedure yields more accurate and complete reporting than a single-time frame procedure. Additionally, we aimed to distinguish between several general classes of explanations for reduced overreporting when two time frames are used.

Method

Our research was carried out in collaboration with Group Health Cooperative (GHC) of Puget Sound, the largest consumer-governed health maintenance organization in the United States. The Center for Health Studies at GHC conducts telephone surveys of Group Health clients on a regular basis, using standardized questionnaires from which interviewers read. By selectively manipulating the item content within one such survey, we conducted several experiments. Each subject participated in one or two of the individual experiments. In this article, we report only on the results from the two-time frame study.

SUBJECTS

Prospective survey participants were randomly selected by computer from GHC membership rolls. Letters were mailed to approximately 1,200 members asking for their participation in a consumer survey. Of these, 950 members completed the survey, yielding a completion rate of 79.2%. The sample was randomly drawn within stratified geographical regions. Of the members who participated in the survey, 94% gave permission for their medical records to be reviewed.

A good deal of demographic information was gathered from respondents, only a portion of which was relevant to this study. Of those who participated in the survey, 37% were males and 62% females (1% un-

known). The participants who were interviewed ranged in age from 14 to 82, with a mean of 42.5 years. 15% were over 65. Adults and young people 14 to 17 years old responded for themselves. Data for children 2 to 13 years old were obtained by interviewing parents as proxies for the children, and 19.3% of the sample consisted of parental proxy reports.

In this two-time frame study, 739 members participated and granted permission to have their medical records checked.¹ Permission was sought at the end of the survey.

PROCEDURE

All participants were interviewed during March, 1986. Each respondent who agreed to participate was telephoned and asked a series of approximately 50 questions (some of which had subquestions). The questions were part of a routine consumer opinion survey conducted by GHC to gather opinions and evaluations of GHC services and to provide information to assist in the planning of health care programs and facilities. The survey lasted approximately 30 minutes. Specific questions pertinent to this experiment were embedded in the beginning of this questionnaire. In order to incorporate the manipulations of item content required by the experiment, we constructed three different versions of the survey questionnaire. Participants were randomly assigned to one version.

All versions of the survey began in the same way. The members were asked how many years they had been enrolled at GHC for health care, and the specific medical center to which they usually went. After a few more preliminary questions, they were asked the critical questions that constituted the two-time frame experiment. Respondents were asked whether they had any of a list of procedures (e.g., blood pressure reading) done under their GHC coverage. Several of the procedures on this list were routine, while others were ones that the GHC staff were particularly interested in. The three versions of the questionnaire differed in terms of the reference period about which respondents were asked. In the 2-6 condition, respondents were first asked about procedures utilized over the previous two months, and then about procedures over the previous six months. Because respondents could not anticipate the sequence of questions, responses to the two-month question appearing first in the 2-6 sequence may be considered equivalent to responses to a two-month question asked alone. Adult respondents who were over 18 years ($N = 180$) were asked about 7 different procedures:

1 This research was part of a larger project on enhancing memory for health events. The details of the larger project can be found in Loftus, Smith, Klinger, and Fiedler, 1989.

- “During the past two months, since (date), have you had any of the following procedures done under your GHC coverage?
 Blood pressure reading?
 Test of blood in your stool?
 Mammogram—x-ray of breast (asked only of women over 40 years)?
 Pneumococcus vaccine—flu vaccine (asked only of people over 65 years)?
 Breast exam by a doctor or nurse (asked of women only)?
 Pap smear test for cancer (asked of women only)?
 Had a new prescription filled at a GHC pharmacy?”

Next, the respondent was asked, “During the past six months, since (date), have you had any of these procedures at GHC?” and the procedures were repeated to them.

Adolescents between 14 and 17 years old were asked about a different set of procedures. Also parents responding for their children below age 13 were asked about this set of “child” procedures ($N=62$).

- “During the past two months, since (date), have you (has your child) had any of the following procedures at GHC?
 Physical examination?
 Urine test?
 Vision test?
 Hearing test?
 Had a new prescription filled at a GHC pharmacy?”

Next, the respondent was asked, “During the past six months, since (date), have you (has s/he) had any of these procedures at GHC?” and the relevant procedures were repeated to them

In the 6-2 condition, respondents were first asked about procedures utilized over the previous six months, and then about procedures over the previous two months. Adult respondents who were over 18 years old ($N=180$) were asked about the seven “adult” procedures listed earlier, using the six-month reference period. Next, if they answered yes, they were asked about the relevant procedures using the two-month reference period. Adolescents who were 14 to 17, and parents reporting for their young children ($N=73$), were asked about the five “child” procedures listed earlier, using first the six-month and then the two-month reference period.

In the 1-2 condition, respondents were first asked about procedures utilized over the previous month, and then about procedures over the previous two months. Adult respondents who were over 18 years old ($N=188$) were asked about the seven “adult” procedures listed earlier, using the one-month, then the two-month reference period. Ado-

lescents aged 14–17, and parents reporting for their young children ($N=56$), were asked about the five "child" procedures using first the one-month, and then the two-month reference period.

Results

For this analysis, we considered responses to the two-month question appearing first in the 2-6 condition to be equivalent to responses to a two-month probe alone. We then compared these responses to those received from the 6-2 and from the 1-2 respondents, in terms of their recollections of the two-month reference period.

Do people report more procedures when asked about a single time frame (e.g., two months) than when asked about that same frame, preceded by another time frame (e.g., six months, then two months)? One answer to this question can be found in Table 1, showing the percentage of respondents who reported a procedure within the last two months.

First, compare the 2-6 condition to the 6-2 condition. For 9 out of 12 separate procedures, there were fewer visits reported in the 6-2 condition. That is, for 9 out of the 12 procedures, asking the six-month question first reduced the reporting of visits that had occurred in the previous two months, as Crespi and Swinehart had shown.

Table 1. Percentage Reporting a Procedure in the Last Two Months

	<i>N</i>	Condition		
		6-2	2-6	1-2
Blood pressure reading	542	31.8	29.8	32.1
Colon cancer test	540	5.1	5.6	7.1
Mammogram (women over 40)	144	17.1	5.0	0.0
Pneumococcus vaccine (over 65)	62	5.0	0.0	0.0
Breast exam (women)	301	18.3	18.7	12.0
Pap smear (women)	301	8.3	15.6	12.0
Rx filled	543	24.5	30.4	33.9
Child physical exam	190	9.8	15.3	13.7
Child urine test	187	6.7	12.3	5.9
Child vision test	189	0.0	6.9	11.8
Child hearing test	189	0.0	7.0	7.8
Child Rx filled	188	22.6	28.6	28.6

Next compare the 2-6 condition to the 1-2 condition. There is no consistent pattern showing fewer reports in the 1-2 condition, that is, when a shorter time frame precedes the time frame of interest.

Another comparison can be made to shed light on whether a sequencing effect would appear when a shorter time frame precedes the time frame of interest. We can compare the responses to the six-month question in the 2-6 condition to the responses to the six-month question when asked first (as it is in the 6-2 condition). The percentage of respondents who reported a procedure within the last six months is shown in Table 2.

Compare the 6-2 to the 2-6 condition. For 11 out of 12 procedures, the 2-6 condition led to fewer reported visits during the six-month reference period. Thus, we have another instance in which having respondents report activities in two time frames reduces the proportion reporting the activity in the second time frame.

In sum, there appears to be a modest reduction in the percentage who report a visit over a two-month period, when these respondents are first asked about a six-month period. As for whether a shorter reference period preceding the critical one has a similar effect, the results are mixed. Answering about a two-month period first reduced reporting in a six-month reference period; however, answering about a one-month period first did not have a reliable effect on answers for a two-month reference period.

One problem with these data are that we have no guarantee that the

Table 2. Percentage Reporting a Procedure in the Last Six Months

	N	Condition	
		6-2	2-6
Blood pressure reading	352	61.9	57.3
Colon cancer test	353	21.2	17.6
Mammogram (women over 40)	102	23.8	9.5
Pneumococcus vaccine (over 65)	43	30.0	25.0
Breast exam (women)	198	36.9	35.2
Pap smear (women)	196	29.8	28.4
Rx filled	357	49.1	47.2
Child physical exam	134	43.5	32.8
Child urine test	132	23.3	17.5
Child vision test	133	15.9	12.3
Child hearing test	132	14.8	11.1
Child Rx filled	132	48.3	44.4

actual numbers of visits are the same in the three conditions. To determine more meaningfully whether one condition leads to more overreporting than another, we must examine reports that can be verified. For this reason, we extracted information from the medical records of our participants.

ANALYSIS OF MEDICAL RECORDS

The first step in the medical record check was to order the charts of the respondents who had granted permission to have their records checked. Abstracting of charts was done by research assistants who were trained by GHC. For each participant, we obtained from the medical records information on several specific procedures (e.g., blood pressure reading) that the participant had had during the previous six months. This information was generally found in lab reports, radiology reports, or other parts of the medical chart. The abstracters recorded whether the respondent did or did not have each procedure. For each procedure found, the date was also noted. Once we had the survey and the medical record data, they were matched to determine the accuracy of recall.

A word of caution is in order here. We will talk about errors of recollection, but we must acknowledge that some of these "errors" could be due to problems in the medical records (Martin, 1987). Analyses of medical records have shown the occasional inaccurate or missing piece of information. While GHC has an exceptionally advanced method of record keeping, it still cannot be assumed that all discrepancies between the recollections and the medical records are errors of memory. For the analyses reported here, we will assume that the records are accurate, even if not perfect.

Accuracy of Recall. Of the 739 persons who participated in this experiment, we were able to verify medical information of 660 people. The analyses described in this section pertain only to the 660 verified cases.

For 10 of the 12 procedures, we computed three scores. From the medical records, we found the percentage who actually had the procedure during the previous two months. We compared this to the percentage who reported having the procedure during the previous two months. We then calculated the extent of overreporting by subtracting actual procedures from recalled procedures. These computations are shown in Table 3, for respondents who recalled over the two-month reference period. The *N*s refer to the number of people who were asked about the procedure for whom verification could be obtained.

The data in Table 3 reveal consistent overreporting. It ranges from 2% for the flu vaccine to over 6% for the breast exam and blood

Table 3. Overreporting for Two Months

	<i>N</i>	Recalled	Actual	Overreported	Ratio
Blood pressure reading	486	31.3	25.1	6.2	1.25
Colon cancer test	487	6.0	2.1	3.9	2.86
Mammogram (women over 40)	119	7.6	3.4	4.2	2.24
Pneumococcus vaccine (over 65)	49	2.0	0.0	2.0	—
Breast exam (women)	265	16.2	9.8	6.4	1.65
Pap smear (women)	266	12.0	7.1	4.9	1.69
Child physical exam	171	13.0	10.1	2.9	1.29
Child urine test	168	8.2	4.7	3.5	1.75
Child vision test	171	5.8	2.3	3.5	2.52
Child hearing test	170	4.7	1.2	3.5	3.92

pressure check. The median amount of overreporting across procedures was 3.7%. The extent to which overreporting is a serious problem can be more readily determined by examining the ratios of reported procedures to actual procedures, listed in the last column of Table 3. Note that it was common for reported procedures to be twice as great as actual procedures, and in at least one instance, the reported procedure was almost four times as great as actual. In Table 4, the same data are presented for the six-month reference period. Here even

Table 4. Overreporting for Six Months

	<i>N</i>	Recalled	Actual	Overreported	Ratio
Blood pressure reading	312	59.6	44.6	15.0	1.34
Colon cancer test	315	19.4	7.0	12.4	2.77
Mammogram (women over 40)	84	16.7	9.5	7.2	1.76
Pneumococcus vaccine (over 65)	36	27.8	8.3	19.5	3.35
Breast exam (women)	172	36.0	17.4	18.6	2.07
Pap smear (women)	173	28.9	16.2	12.7	1.78
Child physical exam	117	38.5	26.5	12.0	1.45
Child urine test	119	21.0	10.9	10.1	1.93
Child vision test	121	14.0	6.6	7.4	2.12
Child hearing test	118	13.6	5.9	7.7	2.31

more massive overreporting is apparent. Overreporting ranges from a low of about 7% for the mammogram to a high of nearly 20% for the flu vaccine. The median amount of overreporting across procedures was 12.5%.² Again, it was common for reports of a given procedure to be twice as great as the actual number of procedures.

For all procedures, we found massive overreporting. We can now ask whether the overreporting problem is different as a function of being asked about a single time frame versus two time frames. To see how our analyses were done, consider the blood pressure check for which we provide complete data for the two-month reference period in Table 5. In the 2-6 condition, 29.8% recalled having a blood pressure check, which was quite close to the percentages recalling this procedure in the other two conditions (31.8% in the 6-2 condition and 32.1% in the 1-2 condition). However, when one subtracts the actual percentages from the recalled percentages in each of the three conditions, it becomes evident that overreporting is a more serious problem in the 2-6 condition than in the other two conditions. In the 2-6 condition, the overreporting of blood pressure checks is 10.5% while in the 6-2 condition it is only 3.1% and in the 1-2 condition it is 4.7%. Thus, there is overreporting in all three conditions, but it is greatest when the two-month reference period is asked about first.

Another observation from Table 5 concerns the false alarms, that is, cases in which people recalled having their blood pressure checked, but their record did not confirm this. The false alarm rate was 50% in the 2-6 condition, but was lower when another question preceded the one about the two-month reference period (32% in the 6-2 condition and 25.6% in the 1-2 condition). In short, false alarms occurred much less often with the two-time frame approach.

In contrast to false alarms, the pattern for misses was different. Misses occurred when people had had their blood pressure checked in the previous two months, but claimed they had not. In the 2-6 condition, 6.2% of actual blood pressure checks were not recalled by respondents, as compared to a somewhat higher number in the two-time frame conditions (10.3% in the 6-2 condition and 7.0% in the 1-2 condi-

2 Notice that the prescription data are not included in the above analyses. They were deliberately omitted because of the following problem. The respondents were asked whether they had filled a *new* prescription (for themselves or their child) during the reference period. In retrospect, this wording was unfortunate. Suppose a respondent got a prescription that could be refilled once. If the doctor reissued the prescription, should it be classified as new or not? A second problem arose with the medical record data. The medical record data provided dates on which prescriptions were filled, but did not distinguish between old and new prescriptions. This meant that we had numerous instances in which respondents told us that they had not had a new prescription filled, but the records told us that prescriptions had been filled, leading to massive but misleading underreporting. Given these problems, the only sensible thing to do was ignore the prescription data.

Table 5. Blood Pressure Check in Previous Two Months

Participants' Response	Medical Records		
	Had Test	Did Not	Total
Two-Month Question First			
Yes, I had my B P. checked	24 50.0%	24 50.0%	48 29.8%
No, I did not	7 6.2%	106 93.8%	113 70.2%
Total	31 19.3%	130 80.7%	161 100.0%
Two-Month Question Following Six-Month Question			
Yes, I had my B P. checked.	34 68.0%	16 32.0%	50 31.8%
No, I did not.	11 10.3%	96 89.7%	107 68.2%
Total	45 28.7%	112 71.3%	157 100.0%
Two-Month Question Following One-Month Question			
Yes, I had my B.P checked.	38 70.4%	16 29.6%	54 32.1%
No, I did not.	8 7.0%	106 93.0%	114 67.9%
Total	46 27.4%	122 72.6%	168 100.0%

tion). Thus there were slightly more misses with the two-time frame approach.

We presented the blood pressure data as our illustrative example not only to show how our analysis was done, but also because by a large margin more respondents either had this procedure or recalled the procedure than was the case with any other procedure tested in this study. The most important finding from the blood pressure data was that overreporting was decreased (and thus reporting more accurate) when two time frames were used compared to a single time frame. But

the beneficial effect of the two-time frame procedure is not limited to the blood pressure data.

A similar pattern can be seen in the breast exam data. In the two-month condition, overreporting was 6.4%. All three conditions showed overreporting for a breast exam. However, the overreporting was greater when the two-month reference period was asked about first (11.0% overreporting), compared to when it was asked about second (7.3% overreporting for the 6-2 condition, and 1.1% overreporting for the 1-2 condition). The false alarm rate was high in all conditions. Of those who claimed to have had a breast exam, 77% were false alarms in the 2-6 condition, whereas this figure was lower in the 6-2 condition (53%) and in the 1-2 condition (36%). Misses were lower than false alarms. Of those who actually had a breast exam, 43% failed to report it in the 2-6 condition, whereas the miss rate was lower in the two-time frame conditions (22% in the 6-2 condition and 30% in the 1-2 condition). In sum, overreporting occurred in all conditions, but was highest when the two-month reference period was asked about first. This condition also led to a higher false alarm and miss rate than the other two conditions in which the two-month reference period was preceded by an earlier question.

When all procedures, including the blood pressure and breast exams, are taken into account, the beneficial effects are revealed. To see this, examine Table 6, which presents summary rather than detailed data for all procedures.

Ten different procedures are included in Table 6. When we compare the two-month alone to the 6-2 condition, we find that for 7 of the 10 separate procedures, there was less overreporting in the 6-2 condition. Four out of 10 procedures were at least marginally better off in the 6-2 condition, and none were worse off. When we compare the two-month alone to the 1-2 condition, we find that for 7 of the 10 separate procedures, there was less overreporting in the 1-2 condition. Two out of 10 procedures were at least marginally better off in the 1-2 condition, and one was worse off. Finally, when we compare the six month alone to the 2-6 condition, we find that for 8 of the 10 separate procedures, there was less overreporting in the 2-6 condition. Four out of 10 separate procedures were at least marginally better off in the 2-6 condition, and only 1 was worse off.

In sum, if we now examine our data across procedures, we have available 30 separate comparisons of the single- versus the dual-time frame approach. For 22 of the 30 separate procedures, there was less overreporting in the dual-time frame conditions. Ten of 30 separate procedures were significantly or marginally better off in the dual-time frame than in the single-time frame condition, and two procedures were marginally worse off.

Table 6. Percentage Overreporting by Recall Condition

	Two-Months			Six-Months	
	2-First	6-2	1-2	6-First	2-6
Blood pressure reading	10.5	3.1 ^{***}	4.7 [*]	11.6	18.4 [#]
Colon cancer test	2.5	4.5	4.7	16.1	8.0 [~]
Mammogram (women over 40)	2.5	9.8	0.0	9.5	4.7
Pneumococcus vaccine (over 65)	0.0	5.0	0.0	30.0	6.2
Breast exam (women)	11.0	7.3	1.1 ^{***}	19.0	18.2
Pap smear (women)	7.8	1.2 ^{**}	4.4	9.6	15.9
Child physical exam	6.8	0.0 [~]	3.9	17.7	8.7
Child urine test	3.5	3.4	3.9	15.0	3.5 ^{**}
Child vision test	1.7	0.0	7.9 [#]	8.0	5.3
Child hearing test	3.5	0.0 ^{**}	7.8	9.9	5.5

NOTE: All statistical tests compare two-time frame conditions with single-time frame conditions.

*** $p < .01$ ** $p < .05$ * $p < .10$ # $p < .10$ in opposite predicted direction

Discussion

To reiterate our major result, when people were asked whether they had a specific procedure (e.g., flu shot) in the recent past, they overreported. The median amount of overreporting for the procedures we asked about in the six-month reference period was approximately 13%. For many procedures, two to three times as many people reported having had a procedure done as actually did. Overreporting was more extensive over the six-month reference period than the two-month reference period. Yet even after only two months, the extent of overreporting was 4% (across all procedures).

Can we do anything to reduce the overreporting that occurs in, say, the two-month reference period? Crespi and Swinehart tried to reduce error in the reporting of procedures by asking about procedures in either a single-time frame or two-time frames. They found that if respondents first answered about, say, a six-month reference period and then a two-month reference period, the reporting was lower than if they asked about the two-month question first. They never verified reporting to determine whether the lower reporting meant more accurate reporting. We did. Like Crespi and Swinehart, we found less

overreporting in the two-month reference period when respondents were first asked about six months

There are several possible reasons for the beneficial effect of the 6-2 condition. The two-time frame procedure may work for social desirability reasons. If a respondent has the opportunity to mention a health maintenance procedure as having occurred during the longer reference period, the need to give a socially desirable response has been satisfied, and he or she does not need to mention it again during the shorter reference period. Another explanation is that the two-time frame procedure conveys to the respondent that the interviewer desires greater precision in responding. The precision hypothesis derives a modicum of support from the observation that the 1-2 condition also produced more accurate responding. Moreover, when asking about a six-month reference period, the 2-6 condition produced less overreporting than asking about six months straight away. Thus, we have two demonstrations that having a shorter reference period prior to the period of interest increases the accuracy of reporting. The benefits of asking about two time frames appear to about the same degree no matter whether the first time frame is longer or shorter than the second one. The social desirability hypothesis has no particular explanation for the comparable benefits by asking first about a shorter time period.

It is not a new idea that respondents, when left to their own devices, often make careless and imprecise estimates of the occurrence of particular events (Cannell et al., 1977). It was suggested in one study, for example, as a possible reason for erroneous reporting of drug use (Bachman and O'Malley, 1981). We have speculated here that the two-time frame procedure may communicate to the respondent that a greater sense of precision is desired. It would be a relatively straightforward task for future research to test this more directly. One could ask the two-time frame respondents a question like "On a scale from 1 to 7, how precise an answer do you think we wanted? 1 = just a rough estimate. 7 = a very precise answer?" Our prediction is that the two-time frame respondents will choose a higher scale value than their single-time frame counterparts. If the precision hypothesis is correct, then other, perhaps even more efficient, methods of enhancing the perceived precision requirement could be constructed.

One difference between our procedure, and that of Crespi and Swinehart, is that we gave respondents a date that marked the beginning of the reference period. The date was given once, at the beginning of the list of procedures inquired about, and thus may have been ignored or forgotten by some respondents. Those who did not keep the date in mind while working through the list of procedures, may have not sensed that the question was demanding precision. The two-time frame procedure might have worked only for this subgroup. This tran

of thought leads to the speculation that the beneficial effect of the two-time frame procedure would have been even greater if the date had not been included.

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