

Use of Telephone Interviewing to Study Human Reproduction

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MOUNTING CONCERN regarding world-wide population problems has created an urgent need for increased research activity in many areas. Improvement of methods of family planning and prevention of physical and mental defects in the newborn, for example, requires more detailed information about the basic processes of human reproduction. Although the

study reported here is concerned with methods of gathering data relating to the etiology of congenital malformations, we believe the results may be useful in a variety of research fields.

It is well known that specific agents active in the early months of pregnancy may cause certain congenital malformations. German measles was recognized in the 1940's as one cause; more recently thalidomide taken by mothers early in pregnancy was found to be responsible for deformities in thousands of babies. These and similar discoveries have spurred the search for other agents operating early in pregnancy.

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On pursuing such research, however, one may find no routine medical records of factors of possible relevance. Hence, existing sources of data concerning events early in pregnancy need to be supplemented (1). The time of collection of the data from the mother is crucial. Gathering information at the end of pregnancy may introduce serious biases. For example, the mother of a malformed child, seeking a reason for the child's defect, is more likely to recall and report unusual events during pregnancy than is the mother of a normal child (2).

Dr. H. L. Blum, formerly health officer of Contra Costa County, Calif., and Mrs. Eleanor Fletcher, formerly chief public health analyst for the county health department, supplied the certificates of first and subsequent child births for the women included in the study.

Obtaining the desired information at the time of the woman's first prenatal visit to the physician should reduce these biases, but difficulties in recall would still remain. Even among women obtaining prenatal care in the first trimester, only a small proportion start such care

in the first month of pregnancy. A substantial proportion of pregnant women start prenatal visits after the first trimester. Thus, when women on their first prenatal visit are interviewed about events occurring since their last menstrual period before pregnancy, most of them are being asked to recall events over a period varying from 6 weeks to several months or more. As the length of the recall period increases, so does the likelihood of memory decay.

In conducting research on congenital malformations, pregnancy should be detected as early as possible, namely after one missed menses. Detection of a missed menses requires a check following each expected menstrual period. The delay or absence of a period would indicate the possibility of pregnancy, and the frequency of data collection and the scope and intensity of questioning could then be increased.

Possible Methods for Data Collection

What periodic checks are available to achieve early detection of pregnancy? Daily immunologic pregnancy testing is one possibility (3). In some U.S. hospitals, the assembling of data from the hospital's own records, the patient's private physician, and other sources has been effective (4). Periodic household visits have been used successfully among villagers in the State of Punjab, India (5), and with the population of an isolated community in Kauai, Hawaii (6). In the United States, monthly or semimonthly household visits have been effective in checking health information (7); menstrual data were also obtained during such visits (according to a personal communication from Dr. S. M. Wishik, International Institute of Human Reproduction, Columbia University, New York City). Use of such approaches in research on congenital malformations would pose special problems. Some married women never become pregnant, and for many others the intervals between pregnancies are long. Moreover, malformations occur in only a small proportion of the newborn—about 4 percent. Therefore, the large number of women required to obtain enough cases would make a procedure of household visits prohibitively expensive (8).

Mail surveys are another possibility, being much less expensive for periodic inquiries than

household visits. In numerous studies, volunteers have recorded the dates of their menstrual periods and mailed the information in at regular intervals (9). In our study, however, when a missed menstrual period was reported, the scope and intensity of questioning was to be increased in order to clarify questions and probe for more complete information. This feature called for immediate rather than delayed questioning of the respondent.

In the United States, one-time telephone interviews have been used in the collection of a variety of data from persons with access to a telephone. The subject matter has ranged from screening for visual impairment (10) to delineating the characteristics of teenagers relevant to their cigarette smoking practices (11).

Repeat telephone interviews have been used after an initial face-to-face visit—for example, following an initial personal interview with mothers who have taken their children to a child guidance clinic (12) and in interviewing mothers 1 month after hospital delivery in a study of the epidemiology of staphylococcal disease (13). In a fertility survey of a panel of Detroit area women whose initial interviews were by household visit, there has been a continued high response rate in repeat interviews conducted primarily by telephone (14).

Thus, telephone interviewing seemed to be the best method with which to begin our study. Telephone calls are less expensive than periodic visits and provide more flexibility than mailed questionnaires. Excepting commercial telephone surveys (15), we knew of no instances in which this research method had been used before in a general population segment for repeated interviewing of members of a panel who had received no initial household visits, nor instances in which telephone interviewing had previously covered such a relatively sensitive topic as menstruation. Therefore, a methodologic investigation of the collection of menstrual and related information from a telephone-interview panel seemed worthwhile.

Group Studied

Contra Costa County, Calif., an area with a heterogeneous population, located across the bay from San Francisco, was selected as the study

site. The proportion of households in the county having telephones was known to be high—88 percent at the time of the 1960 census. In view of the dearth of information on reactions of respondents to repeated telephone interviews about an intimate topic such as menstruation, we were prepared for a substantial refusal rate. Concern about the anticipated refusal rate led us to seek a group which rated fairly high in terms of probable willingness to be interviewed. Also, if we were to accumulate sufficient experience in interviewing pregnant women, the group selected should have a substantial pregnancy risk. Finally, to permit concentration of our efforts on methodologic procedures, the group should not be difficult to identify and locate. If the procedures showed promise in such a group, they might then be extended to other groups.

Women in Contra Costa County who had recently given birth to a first child appeared to meet the criteria. Women with one child are more likely to have another pregnancy than are women of higher parity. These women could be located from the addresses listed on the child's birth certificate. To further our objective of having a group at high pregnancy risk who would be willing to be interviewed, we selected primiparous women 17–35 years old, who were married at the time of the first birth, had no history of stillbirths or spontaneous abortions, and whose first-born child was presumably healthy.

Birth certificates were the source of the initial information used in selecting the mothers. Because of the limited time between the selection of birth certificates and the start of interviewing, we tried our procedures with mothers whose telephone numbers could be easily determined from telephone company directories and "information" operators. Of the 577 primiparous women selected, 345 had easily determined telephone numbers.

Subsequent mailed queries, results of which are summarized in the following table, revealed that 447 women, almost 80 percent of the 577 women initially selected, had a telephone when their first child was born. Our group of 345 with easily determined numbers constituted about three-quarters of the women who had access to a telephone at the time of their first child's birth.

| <i>Availability of telephone</i> | <i>Percent</i> |
|--|----------------|
| Total (N=577)----- | 100 |
| Women with telephones----- | 78 |
| With easily determined numbers----- | 60 |
| With numbers ascertained by subsequent mailed queries----- | 18 |
| Women without telephones----- | 14 |
| Telephone availability not ascertained----- | 9 |

NOTE: Because of rounding, the figures add to more than 100 percent.

For 9 percent of the group, telephone availability could not be ascertained; the women proved untraceable through mail followup, or else they were traceable by mail but failed to return a registered mail query. Appraisal of their demographic characteristics, especially their high mobility, leads to the conclusion that a large majority did not have telephones at the time of their first child's birth.

In assessing the socioeconomic status of the group scheduled for telephone interviews, the two following questions arise: How does this group of women with easily determined numbers differ from all those having telephones? How do those with telephones differ from those without telephones? Mobility, defined here as average annual number of moves since the birth of the first child, proved to be one discriminating factor. Mobility was 0.3 for the group with easily determined telephone numbers; it was considerably higher, 0.6, for the telephone-owning group as a whole. For women without telephones, mobility was at least 1.3 moves per year—more than twice as high as that for women with telephones. Table 1 provides additional data showing that those with easily determined numbers were older and in higher occupation groups. Similar socioeconomic differentials with respect to age and husband's occupation existed between primiparous women with and without a telephone. These differentials relating to telephone ownership are similar to those observed in 1960 for a sample of U.S. households in the Current Population Survey (16).

Procedures

We used a short span between the first birth and initial telephone interview (5 months average) for about half the mothers with easily determined numbers and a longer one (11 months average) for the other half (table 1). This

division was made to provide panel interviewing experience with women in each of three reproductive states and to afford opportunities for detecting changes from one state to another. These states are (a) the menstruating interval—the period when most pregnancies occur, (b) pregnancy—the time between conception and fetal loss or childbirth, and (c) postpartum amenorrhea—the interval between termination of pregnancy and the first menstruation.

We mailed introductory letters to consecutive samples of women about 5 days before the planned date for the initial telephone interview. Each letter was individually addressed, mentioned the name of the health department interviewer who would make the initial telephone interview, and bore the personal signature of the chief of the bureau of maternal and child health, California State Department of Public Health. The letter described the study as including telephone interviews of “several hundred young mothers” concerning their health during the menstrual cycle.

Among the requirements for the four women interviewers were enthusiasm concerning survey objectives and a pleasant, mature voice. Using highly structured questionnaires, they com-

menced the first telephone interview with a series of questions about the resumption and continuation of menstruation after the mother's first pregnancy, followed by questions about the characteristics of the woman's menstrual cycle before her first pregnancy and information about recent illnesses. At the close of the initial telephone call, the interviewer advised each respondent that she would telephone again and asked the mother to designate a convenient time of day. Based on her responses to the questions on menstrual status, the respondent was presumptively classed in one of the three reproductive states. The scheduling of subsequent telephone interviews and selection of the type of structured questionnaire to be used depended on the presumptive classification of the woman on the prior interview.

For women classed in the menstruating interval, questionnaires for subsequent interviews, administered by the same interviewer making the first telephone call, covered the history of menstruation and illness since the prior interview. Emphasis was placed on accurate reporting of menstrual dates so that the next call could be scheduled soon after the next expected menses. Thus, women could be interviewed

Table 1. Percentage of initially selected primiparous women with various demographic characteristics, according to availability of telephone when first child was born

| Characteristics | Initially selected women (N=577) | Telephone available | | | Telephone not available (N=79) | Telephone availability not ascertained (N=51) |
|---|----------------------------------|---------------------|-----------------------------------|--|--------------------------------|---|
| | | Total (N=447) | Easily determined numbers (N=345) | Numbers obtained later by mail (N=102) | | |
| Husband's occupation: | | | | | | |
| White collar..... | 34 | 42 | 47 | 24 | 5 | 10 |
| Blue collar..... | 66 | 58 | 53 | 76 | 95 | 90 |
| Age group (years): | | | | | | |
| 17-19..... | 35 | 27 | 24 | 41 | 57 | 71 |
| 20-24..... | 41 | 44 | 44 | 45 | 32 | 26 |
| 25-29..... | 17 | 20 | 22 | 13 | 8 | 4 |
| 30-35..... | 7 | 9 | 10 | 2 | 4 | 0 |
| Race: | | | | | | |
| White..... | 95 | 95 | 95 | 96 | 94 | 94 |
| Negro..... | 3 | 3 | 3 | 3 | 2 | 4 |
| Other..... | 2 | 2 | 2 | 1 | 4 | 2 |
| Average interval between birth and start of telephone interviewing: | | | | | | |
| 5 months ¹ | 47 | 49 | 52 | 40 | 46 | 27 |
| 11 months ² | 53 | 51 | 48 | 60 | 54 | 73 |

¹ For mothers whose first child was born between Oct. 13 and Dec. 12, 1959.

² For mothers whose first child was born between Apr. 12 and June 12, 1959.

NOTE: Because of rounding, figures for a group may not add to 100 percent.

Table 2. Number of interviews completed and refused by the 224 members of the panel, by length of time they were on panel

| Interviews completed | On panel less than 8 months | | On panel at least 8 months (N=209) |
|----------------------|-----------------------------|------------------------------|------------------------------------|
| | Refused interview (N=7) | Telephone disconnected (N=8) | |
| 0----- | 4 | | |
| 1----- | | | |
| 2----- | | 2 | |
| 3----- | 1 | 1 | |
| 4----- | 1 | 1 | |
| 5----- | 1 | 2 | 2 |
| 6----- | | 1 | 3 |
| 7----- | | 1 | 5 |
| 8----- | | | 13 |
| 9----- | | | 57 |
| 10----- | | | 59 |
| 11----- | | | 39 |
| 12----- | | | 26 |
| 13----- | | | 4 |
| 14----- | | | 1 |

within a relatively short time after a "missed" menstrual period. Toward the close of each repeat interview, the interviewer asked three to six questions about the growth and development of the respondent's first child. At the end of the interview, the respondent was told the approximate time planned for the next call, so that she could designate a more convenient time if she wished.

Panel members classed as pregnant after reporting a "missed" menses were scheduled for biweekly interviews during the first 3 interview months, that is, during approximately the first trimester, and monthly thereafter. To maintain procedures parallel with those for women already pregnant at the survey's start, scheduling and questionnaire content were the same as for the newly pregnant women. For women in post partum amenorrhea, interviews were scheduled monthly until the women reported resumption of menstruation.

Response Rates

The initial cooperation of several consecutive samples of the 345 women with easily determined telephone numbers was much higher than anticipated. Consequently, we decided that the utility of the study would be enhanced by inter-

viewing a panel of lesser size over a longer time than originally envisaged. Reducing the 345 women to a sample of 224 enabled us to extend the interviewing period to at least 8 months from the date of the initial interview.

The number of telephone interviews completed within 8 months of the initial interview and the reasons for losses within that 8-month period are shown in table 2. Of the 224 women approached, only four (less than 2 percent) refused to grant an initial interview. By the start of the survey, another 2 percent of the participants no longer had telephones. Additional correspondence was required to complete initial interviews with these women; they telephoned the interviewer or made themselves available at someone else's telephone.

What of losses subsequent to the initial interview? Three additional refusals on repeat interviews resulted in an overall refusal rate of 3 percent. Four percent of the women on the panel were dropped because their telephones had been disconnected subsequent to the initial interview.

The majority of panel members provided 10 or more interviews over an 8-month period. Almost half of the participants were pregnant at the start or following the start of the study and therefore were interviewed biweekly rather than monthly.

Other Results

Tracing panel members. Between the time that the women on the panel first gave birth and the last interview, an average interval of about 16 months, 36 percent moved one or more times. More than 80 percent of those moving, however, remained within the San Francisco Bay area. Fifteen percent moved elsewhere in California; only 3 percent (three persons) left the State.

We continued to interview the women who moved but had telephones in their new homes, regardless of distance. Because of occasional tardy replies to correspondence requesting a new address or new telephone number, changes of residence sometimes caused delays in completing interviews but did not result in losses from the panel.

For the small proportion of women moving out of the Bay area, long-distance person-to-

person telephone charges exceeded costs for the interviewers' time. Since the amount of movement outside the local call area was relatively small, increased telephone charges did not raise costs significantly.

Staff time per interview. Before the interviewer placed her first call for a scheduled repeat interview, she thoroughly reviewed the previous questionnaire, which contained notations as to the best time to place the next call. A call which had not been previously completed was scheduled for the same time on the succeeding day, but the time was left more to the discretion of the interviewer as her knowledge about the respondent increased. On 62 percent of repeat interviews, the respondent was at home and could be interviewed on the first call; 35 percent of the repeat interviews required two to five calls for completion of the interview, and 3 percent required six or more.

The time interviewers spent on calls not completed averaged 5 minutes per call. The interview itself averaged about 7 minutes in length. Reviewing the previous questionnaire, placing any unfinished calls, completing the current interview, and making the necessary notations for scheduling the next interview averaged about 15 minutes per completed interview.

Timing of interviews. In scheduling the repeat interview for menstruating women, our goal was to complete the call within a few days after the end of the woman's next expected menstrual period. In view of considerable variability in the length of a woman's successive menstrual cycles and the durations of menses, the end of the next expected menstrual period could not be forecast accurately. An interval which exceeded by 4 days the longest cycle reportedly experienced by the respondent during the year preceding pregnancy was used in scheduling calls (17). This procedure had the advantage of simplicity and was intended to minimize instances in which, because of an unusually long cycle, the next call would be completed before the next expected menses.

Sometimes interviews were completed a day or so early because the interviewer or respondent expected to be absent on the scheduled date. More often, interviews were completed later than scheduled, typically because the respondent was not at home. The following table shows the

extent of lag between the scheduled date and the completion date for 1,185 repeat interviews of women classed in the menstruating interval.

| <i>Completed interviews</i> | <i>Percent of total</i> ¹ | <i>Cumulative percent</i> |
|-----------------------------|--------------------------------------|---------------------------|
| Before scheduled date..... | 6 | 6 |
| On scheduled date..... | 31 | 37 |
| After scheduled date..... | 63 | (²) |
| Within 1st week..... | 44 | 81 |
| 1st-2d week after..... | 11 | 92 |
| 2d-3d week after..... | 4 | 96 |
| 3d-4th week after..... | 1 | 97 |
| 4th-8th week after..... | 2 | 99 |
| 8 weeks or more after..... | 1 | 100 |

¹ Total does not include repeat interviews in which initial menstrual periods following deliveries or miscarriages or missed or ill-defined menses were reported.

² Category not applicable.

The majority of these repeat interviews, 81 percent, were completed within 1 week of the date scheduled for the telephone call. Thus, 37 percent were completed on, or a day or so before, the scheduled date, and 44 percent were completed within the week following the scheduled date. Only 3 percent were completed more than 4 weeks after the scheduled date; the delay in these instances was caused by a temporary lack of telephone service or by the temporary absence of respondents. We found similar relationships between the scheduled date and the completion date for repeat interviews of women in the other two reproductive states—pregnancy and post partum amenorrhea.

How well did we realize our goal of completing most calls shortly after the end of the next expected menses? Did ability to recall exact dates diminish as this interval increased? In table 3, we have distributed the 1,185 repeat interviews of the women in the menstruating interval according to the elapsed time between the end of the menstrual period and the date of completion of the interview. Almost half the interviews took place within 1 week of the end of the menstrual period, three-quarters within 2 weeks. Ninety-four percent of the interviews were completed before a second menstrual period had occurred. The remaining 6 percent of the women had experienced at least two menses since the previous telephone call.

If the respondent could not recall the exact dates of a menstrual period, the interviewer assigned dates. Table 3 lists the percent of interviews for which the interviewer had to assign

dates because the respondent could not furnish exact information.

For more than 99 percent of the repeat interviews taking place after only one menses had ended, the respondents supplied exact dates. As the number of menses since the previous interview increased, interviewers had to assign these dates for an increasingly large proportion of the women. These results emphasize the importance of completing scheduled calls promptly.

In addition to the effect of scheduling procedures, data bearing on two other survey objectives required investigation, namely, the

Table 3. Elapsed time between menses and completion of repeat interview, with percent of interviews for which interviewers assigned menstrual dates because of respondents' forgetfulness

| Menses since previous interview | Repeat interviews completed | | |
|--|-----------------------------|---------|--|
| | Number | Percent | Percent with interviewer-assigned dates ¹ |
| Total repeat interviews ² ----- | 1, 185 | 100 | 1.5 |
| 1 menses not ended ³ ----- | 72 | 6 | (⁴) |
| 1 menses ended----- | 1, 036 | 88 | 0.3 |
| Menses in relation to current interview: | | | |
| Ended within 1 week earlier----- | 498 | 42 | 0 |
| Ended 1-2 weeks earlier----- | 403 | 34 | .5 |
| Ended 2-3 weeks earlier----- | 107 | 9 | .9 |
| Ended 3-5 weeks earlier----- | 28 | 2 | 0 |
| 2 menses ended----- | 64 | 5 | 12 |
| 3-4 menses ended----- | 13 | 1 | 46 |

¹ For total repeat interviews, percentage base excludes the 72 cases labeled "1 menses not ended." For all subcategories, the percentage base is the whole number in the same line. In assigning the dates of menstrual periods, the interviewers were mindful of the approximations by the respondent, the exact dates the respondent gave in prior interviews, and the number of menses since the prior interview.

² Does not include repeat interviews in which initial menstrual periods following deliveries or miscarriages or missed or ill-defined menstrual periods were reported.

³ Respondent reported that menstruation started but was not yet completed.

⁴ Category not applicable.

accuracy of the dates for the menses preceding pregnancy and the general quality of the dates given for the menstrual cycles.

Quality of menstrual data. Frazier has noted that, "the practices of determining the expected date of confinement from the first day of the last menstrual period is recognized at its best to be only an approximation" (18). Since women in our study group had been encouraged to recall menstrual dates, one would expect their birth certificate entries for "first day of last normal menses" to be more accurate than for women who had not been so encouraged. However, another study in the Bay area comparing the dates on birth certificates with the dates on the corresponding hospital records—each retrospectively obtained—revealed that the date of the last normal menses was entered on only 80 percent of the hospital records and that in 16 percent of the instances in which the menstrual dates appeared on both records the dates were in disagreement (19). These observations prompted us to investigate the completeness and accuracy of the dates obtained in our survey.

Of 65 pregnancies reported as starting during the survey, 13 ended in miscarriages for which no official record existed. We were able to find birth certificates for the remaining 52 and thus verify the pregnancy reported in the survey. However, the possibility of bias in the dates of the last normal menses reported in the survey also needed examination.

Omitting three birth certificates prepared on forms which did not require the date of the last menses, we compared the "first day of last normal menses" listed on the 49 certificates with the starting date reported in the survey. Ten of the birth certificates had entries that the first day of the last normal menses was not known. There was exact agreement between the dates on 20 of the records compared. The dates on the remaining 19 certificates were within 1 to 12 days of the information reported in the survey, 15 being within 7 days.

We believe that the majority of the discrepancies resulted from reporting errors on the birth certificates. The respondents' statements in the survey about menstrual dates were based on current information. When the respondent was reporting a given menstrual period in the survey, she had no prior knowledge that the

period might be her "last normal menses" before pregnancy. For these reasons, the dates given in the survey for the last normal menses appear to be reliable, and this appraisal seems applicable also to the large body of menstrual data reported in the survey.

Reporting of illness. It is well known that reporting of minor acute illness is subject to considerable memory variability (20), but also that forgetfulness is reduced if the recall period is shortened (21). Therefore the pregnant women were scheduled for biweekly interviews during the first trimester and monthly interviews thereafter until the termination of pregnancy. Also, they were asked additional probing questions in order to elicit more complete reporting of illnesses.

The 65 pregnancies reported during the 8 months of the survey occurred among 59 women—some of whom had more than one pregnancy. From these women and from 42 others already pregnant at the start of the survey, we obtained reports of 202 acute illnesses. The majority, 61 percent, were respiratory; only 14 percent were medically attended.

Table 4 contains data on pregnant women's forgetfulness of acute illnesses as evidenced in biweekly and in monthly interviewing. The rates of illnesses reported as starting in the first, second, and succeeding weeks before the day of in-

terview are shown. In biweekly and monthly interviews, the rates for illness starting in the first week before the interview are identical, suggesting that the degree of completeness of recall for the first week before the interview was about the same in biweekly and monthly interviews. The table also shows the rising loss in reporting with passage of time by comparing each succeeding week with the first. Rates of acute illness reported as starting in the second week before the interview are expressed as a ratio to the rate of illness reported in the first week. For the biweekly interviewing, the rates for the second week were only 14 percent below the rates for the first week; for monthly interviewing, the rates for illness starting in the second week were about one-half of the rates for the first week. In the third and succeeding weeks, the rates for monthly interviewing declined to about one-third of those for the first week.

It is apparent that biweekly interviewing produced much more complete reporting of acute illness than did monthly interviewing. Moreover, we found no evidence of a decline in the reporting of acute illnesses as the number of completed interviews for a given person increased. The telephone survey elicited a much more complete health history during pregnancy than could have been obtained by relying solely on a routine medical record because only a mi-

Table 4. Number of acute illnesses and weekly incidence rates among 101 pregnant women, by number of weeks before interview that illness started, with ratios to rates for week 1, based on 2-week and 1-month recall periods

| Weeks before interview that illness began | Number of acute illnesses | | Incidence per 1,000 person days ¹ | | Ratio to rate for week 1 | |
|---|----------------------------|-----------------------------|--|-----------------------------|----------------------------|-----------------------------|
| | 2-week recall ² | 1-month recall ³ | 2-week recall ² | 1-month recall ³ | 2-week recall ² | 1-month recall ³ |
| 1----- | 57 | 37 | 24 | 24 | 1.0 | 1.0 |
| 2----- | 48 | 20 | 21 | 13 | .9 | .5 |
| 3----- | 3 | 12 | (4) | 8 | (4) | .3 |
| 4----- | 0 | 11 | (5) | 8 | (5) | .3 |
| More than 4----- | 0 | 14 | (5) | 9 | (5) | .4 |

¹ "Person days" were obtained from the number of days in the recall period for any given interview.

² Interviews with recall periods of 21 days or less; average length was 16 days.

³ Interviews with recall periods exceeding 21 days; average length was 34 days.

⁴ Numbers were too small for meaningful comparison.

⁵ Category not applicable.

NOTE: An acute illness was defined as a condition not reported by the respondent as being related to pregnancy or menstruation, lasting less than 3 months, and not generally classified as chronic. The definition includes acute illnesses involving neither medical attendance nor activity restriction as well as injuries, which comprise 6 percent of the 202 illnesses on which this table is based.

nority of the acute illnesses the respondents reported were medically attended.

Child growth and development. Questions on child growth and development, covering the time that the pregnancy was first noticed up to the child's second year, were asked about the woman's first child. Toward the close of each interview, the mothers supplied specific details in each of three to six subject areas. The high degree of interest shown by respondents in these questions was on a par with that given to questions on menstrual data and other reproductive states. Moreover, long term cooperation was enhanced by the variety in subject matter provided by these questions.

Discussion

We believe that the following features of the study contributed to the high participation of primiparous women:

1. Adequate groundwork. Introductory letters mentioned the topic to be covered, established its importance, and gave the name of the telephone interviewer who would make the first call.

2. Legitimacy of auspices. The study was conducted by an official State agency having a bona fide interest in the group studied and in the topics covered in the interview.

3. Short intervals between calls. Since most calls were placed at monthly or biweekly intervals, the respondents kept us informed of pending moves or changes in phone accessibility.

4. Length of interview. Interviews were short, averaging about 7 minutes each.

5. Respondent interest. Far from considering menstruation a taboo subject, the majority of respondents seemed genuinely interested in reporting factual data about menstruation, pregnancy, and child development.

Can other telephone interview studies having subject matter and procedures similar to ours also experience high rates of cooperation? Before offering opinions on the extent to which our experience can be generalized, we wish to point out that our study women did not exactly represent our original target group of married primiparous women with telephones. Mothers of lower socioeconomic status were under-represented because of their relatively high mobility, coupled with the fact that the first

telephone interviews were placed 5 to 11 months after the birth of the first child rather than immediately after the birth. Fortunately, a straightforward procedure is now available for initial identification of a group with access to telephones, including those with unlisted numbers, within a given geographic area (22). In the panel study of fertility in the Detroit area, it was found that attrition rates with telephone interviews are greater among respondents of lower socioeconomic status (23). This result suggests that if all our original target group had been reached, participation would have been somewhat lower. As the proportion of members of the lower socioeconomic group increases or as departures from the five positive features just mentioned increase, a corresponding decrease in participation may be expected.

Although our study did not include a detailed cost analysis, the small amount of the interviewer's time spent per completed call suggests that a given interviewer should be able to interview a sizable number of respondents—about 400 a month. However, most other telephone studies have used considerably longer interviews; they also have covered more widely scattered populations, necessitating a considerable number of long-distance calls. Results from these studies indicate that telephone interviewing costs do not exceed one-third the cost of a similar face-to-face interview (10, 23, 24).

What about the addition or substitution of different topics than we used? Several studies have shown that reliability and completeness of response in telephone interviewing is similar to that obtained in face-to-face interviews (23, 25). Therefore these elements need not concern the researcher unduly unless his topics are subject to memory decay or cover sensitive areas.

Although decreased interest was undoubtedly a factor in the less satisfactory reporting of minor illness in our study, the inter-related element of memory decay also played a role. Weekly rather than biweekly interviewing regarding illness might well have produced more satisfactory results. Similar considerations regarding the frequency of interviewing may also apply to other topics having relatively low saliency for the respondent. The alacrity with which questions on child development were answered suggests that inquiry about other

topics of high interest to the respondent should pose few problems.

Particularly in the area of human reproduction, one may ask whether our favorable experience with telephone inquiries about reproductive states would apply to other sensitive topics. Some evidence is promising. In the panel study in the Detroit area, less than 0.3 percent of the persons reinterviewed refused to answer questions about contraceptive practice; refusal rates were somewhat higher for financial data (23). Limited experience from a panel study that we are currently conducting in California indicates that a question about coital frequency will be answered as readily in a telephone interview as a face-to-face meeting, once rapport has been established.

If the telephone respondent has a favorable image of the auspices of the project and of the interviewer, communication solely by telephone may be less likely to disturb that image than would a personal interview. The telephone interview also affords greater flexibility than the mailed questionnaire. If the proportion of households with telephones continues to rise and the costs for calls outside the local area decline, additional experience may disclose many more situations favoring research based primarily on telephone interviews.

To determine the limits of the telephone interview, further exploration is needed. For research requiring only one interview, future studies might deal with different elements of the population, longer phone calls, the characteristics of the interviewers, and other research topics—sensitive ones especially. In telephone panel studies, further investigation is also required in the aforementioned areas. Moreover, panel studies need further trials with aids to recall (calendars or diaries), with letters of appreciation to encourage continued participation and other ways of minimizing panel attrition (26), and with various frequencies of interviewing so that the optimal frequency can be determined.

So far we have confined our discussion to techniques for groups having access to a telephone. Very often the researcher wants to study either all members or a sample of persons from a specified population, irrespective of the procedures required to obtain the desired informa-

tion. The collection of sensitive information regarding human reproduction is becoming more prevalent. For example, in the 1965 National Fertility Survey, a household interview question on relative coital frequency was answered by more than 95 percent of the respondents (according to a personal communication, August 1968, from Dr. Charles F. Westoff, associate director, Office of Population Research, Princeton University). More detailed coital histories have been collected from more restricted populations by a variety of methods (27 and a personal communication, August 1968, Dr. J. R. Udry, associate professor, School of Public Health, University of North Carolina, Chapel Hill).

Much is already known about mail questionnaire techniques (28), procedures for face-to-face interviewing (29), and the extraction of data from records (4). If telephone interviewing is to be used, it will need to be integrated with one or more of these other procedures in order to cover the specified population. The continuing U.S. National Natality Surveys provide an example of effective coordination of telephone interviews with these three other sources of information to produce sample data representing a specified population (30).

Summary

The worldwide population explosion has created an urgent need for improved research procedures in many areas, including studies of human reproduction. In a study conducted in the bureau of maternal and child health of the California State Department of Health, an inexpensive procedure was sought to improve women's recall of events occurring around the time of conception and early in pregnancy. The study concentrated on the means of recruitment and maintenance of a panel of 224 married, primiparous women—all residents of Contra Costa County, Calif., with access to telephones. The procedure studied required no face-to-face contacts—only an introductory letter followed by a series of short telephone interviews, each scheduled to follow the woman's next expected menstrual period. The method provided a longitudinal record of menstruation and illness, as well as data on child growth and development.

After a woman had missed a menstrual period, she was telephoned biweekly during approximately the first trimester of pregnancy. To promote more complete reporting of illness, additional probing questions were asked throughout her pregnancy. The refusal rate upon initial telephone interview was very low—less than 2 percent, and the proportion of women refusing to provide repeat interviews over an 8-month period was also less than 2 percent.

The reporting of illness, most of which was minor, was less accurate and complete and reflected less interest on the part of the respondents than did their responses regarding menstruation and child development. However, illness was reported much more completely in biweekly than in monthly interviews. The respondents were interested in, and reported accurately on, the sensitive topic of menstruation, thus permitting early detection of their pregnancies. They showed a similar interest in providing accurate accounts of child growth and development.

When planning either one-time or panel studies, integration of the relatively inexpensive telephone interview with other procedures for data collection deserves the researcher's serious consideration.

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Automating Nursing Stations

The application of computer-assisted information systems to hospital nursing will be studied and evaluated over a 10-month period by Lockheed Missiles and Space Co., Sunnyvale, Calif., under a contract with the National Center for Health Services Research and Development of the Health Services and Mental Health Administration. Recommendations on how to automate the flow of information most effectively, through a typical nursing station should reduce the paperwork which now consumes 40 percent of a hospital nurse's time.

The nursing station is a nerve center of the hospital. At the end of the study period it will be possible to determine what information processing is going on at a typical station, what nurses think of their present system, and which systems look best for the future.

Lockheed, in carrying out the study, will analyze the operation of nonautomated nursing stations in nine general short term hospitals in major U.S. cities and develop a model of the typical nursing station, pictorially displaying the information flow.

In six hospitals with computers now in operation, the contractor will evaluate current operations. He will then design a system incorporating the techniques which are acceptable to the working nurses and most easily adapted to the model nursing station.

NAGUIB, SAMIR M., GEISER, PATRICIA B. (National Cancer Institute, Public Health Service), and **COMSTOCK, GEORGE W.:** *Response to a program of screening for cervical cancer. Public Health Reports, Vol. 83, December 1968, pp. 990-998.*

In 1963, a cervical cytological screening program was initiated in rural Washington County, Md. Pipettes for self-use were mailed to 2,612 white women, 30 to 45 years of age; 75 percent of them used the pipettes. When interviewed, about half the 652 nonrespondents claimed to have had

valid reasons for failure to respond. Nonrespondents tended to be older, unmarried, and in the lowest socioeconomic groups. They were less concerned about their health, had fewer symptoms, and were less likely to take other health-protective steps such as giving up smoking or using

seat belts. Nonrespondents were less likely to attend church frequently or to belong to social organizations.

In this population, publicity was associated with a very high level of response, leading to speculation that adequate publicity might reduce nonresponse so much that it would be feasible and profitable to make home visits to inform and persuade the relatively few initial nonrespondents.

FREDERIKSEN, HARALD (U.S. Agency for International Development), and **BRACKETT, JAMES W.:** *Demographic effects of abortion. Public Health Reports, Vol. 83, December 1968, pp. 999-1010.*

The demographic effects of abortion were evaluated in these four prototype situations: large-scale abortion is introduced where contraception is widely practiced; large-scale abortion is introduced where illegal abortion is widely practiced; large-scale abortion is introduced where contraception is not widely practiced; and large-scale contraception is introduced where abortion is widely practiced.

One might assume that the increase in legal abortions that follows the liberalization of the abortion law represents a replacement of hidden

illegal abortions by reported legal abortions. In the particular prototype situation we examined, however, the increase in legal abortions was accompanied by an increase in illegal abortions.

Where contraception is already widely practiced, it appears that permissive abortion laws may contribute more to a diminution of the effective practice of contraception than to a reduction in the birth rate below the level obtained by contraception. Conversely, when contraception is introduced where abortion is widely practiced, declines in abortion rates

may accompany declines in pregnancy and fertility rates.

For lack of clear-cut and generalizable case histories, we do not know what would happen if abortion were to be facilitated where contraception has not been widely practiced. The relative acceptability and feasibility of contraception and abortion as alternative methods of birth control in traditional societies with high levels of fertility remain to be established. Moreover, it remains to be determined whether these two methods of birth control would be more effective and efficient in combination than contraception extended singly.

BAILIT, HOWARD L. (University of Connecticut School of Dental Medicine). *Factors affecting mothers' estimations of their children's birth weights. Public Health Reports, Vol. 83, December 1968, pp. 1011-1014.*

Accurate birth weights of 372 children from 136 families were compared with the mothers' estimates of birth weights. The purpose was to determine the frequency, direction, and magnitude of the mothers' errors. The mean for the mothers'

ages was 37 years, the children's ages, 10 years, for the number of children per family, 3.96, and for the birth weights, 7.45 pounds. The middle class white women from the Boston area had a mean error of only 0.24 pound, but when an error was

made, it averaged 0.43 pound. Furthermore, 51.1 percent of the birth weights were incorrectly estimated, and, of these, 58.4 percent were underestimations.

Of the factors examined for their influence on the estimate, the mother's age and number of children had a major effect on the magnitude of the error, but only age of the mother affected the frequency of the error. The estimate also varied with birth order and birth weight.

BACKENHEIMER, MICHAEL S. (Public Health Service): *Demographic and job characteristics as variables in absences for illness. Public Health Reports, Vol. 83, December 1968, pp. 1029-1032.*

Frequency of absences because of illness was explored using, for the most part, a purposive sample of 128 employees of a large Federal organization. The feasibility of explaining absences in terms of sociocultural variables—specifically demographic and job variables—rather than as a strictly physiologically influenced phenomenon was tested. The data were analyzed by the Mann-Whitney U test.

Among demographic variables, men had significantly fewer episodes of absence than did women, and the absences for men decreased as education increased. Age did not serve to discriminate between persons with high and low frequency of absences. Women with children showed higher incidences of absences than did their counterparts without children.

For job variables, frequency of absence because of illness decreased as

job status (as measured by service grade or salary level) increased. Neither occupational grouping nor length of service in the organization was significantly related to absence behavior.

The research results support the contention that a biological frame of reference is too narrow to explain the condition of being ill and absent from work. Other elements such as cultural and social variables influence absence behavior, and industry would do well to extend its thinking on absence because of illness beyond the physiological state of health or illness.

ROBISON, CHARLES B. (Jefferson County Department of Health), CHAMBERS, J. CARROLL, and BATES, JOSEPH W.: *Defining the problem of air pollution in Metropolitan Birmingham, Alabama. Public Health Reports, Vol. 83, December 1968, pp. 1033-1044.*

In 3½ years of continuous air monitoring in Jefferson County, Ala., 6,628 suspended particulate, 5,191 sulfur dioxide, 6,884 nitrogen dioxide, 5,445 aldehyde, 433 dustfall, 405 sulfation, and more than 2,400 pollen and spore samples have been collected and analyzed by personnel of either the Public Health Service or the county health department.

The range of annual averages of

suspended particulate matter varied from 72 to 281 µg. per m.³ with a combined areawide average of 151 µg. per m.³. Seasonal variations of suspended particulate matter were small, indicating year-round sources of pollution in the county.

The annual averages for dustfall ranged from 10 to 88 tons per mi.² per month among various areas. Sulfation levels are generally low, but

follow a definite seasonal trend, winter levels being about twice as high as those of any other season.

The greatest pollution levels at all stations for all measured pollutants occur on calm days with little or no wind movement.

In general, air pollution comes from four main sources—domestic, transportation, commercial, and industrial. The major sources of particulate emissions are stationary, and pollution control efforts in Jefferson County should be directed at these stationary sources, particularly industrial ones.

MOONEY, H. WILLIAM (University of California School of Public Health), POLLACK, BEATRICE R., and CORSA, LESLIE, Jr.: *Use of telephone interviewing to study human reproduction. Public Health Reports, Vol. 83, December 1968, pp. 1049-1060.*

The worldwide population explosion has created an urgent need for improved research procedures in many areas, including studies of human reproduction. In a study conducted in the bureau of maternal and child health of the California State Department of Health, an inexpensive procedure was sought to improve women's recall of events occurring around the time of conception and early in pregnancy. The study concentrated on the means of recruitment and maintenance of a panel of 224 married, primiparous women—all residents of Contra Costa County, Calif., with access to telephones. The procedure studied required no face-to-face contacts—

only an introductory letter followed by a series of short telephone interviews, each scheduled to follow the woman's next expected menstrual period. The method provided a longitudinal record of menstruation and illness, as well as data on child growth and development.

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