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MEMORY ERRORS IN A MORBIDITY SURVEY*

ANN CARTWRIGHT**

ANY social surveys are concerned with obtaining information about events occurring during a particular period of time. Budgetary, dietary and morbidity inquiries all rely upon people's ability to recall or to record relevant events. The accuracy of retrospective studies inevitably depends on memories which are often capricious and invariably selective. Whether or not an individual remembers a particular event and can place it within the correct period of time depends on many things such as the nature of the event. the length of period he is asked to recall, the significance of both the event and the period for him, the circumstances under which he is questioned and many other factors including personal characteristics of the individual concerned. Although many of the factors governing memory are out of the control of the investigator, there are certain ways in which the latter can help the informant to recall events and to put them in their correct historical sequence. In particular the accuracy of informants' memories is likely to be related to the length of the period to be studied and to the delineation of the period.

This paper discusses these two techniques in relation to a number of large-scale morbidity inquiries. It then describes the methods used on a small study with which the author was concerned, and presents some information on the probable size and nature of the memory error that was observed in one aspect of this inquiry.

* This material was part of an unpublished Ph.D. thesis, London University, 1960.

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THE LENGTH OF PERIOD STUDIED

The basic periods studied on a number of morbidity inquiries have ranged from two months, on the U.K. Survey of Sickness, to two weeks, on the U.S.A. National Health Survey. The variation is shown in Table 1.

Certain data relating to possible memory errors are available from the Survey of Sickness, the California Health Survey and the Charlotte pretest for the U.S.A. National Health Survey. In each of these studies people were questioned about events occurring during a particular period which ended some time before the interview. The periods studied were divided into two or more shorter periods of time and informants were asked to place the onset of any illness reported within one of the subdivisions. Such a breakdown makes it possible to compare the incidence rates for the different periods, and the seasonal coverage of these inquiries leads to the theoretical expectation that incidence rates in periods of similar length will be equal. In all three studies, rates in the latter part of the period exceed rates in the earlier part.

Data from the U.K. Survey of Sickness show fewer illnesses and medical consultations reported in the month further away

Inquiry	Period
U.K. Survey of Sickness (11) Danish National Morbidity Inquiry (10) Baltimore Chronic Illness Study (4)	2 Months † 1 Month Yesterday 4 Weeks 12 Months
Health and Medical Care in New York City (7)	Yesterday 8 Weeks
U.S.A. National Health Survey (12)	1 Year 2 Weeks
California Health Survey (12) Canada Sickness Survey (13)	U I Year 4 Weeks 1 Month*

Table	1.	Periods	studied	in	various	morbidity	ind	miries.
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*A year was studied with interviews at monthly intervals, but the families involved were asked to keep a calendar record of their illnesses. † Initially this was 3 months.

from the date of interview than in the month immediately preceding interview (11).[†] In the California Health Survey the incidence rates for acute illnesses in the periods two, three and four weeks before interview were 73 per cent, 51 per cent and 42 per cent of the rate one week before interview (12). But in the Charlotte pretest for the U.S.A. National Health Survey which only covered the two calendar weeks before interview, the discrepancy was considerably less. The incidence rate in the second week before interview was 95 per cent of that for the week immediately preceding interview (12).

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This type of discrepancy may arise in three different ways: first, events occurring in the earlier part of the period may be omitted; secondly, events occurring between the end of the period and the time of interview may be wrongly included in the latter part of the period; and thirdly, events occurring in the earlier part of the period may be transferred to the latter part. Gray (6) observed a tendency for people to telescope events and place them nearer to the time of interview. In the middle of one month he asked a group of civil servants to record the sick leave they had taken in the last four and a half months and compared the information obtained this way with official records. The ratio of remembered to true values for the average number of days taken each month was highest, 1.22, for the current month, lowest, .89, for the month immediately preceding with the other months varying between these. Most transference occurred between the immediately preceding month and the current one.

Woolsey (15) observed a somewhat similar trend when he questioned people about their sick leave in the normal sequence, asking first about the most recent period and then about the earlier part of the period. The trend was reversed but less marked when he asked about the earlier part of the period first.

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[†]An ingenious but fallacious argument was advanced by Stocks (14) who concluded that "no advantage would accrue by basing morbidity rates on the last month's experience alone . . . even if the number of people interviewed each month was so increased that the sampling error would be the same." But the data on which he based his theory related only to the most serious illness of each person and not to all illnesses, as they should have done.

Period	Usual C	Order of	Reversed Order of		
	Quest	ioning	Questioning		
	Males	Females	Males	Females	
Most Recent Quarter	1.37	1.31	.73	.88	
Intermediate Quarter	.76	.93	.96	.97	
Earliest Quarter	.81	.87	1.05	1.08	

Table 2. Ratio of reported to recorded sick leave absences. (After Woolsey, 15.)

Collins, Phillips and Oliver, (3) with data from Cattaraugus County and Syracuse, showed that incidence rates of illness declined with an increasing length of interval between the reported month of onset of the illness and the interview. Douglas and Blomfield (5) reported a different effect. They compared information on measles and whooping cough given by mothers at two successive surveys at an interval of two years, and found that mothers were least likely to forget illnesses that had occurred early in their child's life, that is, illnesses most distant in time from the date of interview. Clearly, the relative impact of the event is important as well as the time that elapses between it and the interview.

In practice, decisions about the length of period to be studied in detail are inevitably related to considerations other than those of possible memory errors. In particular they depend on the amount and distribution of the data which are likely to arise during different periods. The choice about the length of period is inevitably a compromise, based on a number of conflicting factors, and the way in which the period is defined is an important one to consider here.

THE DELINEATION OF THE PERIOD

Apart from the Canada Sickness Survey all the inquiries listed in Table 1 were concerned with studying a defined period of time retrospectively. In three of the six studies the period went up to the time of interview while in the remaining three, the Survey of Sickness, the Danish National Morbidity Inquiry and the California Health Survey, the period ended sometime before the date of interview. Thus, the Danish National Morbidity Inquiry, concerned with a period of one month, interviewed people during the first three weeks of a month and questioned them about their health in the immediately preceding calendar month. In the Baltimore Chronic Illness Survey informants were asked first about the day preceding the interview and then about their health during the last four weeks, with the interviewer defining this by saying "that is, since . . ." and stating the date. The U.S.A. National Health Survey, studying a period of only two weeks, questioned people about their health "last week or the week before."

This last definition of a particular period may be rather less precise than those used on the other two inquiries, but it is probably more meaningful to the informants. Many people do not know the date and if they are paid weekly may not be particularly aware of months. Pay days, weekends and public holidays are events which generally serve as landmarks, and these are often supplemented by family occasions such as birthdays and weddings. If people are asked to recall events during a particular period, it is likely to reduce confusion and memory errors if that period is a meaningful one for them. To define a period precisely by dates may seem important statistically, but if the period has no significance for the informants the inquiry has merely acquired an appearance of scientific precision which is unlikely to be justified by the quality of the information obtained.

The advantage of studying a period which ends on the day of interview would seem to be considerable, as with this approach there is no possibility of the erroneous inclusion of events which occurred after the study period but before the interview. One disadvantage is that people will be questioned about rather different periods of time, and the importance of this consideration depends on the seasonal variation of the factors studied.

The meaningful delineation of the start of the period in retro-

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spective studies presents more difficulty. None of the six studies previously mentioned made any attempt to define it other than by a particular date or by reference to a period before the day of interview. It would be possible to mark the start of the study period by an interview or by a letter. This procedure is open to three objections: first there is the additional expense involved; secondly, if both the beginning and end of the period are marked by interviews, the length of the period will inevitably vary somewhat for different informants; and finally, an initial interview or letter may influence the events that occur during the period. For example, if a person had been intending to seek medical advice about a condition the initial contact might provide the necessary stimulus to action which might otherwise have been indefinitely postponed.

There has been no systematic appraisal of the errors which result when people are questioned about periods which are defined in different ways. It is possible that the adequate delineation of a period may make it possible to study longer periods with reasonable accuracy. Meanwhile decisions about the procedure to adopt on any particular inquiry have to be made on an empirical basis.

THE HERTFORDSHIRE MORBIDITY SURVEY

This survey was part of a larger research program undertaken by the Public Health Department of the London School of Hygiene and Tropical Medicine. The broad aim of the whole project was to study use of the different parts of the National Health Service. The study was carried out in a relatively small area so that material could be collected about different aspects of the probem. The area chosen was a post-war housing estate just outside London, with a population of about 17,000.

A family morbidity survey was designed as part of this research project. Its aims were to supplement information obtained from the records of various agencies, and also to present a picture of the problems of ill-health and the success of the health services in solving these problems, as seen from the rterly

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viewpoint of the individuals and families concerned. The sample for this survey was composed of the families and individuals living in a randomly selected three-sixteenths of the dwellings on the estate. The aim was to interview all the adults[‡] in this sample of dwellings personally; in addition, mothers of children were to be interviewed again, on a separate occasion, about the health of their children.

To obtain fairly precise information about the use of different services it was decided to study a limited period of time in detail. In addition a brief history of all the treatment received for current illnesses was sought. This double requirement made it advisable to have two interviews with each informant. The advantage of defining the period for detailed study by an interview at either end also influenced this decision.

At the first interview the emphasis remained entirely on current illnesses and a considerable number of questions were asked about each condition reported. At the subsequent interview information was obtained about the events that had taken place since the previous interview—new illnesses, consultations, other treatment and advice, incapacity.

The length of the period between the two interviews was intended to be four weeks. This was decided after consideration of possible memory errors, the problems of organizing the field work, the amount of data that was likely to be obtained and the distribution of the data in relation to the individuals in the sample. This last point was felt to be of considerable importance since we aimed at obtaining a number of details about all the consultations that had occurred during the study period and it was therefore advisable for the period to be relatively short so that few people would have had several consultations. Data from the Survey of Sickness showed that less than two per cent of adults had had more than four medical consultations in a month, so that the number of interviews which might be tedious and difficult because of the necessity to question one informant about several consultations was small.

‡ An adult was defined as a person aged 15 years or over who had left school.

Number of Consultations	Percentage of Adults Reporting Specific Number of Consultations	ESTIMATED PERCENTAGE OF CONSULTATIONS MADE BY ADULTS WITH SPECIFIED NUMBER		
0	80.7			
1	9.1	18.7		
$\frac{1}{2}$	4.3	17.8		
3	1.6	9.9		
4	2.5	21.1		
5-9	1.4	18.3		
10 or More	0.4	14.2		
Numbers on Which Percentages Based	44,042	21,349		

Table 3. The distribution of adults and of medical consultations by the number of consultations reported for a calendar month by adults aged 16 or more. (From the U.K. Survey of Sickness.)

However, in the resulting sample of medical consultations the proportion based on interviews about several consultations would be much larger. These proportions are given in the final column of Table 3 and show that details about a third of medical consultations would be obtained at interviews where the person had had five or more consultations in the month.

This concentration of a considerable proportion of general practitioner consultations among a small proportion of individuals favored a short period for intensive study. However, we also wanted to obtain a sample of out-patient consultations at hospitals and clinics and data from the Report of the Chief Medical Officer of Health for 1952 suggested that a study period of four weeks for a sample of 3,000 individuals should yield about 140 such consultations. We were anxious to obtain at least this number of consultations. Finally, as it was inevitable that the length of period between the two interviews would vary for different people in the sample, the longer the period the smaller would be the importance of this variation.

The variation in the actual length of period between the two interviews is shown in Table 4.

Instructions to the interviewers on this point read "When you are working on a quota of second interviews, try and arirter!

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Period Between		Adult		m	
Two Interviews (Days)	Male	Female	Both Sexes	Children	TOTAL Sample
21 or Less	3	2	2	1	2
22, 23, 24, 25	6	5	5	3	4
26	9	8	9	6	8
27	12	12	12	17	14
28	33	35	34	49	41
29	13	15	14	12	13
30	7	7	7	4	5
31, 32, 33, 34	12	11	12	6	9
35 or More	5	5	5	2	4
Estimated Average					
Period in Days	28.4	28.5	28.5	28.1	28.3
Number of Individuals [†]	658	716	1,374	1,023	2,397
	1	1		1	

† The dates were inadequately recorded for 13 adult males, 12 adult females and 33 children.

Table 4. Percentage distributions according to time between interviews for adults, children and total sample.

range your interviews as near as you can to 4 weeks after the first interview. You should aim to get at least three quarters of your interviews done within one day of the 4 weeks, that is on the precise day, the day before or the day after. Try at all costs to avoid being more than 4 days out with any of your interviews."

In practice, 41 per cent of the interviews were completed 28 days after the first interview, 68 per cent within one day and 81 per cent within two days. Six per cent were a week or more earlier or later than the 28-day period. The variations were greater for adults than for children but, rather surprisingly perhaps, there was relatively little difference between the male and female adults. This lack of difference between the sexes may be because we were interviewing all adult members of a household, but if we had been concerned with selected individuals it is possible that there would have been longer intervals for men who are less frequently found at home.

The effect of the variations in the length of period is demonstrated by the following comparisons:—

	Adults	Children
Average Number of G. P. Consultations		
in Period—Uncorrected	.333	.276
Average Number of G. P. Consultations		
in Period—Corrected	.330	.276

The adjustment for the length of period was so small and the tabulation and computing necessary so tedious that uncorrected figures have been used in analysis.

Apart from the length of the period studied and the definition of this period, the actual questions asked at the interview can be helpful in reducing possible memory errors. At the first interview, informants were asked about their health at that point in time, and the actual questions used have been discussed elsewhere (2). For the second interview, the interviewer took with her a summary of the conditions reported at the first interview and asked a number of questions about their progress since that time. She then asked about any other illness, minor complaint, accident or injury which had occurred since the first interview. For each condition reported as present during the period informants were asked whether they had had any medical consultations relating to the condition during the study period. After this series of questions relating to conditions, the emphasis of the interview changed and informants were questioned about the various medical consultations and incapacity that had occurred since the previous interview. With this approach questions about medical consultations were posed in two different ways and any discrepancies in statements were raised at the time of interview.

Another factor which is likely to affect the accuracy of information obtained is the informant—that is, the relationship of the informant to the people included in the study and the number of different people about whom an informant is questioned. In the Hertfordshire study, adults were interviewed

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dema personally and mothers were interviewed on a separate occasion about the health of their children. The U.K. Survey of Sickness and the Danish Morbidity Inquiry both were related BUIG to individuals rather than households, and the individuals were normally interviewed personally. In the other inquiries, which 10 were concerned with households, a less rigorous procedure than that used on the Hertfordshire inquiry was adopted. In 276 the Canadian Sickness Survey, usually only one individual smal : in a household was contacted. In the Baltimore Chronic Illness hitm Study, interviewers were instructed to interview a responsible member of the household who knew about the health of other the de members of the household and was related to them by marriage e interr or adoption, but each adult member of the household who At the happened to be at home at the time of the inquiry was inter-viewed personally. In the U.S.A. National Health Survey the e been a following procedure was adopted: "Information for an adult ine z at home at the time of the interview is to be obtained from the person himself; for a person absent, only from the person's Teper:: spouse if he is married, or from a parent or adult son or daughter CODS and residing in the household." (12) tmat

Data from a pilot inquiry on the Hertfordshire Survey had shown significant differences in the number of illnesses reported by wives for their husbands and those reported by a comparable group of husbands interviewed personally (1). Linder, (9) discussing results from the Charlotte pretest for the U.S.A. National Health Survey, comments that "the use of proxy respondents in some households not only reduced the total amount of illness reported, but changed, qualitatively, the composition of the illnesses which were reported." No data are available about the effect of proxy interviews in the number of medical consultations reported but it is likely that errors are less likely to arise when adults are interviewed personally and when they are not questioned about other adults and children at the same time.

In this relatively small-scale inquiry, then, a length of period was studied which was similar to that used in a number of other inquiries, although twice as long as that studied in the U.S.A. National Health Survey. The period however was not merely defined retrospectively, as in the other studies described, but by an interview at either end. The method of approach at the second interview and the selection of informants within the families were also intended to minimize memory errors. With this method, what errors did arise in practice?

A COMPARISON OF THE NUMBER OF DOCTORS' CONSULTATIONS REPORTED AT INTERVIEW WITH THOSE RECORDED BY THE GENERAL PRACTITIONERS

Since the general practitioners on this estate had agreed to keep records of all their consultations during the survey period, it was possible to compare the number and nature of consultations reported at interview with those recorded by the doctors for those people who both co-operated fully in our survey (81 per cent of those selected) and who were registered with the general practitioners on the estate (85 per cent of those interviewed). This comparison was made by examining the doctors' records for all individuals for whom a consultation was reported at interview as occurring during the four weeks between the two interviews. The general practitioners' records were also examined for a one-in-four sample of people who reported no consultation. (In the analyses, the results from this one-in-four sample have been multiplied by four.) The distributions of the number of consultations reported and recorded are compared in Table 5.

The agreement between the reported and recorded figures is very close, both for the average number of consultations and for the distribution of consultations. The variations in the distributions of reported and recorded consultations are similar, although Gray (6) found that the variance of remembered values is likely to exceed the variance of the true values.

Our data make it possible to compare actual individuals and not only overall distributions. This information is given in irten : U.S. t mere ibed, by proach ; within t ors, Tr

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Memory Errors in a Morbidity Survey

Number	Арт	JLTS	Свіг	DREN	All Individuals	
of Consultations	Reported Per Cent	Reported Recorded Per Cent Per Cent		Recorded Per Cent	Reported Per Cent	Recorded Per Cent
0	79.6	80.5	77.1	77.5	78.6	79.3
1	13.8	12.1	16.5	14.8	14.8	13.2
2	3.4	4.1	5.2	5.9	4.2	4.8
3	1.4	1.6	0.6	1.3	1.1	1.5
4	1.1	1.1	0.6	0.4	0.9	0.8
5 or More	0.7	0.6	-	0.1	0.4	0.4
Total Individuals	1,220	1,220	820	820	2,040	2,040
Total Consultations	420	411	256	267	676	678
Average Consultations	0.34	0.34	0.31	0.33	0.33	0.33
Standard Deviation	1.01	0.94	0.66	0.70	0.88	0.85
Consultations per Person						
Consulting	1.69	1.73	1.36	1.45	1.55	1.61

Table 5. A comparison of the distribution and average number of consultations reported at the interview with those recorded by the doctor.

Table 6 which shows that the apparent agreement in Table 5 is the result of many cancelling errors.

Sixty of the people who reported no consultations had had one or two recorded by the general practitioner, and no consultation was recorded for seventy-four people although they re-

Table 6. A comparison of the number of general practitioner consultations reported by individuals with the number recorded by the doctor.

Number Recorded		NUMBER REPORTED AT INTERVIEW						
by General Practitioner	0	1	2	3	4	5	6+	Total
0	1,544	65	8	1				1,618
1	52	198] 19					269
2	8	32	50	6	1	1		98
3		5	5	12	9			31
4		2	2	1	7	1	3†	16
5		1		1 ′	1	1]	4
6+			1	1*		1	1°	4
Total	1,604	303	85	22	18	4	4	2,040
† (4,6) (4,8) (4,1	6) *	(7,3)	° (17,1	5).				

	Errors in Recording by Doctors	Errors in Reporting
Underestimates	Omission of consultations	Failure to remember consulta- tions at all. Believing consultation to have taken place before first inter- view.
Overestimates		Believing consultation to have taken place during period when it took place before first interview.
Both Directions	Recording of consultation in wrong patient's notes. Wrong recording of date (by failure to adjust date stamp or otherwise.)	

Table 7. Possible sources of error in the recording and reporting of general practitioner consultations.

ported one or more. In addition, fifty-three reported some consultations, but fewer than the numbers recorded by the doctor, and forty people reported more than the general practitioner had recorded.

The estimate of the actual number of consultations could lie between 534 (if only both reported and recorded are counted) giving an average of 0.26 consultations per individual and 820 (if those either reported or recorded are included) with an average of 0.40 consultations, a considerable variation.

Some possible sources of error in the data on consultations are summarized in Table 7 and then discussed under separate headings.

Errors of General Practitioners

The types of consultations most difficult to record systematically are home visits and casual consultations, since on these occasions the general practitioner does not have his record cards ready at hand. The additional consultations at patients' homes which take place "While you're here, Doctor" are particularly likely to be omitted.

Of all consultations reported at interview, 21 per cent were home visits, compared with about 18 per cent* of all consultations recorded by general practitioners during the study year. This does not suggest a serious discrepancy. However, the proportion of home visits among those reported and not recorded was as high as 44 per cent, compared with 14 per cent among visits both reported and recorded. It seems safe to conclude that there were a number of home visits not recorded by the doctor.

Another type of consultation which might sometimes be omitted from the doctor's notes are messages and consultations with someone other than the patient involved. Of all the consultations reported at interview 6.5 per cent were said to be of this nature, whereas only 3 per cent of those recorded by the general practitioners during the study year fell into this category. This discrepancy might arise if the consultations were classified differently by interviewers or doctors; but among consultations reported and not recorded the proportion was 9 per cent, which suggests that the doctors failed to record some of these consultations.

Other possible sources of error in the medical notes are the recording of a consultation for the wrong person, and mistakes in the dates. These errors will tend to cancel each other out in the estimation of total number of consultations in a period, but are likely to give rise to double discrepancies in Table 6. It is not possible to estimate the number of these errors but it seems unlikely that the use of wrong record cards will occur very frequently.

Errors in Reporting Consultations at Interview

One type of consultation which might tend to be forgotten altogether is that in which the informant was not directly in-

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^{*} This estimate was made by totalling different types of consultations for all episodes of illness. This means that consultations for two different illnesses have been included twice. It is likely that multiple diagnoses were more frequently made at home visits than at office consultations so that this proportion may be an over estimate of the proportion of home visits among all those recorded by the general practitioner.

volved. For example, it could be supposed that consultations for children which were reported at interviews with the mothers, might have been forgotten more often than consultations for adults when the person involved was also the informant. When all consultations either reported or recorded are considered, among those for adults there are slightly more reported and not recorded than recorded and not reported, while for children the discrepancy is in the other direction. However, the differences shown in Table 8 are small in both cases and it seems unlikely that the information about the numbers of consultations with general practitioners which we obtained at interviews was much less reliable for children than for adults.

It might have been expected that informants would forget relatively frequently consultations in which the patient was not seen directly by the doctor. But it has already been shown that the proportion of these consultations was higher amongst consultations reported at interview than it was for consultations recorded by the general practitioners. This is likely to be because the question asked at the interview specifically reminded informants of the possibility of such consultations.

There remains the problem of transference—informants believing either that a consultation took place before the first interview when in fact it occurred between the two interviews, or vice versa.

Although informants were asked the approximate date of any consultations reported, few of them proved able to provide this information. Therefore, it is not possible to consider the

	Aı	OULTS	Сн	ILDREN	ALL INDIVIDUALS	
	No.	Per Cent	No.	Per Cent	No.	Per Cent
Reported, Not Recorded	93	18.4	49	15.5	142	17.3
Reported and Recorded	327	64.9	207	65.5	534	65.1
Recorded, Not Reported	84	16.7	60	19.0	144	17.6
Reported or Recorded	504	100.0	316	100.0	820	100.0

Table 8. A comparison between the proportion of general practitioner consultations reported and recorded for adults and children.

relative position in the study period of consultations which were reported but not recorded. For the 74 individuals for whom a consultation was reported but not recorded in the doctor's records it is possible, however, to consider the most recent consultation that was recorded. The length of time between this consultation and the first interview was as follows:

Within Week of First Interview	12
1 Week < 1 Month Before First Interview	15
1 Month < 2 Months " " "	11
2 Months < 3 Months " " "	2
3 Months < 6 Months """"	4
6 Months or More Before First Interview	14
Un known*	16

* The majority of these people were interviewed in January and February, 1955 and it was noted that no consultations were recorded in the doctor's notes during 1955.

A skew distribution is obviously to be expected for the most recent doctor's consultation especially if the relevant group consults the doctor within the next month. One rather unsatisfactory estimate from the U. K. Survey of Sickness shows about 45 per cent of people with a consultation in one month reporting a consultation in the month immediately preceding. The proportion here is very similar—47 per cent, which again suggests that some of the consultations reported and not recorded were omitted by the doctors rather than placed in the wrong period by our informants.

A final source of error is the person who consults the doctor fairly frequently or regularly. A person may think of himself as seeing the doctor every month, or every week or every other day and may forget the occasions when fewer or additional consultations occur. Of the eighteen people who reported four consultations in the month, ten were recorded as having fewer consultations and only one as having more, while of the sixteen who were recorded as having four, four reported more and five less. It seems likely that this type of error may lead to over-reporting rather than under-reporting. Speculations About the Probable Size of Error

It is difficult to see any reason why general practitioners should record more consultations than actually occurred. They may make occasional errors about the date or even record the consultation in the wrong notes but these errors are likely to cancel each other out in an estimate of the total number of consultations in a period. There is some evidence, however, that they tend to under-record home visits and messages. The number recorded by them may therefore be regarded as a minimum estimate of the number which occurred.

It is likely that the bulk of consultations recorded by the general practitioners and not reported at the interview were forgotten by our informants. It is also possible that they reported some consultations which either did not occur at all or else took place before the first interview, but the number of such cases is probably not large.

Although the number of consultations both recorded and reported was only 534 while the number either recorded or reported was 820, the actual number seems likely to be larger than 678 (the total recorded). The average rate of consultation per person was therefore probably rather greater than 0.33 and almost certainly less than 0.40. This suggests an error of between five and fifteen per cent in both reporting and recording.

DISCUSSION

On the Hertfordshire inquiry the techniques adopted were such that memory errors were likely to be somewhat less frequent than on a number of large-scale morbidity inquiries, with the possible exception of the U.S.A. National Health Survey. More memory errors might have been expected if the period studied had been longer, or if the beginning of the period had not been delineated by an interview. The questions asked at the second interview were drawn up with the intention of minimizing memory errors, and separate interviews with each adult member of the family and additional interviews with

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mothers about the health experience of their children are likely to result in rather fewer errors than the method used in other family inquiries in which one person might act as an informant for all the other related members of the household.

Consultations with general practitioners are, unlike illnesses, easily defined events, and failure to report such a consultation at an interview is likely to be due either to a failure to recall the event as having occurred in the relevant period or to a deliberate withholding of information. It is not possible to separate these two sources of error. These consultations are likely to be more memorable than certain other occurrences, such as the consumption of medicines, which are sometimes studied on morbidity surveys (8). For these reasons a comparison of the number of consultations reported at interviews with those recorded for the same individuals by their general practitioners might be expected to provide an estimate of the minimum number of memory errors which are likely to arise on surveys of this type.

An initial comparison of the distribution of consultations obtained from these two sources showed very high agreement, but further analysis revealed many compensating errors. It could not be held however that all the discrepancies were the results of errors in reporting, and it appeared for example that the general practitioners had tended to under-record home consultations.

It is estimated that there was both an under-recording and an under-reporting of between five and fifteen per cent of consultations. This estimate is similar in size to the probable sampling error of the mean, on a sample of about 2,000.

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