THE ACCURACY OF RETROSPECTIVE DATA
FROM THE MALAYSIAN FAMILY LIFE SURVEY

John G. Haaga

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A RAND NOTE

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PREFACE

This Note reports the results of some investigations of the accuracy of retrospective data from the Malaysian Family Life Survey (MFLS). This was a household survey, designed and conducted by The Rand Corporation in cooperation with Malaysian institutions, as part of a research project funded by the U.S. Agency for International Development. Several questionnaires were fielded during the three rounds of the survey (1976-77), covering a wide variety of economic and demographic topics. The questions elicited data on the current situation of the 1262 households in the sample, as well as on the life histories of selected respondents. The present Note deals with data gathered using questionnaire MF2, administered to one ever-married woman (EMW) in each sample household.

Researchers using these data will, of course, need to assess for themselves their suitability for specific analyses. The Note is being published separately for several reasons: (1) to gather in one place results of potential interest to users of the MFLS data; (2) to illustrate methods and to list external sources of information that could help researchers using MFLS data to conduct their own checks of data quality; (3) to provide readers of substantive research based on the MFLS data with an opportunity to learn about the strengths and limitations of the data set in more detail; and (4) to suggest ways in which designers and users of other retrospective surveys can study, and perhaps improve, the quality of their data.

This study deals in greatest detail with the accuracy of data on pregnancy histories of the EMWs, the mortality experience of their children, and the EMWs' contraceptive use and infant feeding practices. This emphasis reflects partly the availability of external and internal consistency checks, but more importantly the needs of Rand projects on which the author worked during the writing stage.

The research on which the Note is based was funded by the U.S. Agency for International Development under Contract AID/pha-1057 with, and Grant AID/otr-1744 to, The Rand Corporation. A preliminary version
entitled "Validity and Reliability of Life History Data from the Malaysian Family Life Survey" was presented to the annual meetings of the Population Association of America, Washington, D.C., in March 1981.

The following Rand publications describe the survey methods and the communities in the sample, reproduce the questionnaires and interviewers' instructions, and show how the data were coded:


ACKNOWLEDGMENTS

Both the substance and the presentation of results were improved with the help of Julie DaVanzo, Allyson Davies, Will Harriss, Nancy Tuma, and Linda Waite, none of whom is responsible for any remaining idiosyncrasies or inaccuracies. Dolores Davis and Gloria Lenaris typed several versions of the manuscript, and Barbara Eubank-Thurston saw it through final stages.


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I. INTRODUCTION

The subject of this Note is the accuracy of retrospective data from life histories reported by ever-married women (EMWs) interviewed as part of the Malaysian Family Life Survey (MFLS). The MFLS included questions on all the respondent's pregnancies and the children born to her, and on her education, employment, and residence since the age of 15. Since the upper limit for the age of respondents was 50 at the time of the first interview (1976), in many cases the events to which the questions referred had taken place decades before the interview.

The quality of such retrospective data has to be questioned. Besides the usual problems of large, multi-topic household surveys that arise from the difficulty of supervising field work, misunderstandings of questions, respondents' and interviewers' fatigue, and the sensitivity of certain topics, there are also problems due to the imperfect memories of the respondents. Events can be either omitted or over-reported, and the timing of events or the duration of intervals between events can be misreported. It is generally believed that data are more inaccurate, the longer the period of recall.¹

Since there are some offsetting advantages of longer periods of recall,² survey designers and analysts need to estimate how the severity of inaccuracy increases with the length of the recall period. This could vary according to the types of data and the populations being surveyed. This Note focuses on differences in the accuracy of MFLS data on different topics and on how data quality is related both to various characteristics of the respondents and to the length of the recall period.

"Accuracy" as used here means the degree to which the numbers and timing of events included in the verbal reports of MFLS data correspond to the real numbers and timing of those events in their lives. The types of inaccuracy dealt with here are all examples of non-sampling

¹Sudman and Bradburn (1974).
²Butz (1981) discusses the advantages and disadvantages of retrospective data in general and of surveys using long recall periods.
error.\textsuperscript{3} This can be of two kinds: bias or systematic error, and random error. Bias would cause an estimate based on the MFLS sample of a rate (say, of contraceptive usage) to have an expected value different from the rate for the whole population of Malaysian women in the year in question. Random error in the individual replies of MFLS women would cause a retrospectively estimated rate to have a wider variance around the population rate than would be due to sampling error alone. Random error is comparable to having a smaller "effective" sample size than that actually obtained.

The methods used to assess the accuracy of the MFLS data include checks of internal consistency, comparisons of rates and proportions estimated from the MFLS data with rates estimated from censuses, other surveys, or official registration lists, and comparisons of answers made on successive rounds of the MFLS when questions were asked more than once. These analyses are performed separately for subgroups of the MFLS sample, defined by the respondents' age at the time of the survey, level of education, urban or rural residence, and ethnicity. Differences among these subgroups are either the subject of investigation or important exogenous variables in most analyses that would use the MFLS. It was not possible to check the verbal reports of an individual respondent against any external source of information on the same individual.

The next section of this Note describes the MFLS in more detail. Sections III through IX are organized by topic, dealing with data on fertility, contraceptive use, birthweights, infant and fetal mortality, breastfeeding duration, postpartum amenorrhea, education, and housing. Section X is an analysis of the types of respondents who gave seemingly inaccurate or approximate answers to questions about breastfeeding, postpartum amenorrhea, birth dates, and birth weights. The final section contains a summary and conclusions.

\textsuperscript{3}These distinctions are based on the model of survey error used by Andersen et al., (1979); see especially pp. 1-15.
II. THE MALAYSIAN FAMILY LIFE SURVEY

Under the sponsorship of the U.S. Agency for International Development, the MFLS was conducted in 1976 and 1977 by The Rand Corporation in cooperation with, first, the Malaysian Department of Statistics and later, Survey Research Malaysia, a private firm. The goal of the research was to investigate the effects of several variables—social background, economic opportunities, changing roles for women, increased availability of modern goods such as contraceptives, and others—on couple's decisions concerning their working lives, marriages, fertility, and the rearing of their children. A total of 52 primary sampling units (PSUs) were chosen from a grid covering all of Peninsular Malaysia,¹ each PSU containing roughly 220 dwelling units. Next, a random sample was taken of all the dwelling units within the selected PSU's, and each was visited to draw up a household roster. Of the 2088 dwelling units selected from the sample frame (originally prepared for the Malaysian Department of Statistics 1967 Expenditure Survey), 1813 could be found and the inhabitants contacted. For each dwelling unit, interviewers listed all women in the household between the ages of 15 and 50 who had ever been married, if there were any. From this latter group, one woman per household (1262 of them) was selected at random and interviewed for the MFLS female retrospective survey. More details of the survey design and sampling procedure are given in Jones and Spoelstra (1978).

The MFLS questionnaires were printed in the major languages used in Peninsular Malaysia: Malay, Chinese, and Tamil (the language of most immigrants from south India and their descendants). Interviewers had to be found who could speak Malay, Tamil, and each of the five main Chinese dialects used in Malaysia. The Appendix lists English versions of the

¹Peninsular Malaysia includes the 11 states formerly comprising the Federation of Malaya, which achieved independence from Great Britain in 1957. Since 1963, these states have been united with the East Malaysian states of Sabah and Sarawak, located on the island of Borneo. Eighty-five percent of the total population of the country lived in Peninsular Malaysia at the time of the 1980 Census.
MFLS questions that elicited the data analyzed in this Note. A complete list of questions appears in Butz et al. (1978). The MFLS also included questionnaires administered to the husbands, but the focus of this study is on the data from the retrospective survey of women only. The MFLS data sets are described elsewhere (Butz and DaVanzo, 1978).

The MFLS life histories included a number of topics not usually found in demographic surveys. They covered the years between the respondent's first marriage or fifteenth birthday (whichever was earlier) and the interview in late 1976. In the second and third rounds, conducted in 1977, most of the respondents were recontacted and the life histories were brought up to date. On these occasions some questions referring to events covered in the Round I history were asked again.

There are also several reliable external sources of data against which MFLS data can be checked. The UN classifies Malaysia's system of registration of vital events as virtually complete.\(^2\) Two censuses (1957 and 1970) and several other household surveys conducted in Peninsular Malaysia produced contemporaneous information against which the MFLS retrospective data can be checked.\(^3\)

\(^2\)UN *Demographic Yearbook*, various issues. Hirschman and Joo (1971) evaluated the completeness of registration of infant deaths in Peninsular Malaysia and found it "rather good" (p. 26). Their conservative estimate, based on comparisons with a 1967/68 survey, is that 3.3 percent of infant deaths were unreported.

\(^3\)Data from the 1980 Census and revisions of population estimates for 1970-80 were not available at the time of writing.
III. FERTILITY

The pregnancy histories are a particularly important part of the MFLS data. The survey was designed in large part to study the household-level factors affecting fertility trends. Any systematic tendency for certain births not to be recorded, or to be recorded with the wrong date, could introduce spurious correlations and trends.

Omissions. In most studies of biases in retrospective fertility data (e.g., Som, 1970), the main problem identified was selective omission of events from pregnancy histories. Such omission would be a source of bias in estimates of fertility rates and trends over time. For example, in many South Asian surveys, the births of girls were underreported. In many surveys, respondents tended to omit infants who subsequently died, because they did not realize that they were supposed to be included, or were unwilling to discuss them. The result was that the infant mortality rates calculated from the reported pregnancy histories in many of these surveys did not agree with what was known from other sources. Some gave examples of surveys from India and the Sudan that showed infant mortality rates rising rapidly in the years closer to the interview date, contrary to all expectation. He developed techniques to correct for omissions of girls and infants who die, to get decent estimates of levels of fertility. Demographers have devised ingenious methods of using census data on own children, parity-progression ratios, comparisons of cohort patterns of age-specific rates, etc., to squeeze the maximum amount of information from faulty data (Hobcraft and Carrier, 1971; Brass, 1975).¹ Survey designers, meanwhile, explored techniques of bounded recall and elaborate cross-checking of events to try to improve data accuracy.

¹These necessarily involved restrictive assumptions. Assuming that the age pattern of first- or higher-order births is the same in earlier as in later periods would be undesirable in a country like Malaysia, where this pattern seems to be changing rapidly.
The accepted view, as Potter (1977) points out, was that retrospective surveys gave a conservative picture of fertility decline: Because births were most underreported in the distant past, any fertility decline that did appear must be understated.

Underreporting of female births does not appear to be a problem with the MFLS data. Table 1 shows the sex ratios of live births reported in the MFLS. (Following the usual practice of demographers, these are expressed as the number of male births per 100 female births.) The expected value of this ratio is 105.² For the whole sample, and for each of the ethnic subsamples, the MFLS value of this ratio is usually less than one standard error of estimate away from the expected value, even for births occurring many years before the date of the interview. In the two cells for which the rates were more than one standard error away from the expected value (births to Chinese women 1945-1960 and births to Malay women 1960-70), they were less than two standard errors.

Table 1
SEX RATIOS OF LIVE BIRTHS REPORTED IN MFLS, BY YEAR AND ETHNIC GROUP

(Number of male births per 100 female births)

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>1945-60</th>
<th>1961-70</th>
<th>1970-76</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malays</td>
<td>111</td>
<td>95ᵃ</td>
<td>108</td>
</tr>
<tr>
<td>Chinese</td>
<td>95</td>
<td>110</td>
<td>113</td>
</tr>
<tr>
<td>Indians</td>
<td>95</td>
<td>104</td>
<td>109</td>
</tr>
<tr>
<td>Total</td>
<td>102 (n=1456)</td>
<td>102 (n=2199)</td>
<td>119 (n=1486)</td>
</tr>
</tbody>
</table>

ᵃProportion is more than one standard error of estimate below expected value of 105.

²Bogue (1969), p. 166. There is some evidence that this ratio is lower in populations with poor nutritional and health status.
away; moreover, these values showed a greater number of females than expected, rather than a smaller number. These results also hold when corrections are made for age of mother in the MFLS sample (not shown).

Figures 1a through 1d show comparisons of the average numbers of children born to MFLS sample women by 1957, 1967, 1970, and 1974 with the average numbers of children ever born reported by Malaysian women in censuses or large sample surveys in those years. The numbers of children reported by MFLS respondents are slightly larger for nearly every age group than the comparable numbers reported at the time of the censuses in 1957 and 1970 and the fertility survey in 1974, but slightly smaller than the numbers reported by survey respondents in 1967. This evidence suggests no consistent tendency to underreport births in the past.

Misreporting the Time of Events. Misreporting the timing of events can be a source of bias often less tractable than gross omission of events. Most analysts had assumed that such misreporting was, at worst, a source of random error: some events would be reported as earlier than they actually occurred and others as later. However, Potter's (1977) simulation studies demonstrated that a spurious fertility decline would appear in survey data if fertility rates were at a constant level, but women tended to report births that occurred more than five years before the date of the interview as having occurred more recently. He found telling evidence that such a systematic tendency has affected fertility surveys. He compared, for example, two surveys from what is now Bangladesh, conducted more than ten years apart, each showing a precipitous decline in fertility beginning about 7-10 years before the survey date. The earlier survey could not be right if the later one was.

A sample responding in the fashion illustrated by Potter's model would tend to exhibit implausibly high fertility rates in the penultimate reporting period. Comparisons of mean numbers of children ever born with data from earlier years would show greater discrepancies than comparisons for years immediately preceding the survey date.
Fig. 1a -- Children born before 1957--Comparison of MFLS retrospective data with 1957 Census data

Fig. 1b -- Children born before 1967--Comparison of MFLS retrospective data with West Malaysia Fertility Survey data
Fig. 1c -- Children born before 1970--Comparison of MFLS retrospective data with 1970 Census data

Fig. 1d -- Children born before 1974--Comparison of MFLS retrospective data with Malaysia Fertility and Family Survey
The accuracy of reported timing of births in the MFLS can be checked by comparing the age-specific marital fertility rates implied by MFLS respondents' pregnancy histories with those contemporaneously reported in vital statistics for past years (Figs. 2a through 2d). The age-specific rates for MFLS respondents for each five-year period are bounded by the rates for the first and last years of the period in almost every case, with only a small tendency for MFLS retrospective reports to show an "older" pattern of marital fertility. There is no evidence, however, of a very different pattern of fertility for the penultimate period before the interview date, as would appear if there were serious and consistent event displacement of the type modelled by Potter.

In regressions not shown here, I attempted to use the MFLS data to fit specific parameters for a Potter-type model of event displacement. The method was as follows: If there is a cutoff date X years before the survey, such that births before that date tended to be reported as occurring later than they actually did, while the timing of births occurring after that date is reported accurately, than there should be a clustering of unusually short intervals around the cutoff date. This required standardization of intervals by age and parity, and removal of that part of the variation in interval length explained by marital separation, widowhood and remarriage, and the like. No such clustering of standardized birth intervals was found.

It appears, then, that systematic misreporting of the timing of births, in the manner described by Potter, is not a problem for users of the MFLS data. The MFLS may be unusually accurate for retrospective data, however. Malaysian citizens are required to keep identification cards, recording the birth dates of children. MFLS interviewers were instructed to ask respondents to check these records to verify birth dates. About 70 percent of the 5665 live births recorded in the sample had dates checked. This is gratifying for the analyst who wants to use these data for accurate fertility studies, but it means that the MFLS does not provide a good test of whether the "event displacement" model suggested by Potter is generalizable.

---

Potter's model is a bit more complicated, having two such cutoff dates.
Fig. 2a -- Age-specific fertility rates, 1956-60--Comparison of MFLS retrospective data with contemporary vital statistics

Fig. 2b -- Age-specific fertility rates, 1961-65--Comparison of MFLS retrospective data with contemporary vital statistics
Fig. 2c -- Age-specific fertility rates, 1966-70--Comparison of MFLS retrospective data with contemporary vital statistics

Fig. 2d -- Age-specific fertility rates, 1971-75--Comparison of MFLS retrospective data with contemporary vital statistics
IV. CONTRACEPTIVE USE

Contraceptive use is an important intervening variable in any theory linking socioeconomic background variables with fertility. MFLS respondents were asked, for each interval between pregnancies, whether they used any means of avoiding pregnancy; a card with a list of modern and traditional methods and simple illustrative diagrams was shown to each woman. Here we are only concerned with bias in the rates of modern contraceptive use. It is difficult to compare reported use of traditional contraceptives across studies, partly because definitions of such terms as "abstinence" or "safe time" and probing questions differ and partly because the lists of traditional methods differ.¹ There are two good external sources of information about the use of modern contraceptives in Peninsular Malaysia: the 1967 West Malaysia Fertility Study (National Family Planning Board, n.d.) and the 1974 Malaysian Fertility and Family Survey, part of the World Fertility Survey. Table 2A shows comparisons of the percentages of those women in the MFLS sample who were married before 1967 and who reported use of modern contraceptives or sterilization before that date, with similar percentages from the West Malaysia Fertility Study results. Table 2B is an analogous comparison with the Malaysian Fertility and Family Survey results.

The MFLS percentages are lower for younger women in the earlier survey and for all but one age group in the later survey. The fact that the 1974 comparisons are no closer than the 1967 comparisons suggests that the problem in the MFLS data is not so much with selective omissions of events in the more distant past, or with misreporting the timing of events, as with general underreporting. One possible explanation is that both the earlier surveys concentrated more on questions about contraceptive use than did the MFLS. Interviewers in the MFLS may not have probed as much as interviewers in the earlier

¹The MFLS list of traditional contraceptives, for example, including breastfeeding with the intent of delaying the next pregnancy, since this effect was widely known in Malaysia; other contraceptive surveys have not counted breastfeeding as a method.
Table 2
COMPARISONS OF CONTRACEPTIVE USE REPORTED IN MFLS
WITH 1967 AND 1974 FERTILITY SURVEYS

A. Women reporting use of modern contraceptives or sterilization before 1967, as a percentage of all women married before 1967, by ethnic MFLS compared with West Malaysia Fertility Survey

<table>
<thead>
<tr>
<th>Age in 1967</th>
<th>Percentage Ever Used (Sample Size in Parentheses)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MFLS</td>
</tr>
<tr>
<td>15-24</td>
<td>7.0%</td>
</tr>
<tr>
<td>25-34</td>
<td>18.5%</td>
</tr>
</tbody>
</table>

B. Women reporting use of modern contraceptives or sterilization before 1974, as a percentage of all women married before 1974--MFLS compared with Malaysian Family and Fertility Survey

<table>
<thead>
<tr>
<th>Age in 1974</th>
<th>Percentage Ever Used (Sample Size in Parentheses)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MFLS</td>
</tr>
<tr>
<td>15-19</td>
<td>13.9%</td>
</tr>
<tr>
<td>20-24</td>
<td>24.8%</td>
</tr>
<tr>
<td>25-29</td>
<td>38.8%</td>
</tr>
<tr>
<td>30-34</td>
<td>49.6%</td>
</tr>
<tr>
<td>35-39</td>
<td>30.1%</td>
</tr>
<tr>
<td>40-44</td>
<td>22.9%</td>
</tr>
</tbody>
</table>
surveys on this one topic, since they had more ground to cover in the retrospective life histories.
V. INFANT AND FETAL MORTALITY

The MFLS data can be used for investigations of household and community factors affecting the relative risks of infant mortality; they contain more information on the household environment than is usual for retrospective epidemiological studies. The data on infant and fetal mortality are also important for studies of the determinants of fertility, since it has often been found that losing a child affects a couple's subsequent childbearing decisions. Child deaths are not easy in any culture to discuss in the format of a survey interview with strangers; both respondents and interviewers may avoid the topic. The problem to be expected with retrospective survey data on mortality is thus undercounting.

MFLS respondents were asked, concerning each child reported to be born alive to them, where the child was at the time of the survey. If the answer was that the child had died, the child's age at death was asked. Also in the pregnancy history, interviewers were supposed to ask for interval between reported pregnancy outcomes if the respondent had had any additional pregnancies, including any that did not result in a birth.

The infant mortality rates reported by the Malay and Chinese women in the MFLS sample show the same downward trend, and roughly the same levels, as do the rates for the same years reported in Malaysian vital statistics (Figs. 3a to 3d). This is evidence that the reports of infant deaths for these subpopulations in the MFLS are not subject to severe bias. The infant mortality rates reported by Indian women in the sample are a great deal higher than the official rates, for reasons that are not clear.

---

1A comparison of rates similar to that shown in Figs. 3a-d was made between infant mortality rates from vital registration and those reported for the same years by MFLS respondents, correcting for the different age distribution of MFLS mothers in the earlier years covered by the survey. The results were much as shown in Fig. 3.

2The official rates lie below a 95 percent confidence interval bracketing the sample rates for the years 1970-76.
Fig. 3a -- Infant mortality rates, all ethnic groups--Comparison of MFLS retrospective data with contemporary vital statistics

Fig. 3b -- Infant mortality rates, Malays--Comparison of MFLS retrospective data with contemporary vital statistics
Fig. 3c -- Infant mortality rates, Chinese--Comparison of MFLS retrospective data with contemporary vital statistics

Fig. 3d -- Infant mortality rates, Indians--Comparison of MFLS retrospective data with contemporary vital statistics
How accurately were the ages at death reported for the babies who died? This can be checked by comparing survival curves for the first year of life from the MFLS with similar curves obtained from vital statistics. Figure 4 presents such a comparison for the period 1966-69 (the earliest four-year period for which the MFLS sample contains enough births and deaths to estimate the first-year survival curves accurately). The similarity (in level and shape) of the survival curves for Malay and Chinese infants estimated from the MFLS data to their counterparts estimated from vital events registration data suggests that ages of infants who died were reported quite accurately in the MFLS.

To check whether fetal deaths are underreported, the MFLS data can be compared with results from a special topic survey covering some of the same years. A survey conducted by the Federation of Family Planning Associations (FFPA) and the International Development Research Centre in 1973-74 was especially designed to elicit information about abortions or miscarriages (Sinnathurai et al., 1977). Several survey approaches were tried. For example, women were first asked if they had had any unusually delayed menstrual periods, then if they thought they might be pregnant, whether they had done anything to bring about menstruation again, etc. Such questions refer to spontaneous or induced fetal deaths of which the women were aware in the first place. It would be impossible to get a measure of "early fetal wastage" from self-report data. Table 3 shows comparisons of MFLS and FFPA abortion rates per thousand pregnancies in the years 1970-73. The FFPA rates are considerably higher, which suggests that the MFLS data are probably underestimates. However, the MFLS data do show a pattern of incidence of fetal death that is similar to that of the FFPA study when ethnic groups are compared. Thus the Chinese reported more abortions in both the MFLS and the FFPA surveys (Table 3). When age groups are compared, the FFPA study data show higher rates among younger women than in the MFLS.

Underreporting of pregnancies that ended in fetal death is a problem in any kind of analysis of components of birth or pregnancy intervals. Unfortunately, it is impossible to say whether the problem
Fig. 4 -- Survival curves for first year of life, 1966-69--Comparison of MFLS retrospective data with contemporary vital statistics
Table 3
ABORTIONS AND MISCARRIAGES, 1970-73

Comparison of Retrospective Data from MFLS and from FFPA

<table>
<thead>
<tr>
<th>Age Group and Ethnicity</th>
<th>Abortion Rates for 1000 Pregnancies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MFLS</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
</tr>
<tr>
<td>Women aged 15-19</td>
<td>40&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>20-24</td>
<td>29</td>
</tr>
<tr>
<td>25-29</td>
<td>62</td>
</tr>
<tr>
<td>30-34</td>
<td>74</td>
</tr>
<tr>
<td>35-39</td>
<td>28</td>
</tr>
<tr>
<td>40-44</td>
<td>91&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Malays</td>
<td>38</td>
</tr>
<tr>
<td>Chinese</td>
<td>70</td>
</tr>
<tr>
<td>Indians</td>
<td>57</td>
</tr>
</tbody>
</table>

<sup>a</sup>Sinnathuray et al. (1977).
<sup>b</sup>Based on fewer than 100 pregnancies.

is worse for the early years in the MFLS survey's period of recall; there is no information about the trend we would expect to see reflected in the MFLS data. From the FFPA study, it appeared that any decline in the number of miscarriages (related to better prenatal care and nutrition) was being offset by increased numbers of abortions among the same groups of women.
The infant mortality data in the MFLS appear not to have been subject to underreporting, as is expected in retrospective surveys. Also, the age pattern of infant deaths seems to correspond with what is known from other sources. Both these results hold when the sample is disaggregated by ethnic group (the ethnic groups in Malaysia having very different infant mortality rates). Fetal deaths, by contrast, appear to have been underreported to a considerable degree. The MFLS data should not be used for study of trends or differentials in abortion rates, and analysts of the fertility data should keep in mind that the data omit particularly one class of pregnancies, those ending in abortion, which are at least 9 percent of all pregnancies.
VI. BIRTHWEIGHTS

Low birthweight is an important factor affecting a child's prospects for survival. The planners of the MFLS were interested, among other things, in studying biological and behavioral correlates of mortality among Malaysian infants; for this purpose, birthweight can be considered either a crucial intermediate variable for studying some presumed causal links or as a potential confounding factor that needs to be controlled in analyses (DaVanzo, Habicht, and Butz, 1984).

MFLS respondents were asked if they knew the exact weights (in pounds and ounces) of each of their liveborn babies; for just under 70 percent of births, an exact weight was recorded.¹ Mothers who did not give an exact weight were asked for an approximate weight. Five choices were offered for the response, ranging from "very small" to "very large."

Asking for birthweights in a retrospective survey with a long recall period was a somewhat speculative venture; the author is not aware of similar surveys that have included this question. Since 47 percent of the births were to women who had had no formal schooling, one might expect that respondents' unfamiliarity with numbers would make the data unreliable. On the other hand, the weight of a newborn baby is a topic that seems likely to interest anyone concerned with the baby's health (or the mother's, for that matter!). There is no inherent reason to believe that a baby's weight, even if only approximate, would be remembered less accurately than other topics.

Figure 5, taken from DaVanzo, Habicht, and Butz (1984), shows a comparison of the frequency distribution of birthweights reported in vital statistics for Peninsular Malaysia, 1977 (the solid line), the distribution of exact weights reported for infants in the MFLS sample born 1970-76 (large dashed line) and the distribution of birthweights in the total MFLS sample of infants (small dashed line). For the last-

¹Exact weights are reported for more than half even of the home births in the MFLS dataset, since government midwives who assist at home births carry portable scales with them.
Fig. 5 -- Frequency distribution of birthweights--Comparison of MFLS retrospective data (1970-76) with vital statistics (1977)

named distribution, it was assumed that the babies reported to be "very small" at birth were exactly two standard deviations below the mean birth weight for the sample; those reported to be "small" were one standard deviation below the mean, those reported to be average at the mean birth weight, and "large" and "very large" infants to be one and two standard deviations above the sample mean. This imputation procedure results in a frequency distribution slightly thicker in the tails but extremely close to that reported by vital events registration (Fig. 5). This suggests that the question on approximate weights and the five-category scale were meaningful to the respondents. They seem to have understood the implicit comparison with an "average baby weight" for the population in the manner that the framers of the survey instrument hoped.
The MFLS data also show higher probabilities of dying in the first year of life for those babies reported to be "very low" or "low" in weight at birth. This is as expected and suggests that the approximate weight categories were indeed reported accurately. Figure 6 shows infant mortality rates (deaths before age one per 1000 live births) reported for infants in each of the five approximate weight categories. It is possible, though, that some of this correlation is spurious, due to respondents' remembering the babies as small because they died. But combined with the results of the comparison of MFLS and vital events registration data on birthweights, the correlation with subsequent mortality suggests that at least categorical data on birthweights can be gathered reliably in retrospective surveys.
Fig. 6 -- Infant mortality rates for births with only approximate weight recorded, by weight category, MFLS retrospective data
VII. BREASTFEEDING AND AMENORRHEA

For each of their children, MFLS respondents were asked whether they breastfed the child, if so for how long, and at what age they first introduced supplementary foods. A major purpose of the research was to investigate the extent, causes, and consequences of the decline of breastfeeding in Malaysia. One possible consequence of great demographic interest is the effect of breastfeeding on the length of postpartum amenorrhea, because the high level of the hormone prolactin produced by the lactating mother is believed to delay ovulation and the resumption of menses. The MFLS respondents were also asked how long it was until menstruation resumed after each pregnancy outcome they reported. Unfortunately, both the breastfeeding and the amenorrhea data from the MFLS are subject to the problem of digit preference—the choice of "peak values" for replies.

The respondents who were reinterviewed on the second round of the MFLS (1201 of the original 1262) were asked again whether they had breastfed their first child, and, if so, for how long. The retest reliability ratio\(^1\) for the first question was quite high for all ethnic groups and for every level of education (Table 4). Correlation ratios of the durations of breastfeeding reported in the two rounds are also high.

The major problem in both the breastfeeding and amenorrhea data is the implausibly large proportion of reported durations that are exact multiples of six months, which can be seen in Figs. 7 and 8. This digit preference was anticipated in the design and pretesting of the questionnaire. Interviewers for the MFLS were instructed to probe if a

\(^1\)This ratio is calculated as \(O - E/N - E\), where \(O\) is the observed number of respondents giving the same answer in Rounds I and II, \(E\) is the expected number of same answers, given the marginal probabilities of No's and Yes' in the two rounds, and \(N\) is the number of women in the sample who answered both questions. This ratio has the advantage over the crude percentage of agreements that it removes the effect of chance agreements. Since there are only two categories in the question discussed here, the sensitivity of reliability indices to the number of categories is not a problem (Coombs, 1977); see also Ryder and Westoff, (1969).
Table 4

RETEST RELIABILITY OF BREASTFEEDING QUESTIONS

Reliability ratio for answers to "Did you breastfeed your first child?" and correlation coefficients for "How long did you breastfeed your first child?"

<table>
<thead>
<tr>
<th>Item</th>
<th>No. of Women</th>
<th>Ratio&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sample</td>
<td>1199</td>
<td>.910</td>
<td>.913</td>
</tr>
<tr>
<td>Malays</td>
<td>573</td>
<td>.914</td>
<td>.908</td>
</tr>
<tr>
<td>Chinese</td>
<td>471</td>
<td>.903</td>
<td>.938</td>
</tr>
<tr>
<td>Indians</td>
<td>142</td>
<td>.864</td>
<td>.900</td>
</tr>
<tr>
<td>No education</td>
<td>421</td>
<td>.891</td>
<td>.885</td>
</tr>
<tr>
<td>Primary education</td>
<td>625</td>
<td>.924</td>
<td>.949</td>
</tr>
<tr>
<td>Secondary education</td>
<td>147</td>
<td>.875</td>
<td>.922</td>
</tr>
</tbody>
</table>

<sup>a</sup>Calculation = \( \frac{O-E}{N-E} \), where \( O \) = observed no. of agreements, \( E \) = expected no. of agreements, \( N \) = number in sample

duration of breastfeeding or amenorrhea was reported as "about a year" or "about six months," by asking whether it was more likely to have been greater or less than the approximate duration. Responses were to be coded in the actual unit of time stated by the women, whether days, weeks, months, or years.

With breastfeeding data it is always possible that the popularity of answers that are multiple of six months reflects actual behavior. Many cultures have traditional weaning ages, and this fact would cause peaks even in perfect data. However, sociological and anthropological studies that discuss breastfeeding in Malaysia (e.g. Millis, 1955; and Kuah, 1972) do not mention any such abrupt weaning ages. More important, the data on current breastfeeding status of infants at various months of age from the MFLS (Fig. 9) do not show a sharp drop in the percentages of babies still breastfed at the time of the interview after the ages of six, twelve, and eighteen months, as they would if these really were traditional weaning ages. Rather, it seems probable that the peaking in MFLS data is caused by respondents' faulty memories, or appropriate rounding off answers to half-years.
Fig. 7 -- Frequency distribution of reported duration of breastfeeding, NLS retrospective data.
Fig. 8 -- Frequency distribution of reported duration of postpartum amenorrhea, MFLS retrospective data
Fig. 9 -- Percentage of children still breastfeeding at time of MFLS interview, by month of age
The digit preference in the reported durations of both breastfeeding and postpartum amenorrhea appears to be worse, the longer the recall period. This is shown in Table 5, where "Whipple's index," a simple measure of the degree of digital preference, is given for breastfeeding and amenorrhea data pertaining to births occurring in the 1950's, 1960's, and 1970's. (The index is defined as the ratio of the reported number of durations that are multiples of six months to the total number of duration; see Shryock and Siegel, 1976, pp. 115-119).

For descriptive purposes, the heaping on certain digits is a nuisance, but perhaps not a crucial one. Survival curves showing percentages of babies still breastfed a certain number of months after birth can be compared for different decades or different subgroups of the population. These curves are not as smooth as might be desired, but they do show trends that are consistent with other evidence. Medians

Table 5

<table>
<thead>
<tr>
<th>Year of Birth</th>
<th>Breastfeeding Duration</th>
<th>Amenorrhea Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1946-55</td>
<td>2.94</td>
<td>2.38</td>
</tr>
<tr>
<td>1955-64</td>
<td>2.23</td>
<td>1.61</td>
</tr>
<tr>
<td>1965-74</td>
<td>1.78</td>
<td>1.31</td>
</tr>
</tbody>
</table>

*"Whipple's Index*: Ratio of durations that are exact multiples of six months to one-sixth of all durations. Expected value, if there were no digital preference, is approximately one.
and quartiles, less sensitive than sample means to the proportion of "peaked" answers, can be used for intergroup comparisons. Some iterative smoothing procedures could be applied to the frequency distributions themselves, especially if the analyst were willing to specify a particular form for the conditional probability of weaning as a function of month of age.

The real problem comes in the use of these data in multivariate analyses. Measurement error in an independent variable biases a regression coefficient for that variable toward zero, and also biases the coefficient on another variable correlated with the first one in a direction that depends on the direction of the correlation between them. In the present case, measurement errors in values of the breastfeeding and amenorrhea variables are themselves correlated: Digital preference in the answer to one set of questions is associated with digital preference in answers to the others (see Table 6). The underlying frequency distribution for length of breastfeeding seems to be downward-sloping, so the "six-month" answers are likely to contain more that have been rounded up than rounded down. Although it is hard to say what

<table>
<thead>
<tr>
<th>Table 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CORRELATION BETWEEN &quot;PEAK VALUES&quot;(^a) FOR DURATION OF BREASTFEEDING AND DURATION OF AMENORRHEA ON SAME OBSERVATION</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration of Breastfeeding</th>
<th>Duration of Amenorrhea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak</td>
</tr>
<tr>
<td>Peak</td>
<td>803</td>
</tr>
<tr>
<td>Not peak</td>
<td>432</td>
</tr>
<tr>
<td>Total</td>
<td>1235</td>
</tr>
</tbody>
</table>

_SOURCE: MFIS._

\(^a\)"Peak Values" = Multiples of six months.
Chi square = 680, prob. < .001.
shape the frequency distribution for length of amenorrhea should have
(Potter and Kobrin, 1981, propose a class of bimodal distributions), it
does seem likely that the twelve, eighteen, and twenty-four month
answers include more overestimates than underestimates. The result is
that in this case we cannot assume that the error covariances are zero,
as is done in most of the econometric literature on the "errors-in-
variables problem." Positive errors in one variable appear to be
associated with positive errors in the other.

The MFLS interviewers were instructed to probe on these questions.
If the response was "about a year," they were instructed to ask, "Was it
more likely to be less than a year or more than a year?" One is not
sure how diligently the probing was done for each of the live births
reported, but it would be wrong to blame this problem on the
interviewers. It seems to plague all retrospective data concerning
durations, even those with much shorter recall periods.\(^2\) The
correlation of digit preference across variables makes it difficult to
use retrospective data to investigate the connection between lactation
and amenorrhea. There is some information contained in the MFLS data,
though, since overall patterns seem to make sense and the retest
reliability of the questions repeated in Round II is so high.

\(^2\)Cherry and Rodgers, for example, show the results of some surveys
of British mothers of infants born in 1946. These mothers were asked,
in 1948 and again in 1950, if their children had contracted measles, and
if so, at what age (in months). "Even in the 1948 report . . . there is
evidence of systematic bias in reporting, with the age of the onset of
measles being distributed with implausible regularity at 6, 18, and 24
months" (Cherry and Rodgers, 1979, p. 36).
VIII. EDUCATION

Two questions in Round I of the MFLS concerned the number of years of formal schooling and the highest certificate received by each woman in the sample. Besides these questions, the life history portion of the questionnaire also covered any time spent in formal education after the women's fifteenth birthday or first marriage, whichever was earlier.

The agreement between the number of years of schooling reported by the women in the MFLS sample and the numbers reported in the 1957 and 1970 Censuses by women in the same birth cohorts is quite high (Figs. 10a and 10b). One might have expected less agreement, since there could have been confusion about definitions of schooling. One might also have expected the sort of intercensal inflation of educational attainment with which we are familiar in this country--respondents in a given birth cohort gradually increase the number of years of schooling they report as they get older, more than can be accounted for by additional schooling between censuses. Such inflation in self-reports may be caused by respondents' embarrassment at reporting less education than they believe the interviewers expect. In Malaysia, it is not uncommon for older women especially to have had no schooling, and apparently there is little embarrassment about reporting this fact.

In Round II, the original respondents who could be reinterviewed were asked directly if they had been in school at age fifteen. The answers to this question can be checked against the life history given during Round I. Because the second interview took place at least four months after the first, and because the same information was elicited in different ways on the two occasions, it is unlikely that respondents' answers the second time were influenced by their memory of what they said before.

Of the 109 women in the MFLS sample who reported having some secondary education, 107 reported in Round II that they were in school at age 15, but their life histories collected in Round I do not include schooling at that age. This is the major source of disagreement between rounds. As Table 7 shows, however, even for women with less education
Fig. 10a -- Women's level of education--Comparison of MFLS retrospective data with 1957 Census data

Fig. 10b -- Women's level of education--Comparison of MFLS retrospective data with 1970 Census data
Table 7
RETEST RELIABILITY OF EDUCATION QUESTION

*Answer to "Were you in school at age 15?" (Round II) compared with answer implied by life history (Round I)*

<table>
<thead>
<tr>
<th>Sample</th>
<th>Number of women</th>
<th>Percent Disagreement Between Rounds</th>
<th>Reliability Ratio$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>1155</td>
<td>13.8</td>
<td>.112</td>
</tr>
<tr>
<td>Malays</td>
<td>538</td>
<td>9.5</td>
<td>.261</td>
</tr>
<tr>
<td>Chinese</td>
<td>463</td>
<td>19.0</td>
<td>.022</td>
</tr>
<tr>
<td>Indians</td>
<td>142</td>
<td>12.7</td>
<td>.100</td>
</tr>
<tr>
<td>No education</td>
<td>422</td>
<td>0.5</td>
<td>.500</td>
</tr>
<tr>
<td>Primary education</td>
<td>597</td>
<td>8.4</td>
<td>.138</td>
</tr>
<tr>
<td>Secondary education</td>
<td>109</td>
<td>98.2</td>
<td>.018</td>
</tr>
<tr>
<td>Rural</td>
<td>677</td>
<td>7.5</td>
<td>.190</td>
</tr>
<tr>
<td>Urban</td>
<td>478</td>
<td>22.6</td>
<td>.069</td>
</tr>
</tbody>
</table>

$^a$See the footnote on page 27 for definition.

The reliability ratios for these questions are low, that is, the number of inter-round agreements is little more than would be expected simply by chance. The implication is that either respondents or interviewers did not realize that the life histories were to include all events, including continuing schooling, beginning from the woman’s fifteenth birthday or first marriage, whichever was earlier. (None of the 109 women with secondary education reported a first marriage before age 15). This finding is disconcerting because this is the only standardized recheck between rounds on what a woman was doing at a particular age.

Finally, it is interesting to note that the correlates of retest reliability in this instance are just the opposite of the correlates of reliability for the other topics examined in this Note (Table 7). That is, reliability was higher for Malays, for older women, and for the less educated.
IX. HOUSING

A series of questions in the MFLS concerned the quality of the houses that respondents had lived in since their marriages. This information was sought to investigate such matters as the connection between water supply and sanitation and infant mortality, or a possible connection between crowding and fertility or migration decisions. In addition to questions asked of individual respondents, questions were put to local leaders on some of these matters to elicit community-level data (pertaining to the time of the survey only).

A very rough check of the accuracy of these data can be done by comparing the percentages of MFLS respondents reporting the availability of certain amenities in the house where they lived in 1970 with housing census data gathered in 1970. One might have expected a good deal of timing error (people who now have electricity or flush toilets tending to claim to report them as installed earlier than they were, or to report having had them in a previous residence as well). Such timing errors in MFLS data are not apparent. Table 8 shows reasonably close agreement between MFLS respondents' reports of their household amenities in 1970 and the census results for Peninsular Malaysia from that year.
Table 8
COMPARISON OF DATA ON HOUSING AMENITIES FROM
MFLS AND 1970 CENSUS OF HOUSING

<table>
<thead>
<tr>
<th>Amenity</th>
<th>MFLS (percentage of households)</th>
<th>Census (Peninsular Malaysia only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric lighting</td>
<td>50%</td>
<td>44%</td>
</tr>
<tr>
<td>Flush toilet</td>
<td>16%</td>
<td>19%</td>
</tr>
<tr>
<td>Non-flush toilet</td>
<td>61%</td>
<td>61%</td>
</tr>
<tr>
<td>No toilet</td>
<td>24%</td>
<td>20%</td>
</tr>
<tr>
<td>Piped water</td>
<td>48%</td>
<td>48%</td>
</tr>
</tbody>
</table>
X. RESPONDENT CHARACTERISTICS, LENGTH OF THE RECALL PERIOD, AND DATA QUALITY

The previous sections of this Note presented the results of checks of data quality separately for key variables in the MFLS. In this section, multivariate analyses are used to investigate three issues that cut across topics: (1) Which MFLS respondents seem to have given the most accurate retrospective data in their pregnancy histories? Are the data on certain births (of boys, or of children who survived) of higher quality than the data on other births? How is the quality of the data affected by the length of the recall period, that is, the interval of time between the birth being talked about and the date of the interview?

The first two questions are important because most analysts of MFLS and other household survey data are concerned with measuring the differences along various dimensions among subgroups of the sampled population, such as the different ethnic groups, rural vs. urban dwellers, the educated and the uneducated. If the data from one subgroup are biased to a greater extent, or in a different direction, than the data from another subgroup, then apparent intergroup differences may be spurious. As was noted earlier, correlations of measurement errors across variables make more complicated the use of multivariate statistical methods; analysts need to be aware of the ways in which errors may be systematically related to variables that might be used in statistical models.

The third question, on the length of the recall period, is one that concerns designers of surveys as well as analysts. The problems of data quality investigated in this Note (omissions or overreporting of events, misreporting the timing of events or the duration of intervals) are generally considered to be worse for data concerning events in the distant past than for events taking place soon before the time of the interview. Little is known, however, about the form this relationship takes.
Since there were no independent, individual-level sources of information against which the MFLS answers could be checked for accuracy, four variables were constructed to serve as indicators of data accuracy in the MFLS pregnancy histories (see Table 9). Two of these are measures of the "peak-value" answers for the duration of time that a baby was breastfed and for the time after giving birth that the mother was amenorrheic. As was pointed out in Section VI, an implausibly high proportion of these answers were multiples of six months. Two other indicator variables measure (1) whether or not the month of a birth was missing in the data or reported only to the nearest season (early-, mid-, or late-year) and (2) whether or not the mother reported an exact weight for her baby.

Logistic regression curves were fitted to the MFLS data to determine how several independent variables (also listed in Table 9) predict the probability of a missing, approximate, or peak-value answer. These independent variables measured both characteristics of the respondent herself (her ethnicity, whether she could read or write, her level of education, whether she lived in a rural area) and characteristics of the child whose birth was being reported (whether the child had died before the date of the interview and whether or not a birth certificate for that child was available in the respondent's home). Also included in the models were measures of the length of the recall period between the birth in question and the date of the interview.

The logistic formulation was used because it is better suited for the prediction of probabilities than other types of regression model. The models were estimated using a maximum likelihood algorithm described

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1For example, logistic regression constrains the predicted probabilities to be between zero and one, as linear regression would not. The logistic model is also free from the usual regression assumption that the standard error of predictions is greater the farther away a point is from the centroid of sample values of the independent variables. This assumption would be inappropriate for predictions corresponding to probabilities, since the confidence interval for predicted probabilities near the one and zero should be narrower rather than those for probabilities near 0.5. See Morris and Rolph (1981), chapter 9, for further discussion of the logistic regression model.
### Table 9

**VARIABLES USED IN LOGIT REGRESSION MODELS OF MFLS DATA ACCURACY**

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Definition</th>
<th>MFLS Sample Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MISS</td>
<td>=1 if exact month of child's birth is missing or reported only by season</td>
<td>.102</td>
</tr>
<tr>
<td>APPROX</td>
<td>=1 if child's weight given as approximate value (&quot;very big,&quot; etc.) rather than in pounds</td>
<td>.302</td>
</tr>
<tr>
<td>BFPEAK</td>
<td>=1 if duration of child's breastfeeding reported as one of &quot;peak values&quot; (6, 12, 18, or 24 months)</td>
<td>.326</td>
</tr>
<tr>
<td>AMPEAK</td>
<td>=1 if duration of woman's postpartum amenorrhea reported as peak value (6, 12, 18 months)</td>
<td>.244</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YEARS</td>
<td>Length of recall period (number of years between birth of child and interview date)</td>
<td>11.8</td>
</tr>
<tr>
<td>LOGYEARS</td>
<td>Logarithm of ((\text{Years} + 1)^a)</td>
<td>2.29</td>
</tr>
<tr>
<td>YEARSQ</td>
<td>Square of YEARS</td>
<td>197.5</td>
</tr>
<tr>
<td>LITERATE</td>
<td>=1 if respondent can either read or write any language</td>
<td>.500</td>
</tr>
<tr>
<td>EDMID</td>
<td>=1 if respondent had some schooling, but less than 5 years</td>
<td>.290</td>
</tr>
<tr>
<td>EDHIGH</td>
<td>=1 if respondent had 5 or more years of schooling</td>
<td>.242</td>
</tr>
<tr>
<td>RURAL</td>
<td>=1 if respondent lived in village</td>
<td>.782</td>
</tr>
<tr>
<td>CHIN</td>
<td>=1 if respondent identifies self as Chinese</td>
<td>.379</td>
</tr>
</tbody>
</table>
Table 9 (continued)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Definition</th>
<th>MFLS Sample Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>IND</td>
<td>= 1 if respondent identifies self as Indian or Pakistani</td>
<td>.135</td>
</tr>
<tr>
<td>DIED</td>
<td>= 1 if child died before date of interview</td>
<td>.087</td>
</tr>
<tr>
<td>DOCMT</td>
<td>= 1 if child's birth certificate was checked during interview</td>
<td>.714</td>
</tr>
</tbody>
</table>

*1 was added to YEARS before taking the logarithm because YEARS = 0 for some observations.

by Brelsford and Relles (1982). Table 10 shows the coefficients and asymptotic t-statistics for the independent variables in the models estimated. Table 11 shows the partial derivatives of the estimated equations with respect to the different independent variables, evaluated at the mean of all other independent variables. These partial derivatives are estimates of the effect that a one-unit change in the value of the independent variable would have on the probability of a missing or approximate answer with all other independent variables held constant at their means.

Characteristics of the Respondent and Her Children

The characteristic of respondents that most strongly affects the probability of an inexact answer in the MFLS data is ethnicity. Consistently, the Chinese women gave the fewest inexact answers. This is so even when the effects of education, literacy, and the rest are taken into account. For the most part, Indian women gave fewer inexact answers than did the Malays, when the other variables are held constant. As is shown in Table 11, the estimated probability that a Chinese woman would give a peak-value breastfeeding answer is 0.19, compared with a probability of 0.43 for a Malay woman with the same characteristics. Chinese and Indian respondents were much less likely to give an
Table 10
LOGIT REGRESSION ESTIMATES FOR MODELS OF MFLS DATA ACCURACY

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>BFPEAK</th>
<th>AMPEAK</th>
<th>MISS</th>
<th>APPROX</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEARS</td>
<td>-.211</td>
<td>-.244</td>
<td>.010</td>
<td>.034</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4.8)</td>
<td>(5.0)</td>
<td>(.97)</td>
<td>(.70)</td>
<td></td>
</tr>
<tr>
<td>LOG YEARS</td>
<td>1.64</td>
<td>1.62</td>
<td>1.24</td>
<td>.380</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(7.3)</td>
<td>(6.5)</td>
<td>(2.0)</td>
<td>(1.6)</td>
<td></td>
</tr>
<tr>
<td>YEARSQ</td>
<td>.0063</td>
<td>.0049</td>
<td>.0024</td>
<td>.0024</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.9)</td>
<td>(4.9)</td>
<td>(.13)</td>
<td>(.22)</td>
<td></td>
</tr>
<tr>
<td>LITERATE</td>
<td>-.127</td>
<td>-.099</td>
<td>-.596</td>
<td>-.351</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.4)</td>
<td>(1.0)</td>
<td>(3.1)</td>
<td>(3.5)</td>
<td></td>
</tr>
<tr>
<td>EDMID</td>
<td>-.107</td>
<td>-.265</td>
<td>-.099</td>
<td>-.731</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.2)</td>
<td>(2.8)</td>
<td>(.52)</td>
<td>(7.3)</td>
<td></td>
</tr>
<tr>
<td>EDHIGH</td>
<td>-.250</td>
<td>-.387</td>
<td>-.090</td>
<td>-1.03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.3)</td>
<td>(3.2)</td>
<td>(3.2)</td>
<td>(7.9)</td>
<td></td>
</tr>
<tr>
<td>RURAL</td>
<td>.061</td>
<td>.047</td>
<td>.070</td>
<td>.0087</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.4)</td>
<td>(1.8)</td>
<td>(.16)</td>
<td>(.30)</td>
<td></td>
</tr>
<tr>
<td>CHIN</td>
<td>-1.19</td>
<td>-1.10</td>
<td>-2.14</td>
<td>-2.24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(17.6)</td>
<td>(14.7)</td>
<td>(12.7)</td>
<td>(26.1)</td>
<td></td>
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<tr>
<td>IND</td>
<td>-.901</td>
<td>-.980</td>
<td>.0058</td>
<td>-2.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(9.6)</td>
<td>(9.1)</td>
<td>(.03)</td>
<td>(17.1)</td>
<td></td>
</tr>
<tr>
<td>DIED</td>
<td>--</td>
<td>--</td>
<td>1.11</td>
<td>.652</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(7.8)</td>
<td>(4.9)</td>
<td></td>
</tr>
<tr>
<td>DOCMT</td>
<td>--</td>
<td>--</td>
<td>-4.56</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(16.1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Constant term        | -2.14              | -2.36  | -2.64  | -.85 |
Log likelihood ratio  | 311                | 258    | 1042   | 921  |

NOTES: Sample size = 5665 (each observation is a live birth reported by an MFLS respondent).
-- = variable not used in model.
Table 11

EFFECT OF INDEPENDENT VARIABLES ON ESTIMATED PROBABILITIES
OF INACCURATE ANSWERS

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B.F. Digit Preference</th>
<th>Amenorrhea Digit Preference</th>
<th>Approximate Birthweight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If indep. var. = 0</td>
<td>If indep. var. = 1</td>
<td>If indep. var. = 0</td>
</tr>
<tr>
<td>LITERACY (of mother)</td>
<td>.31</td>
<td>.29</td>
<td>.23</td>
</tr>
<tr>
<td>MOTHER'S EDUCATION:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary (compared to none)</td>
<td>.32</td>
<td>.30</td>
<td>.25</td>
</tr>
<tr>
<td>Secondary (compared to none)</td>
<td>.32</td>
<td>.27</td>
<td>.25</td>
</tr>
<tr>
<td>RURAL</td>
<td>.29</td>
<td>.30</td>
<td>.21</td>
</tr>
<tr>
<td>ETHNICITY:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese (compared to Malay)</td>
<td>.43</td>
<td>.19</td>
<td>.33</td>
</tr>
<tr>
<td>Indian (compared to Malay)</td>
<td>.43</td>
<td>.24</td>
<td>.33</td>
</tr>
<tr>
<td>CHILD DIED</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
approximate weight than Malays (probabilities of 0.09 and 0.10 compared to 0.48).

There is no obvious reason why Malay women would provide data of poorer quality. The interviewers did not report greater difficulty in finding or completing interviews with Malay respondents. Nor is there any reason to believe that Malay respondents were less willing than Chinese or Indians to give details about their children to a stranger, or that they were more antipathetic to the institutions conducting the survey.\(^2\) The interviewers of all ethnic groups were instructed to ask the same probing questions to elicit more exact answers. Perhaps the Malay respondents were less accustomed than the others to thinking in terms of precise weights and dates. Some of the information that MFLS interviewers were seeking may have greater meaning in the Chinese and Indian cultures in Malaysia than in the Malay culture. The Chinese and Indian respondents may have been more willing than the Malays to fulfill the task requested of them (and perhaps hurry the interview along) by supplying a precise answer when one was sought. Whatever the cultural explanations, it is remarkable that the effect of ethnicity should be so much stronger than those of education level or length of the recall period.

The coefficients for variables measuring the respondent's literacy and her education level are all negative, as expected, and in most instances, significantly different from zero. Literate and educated respondents were thus more likely to give exact answers to these questions. For example, the predicted probability of a peak-value answer to the breastfeeding question was 0.27 for a respondent with more than four years of schooling, compared with 0.32 for a respondent with no schooling (all other independent variables held constant at their mean values; see Table II).

\(^2\)At the initial screening, the purposes of the survey were explained to members of the selected households in general terms. Interviewers were correctly identified as employees of Survey Research Malaysia, Sdn. Bhd., a local private firm, working under the sponsorship of the Malaysian government.
Presumably the MFLS interviewers, themselves young women who had completed secondary school, found it easier to communicate with the more educated respondents. Though the instruments were pretested in all of the languages into which they were translated, it is possible that the same questions were imperfectly understood by uneducated women. This result has been found in other investigations of the quality of survey data from Thailand (Knodel and Piampiti, 1977) and Taiwan (Coombs, 1977).

Data from rural areas were generally more likely to contain inexact values than data from the urban areas, but the differences between predicted probabilities are not large when ethnicity, literacy, and level of education are controlled. Most of the urban/rural difference in the quality of MFLS data is attributable to the fact that rural women are predominantly Malays and are generally less educated than urban women.

The factor most affecting the probability of a missing birth month in the MFLS data is whether or not the child's birth certificate was available for consultation. Malaysian families have an incentive to obtain and save these documents, since citizenship and free public schooling depend on them. The certificates only contain information on the child's date and place of birth, not weight, so its availability added little to the prediction of approximate weights.

In none of the models estimated did the sex of the child have a significant effect on the probability of an inaccurate answer. This confirms the impression derived from the examination of sex ratios of reported births (Table 1 above) that the quality of the MFLS data is not better for boys, as has been the case in some other surveys.

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3For example, in many regions, Malay women use regional pronunciations and vocabularies that differ from those of Bahasa Malaysia, the national language. Only those who had been to school in the Malay medium, or who listened regularly to radio or television, would be thoroughly familiar with spoken Bahasa Malaysia. The topics covered in the questionnaires were part of the ordinary experience of most respondents, but it is always possible that being interviewed formally was an unusual experience for many women.
Another independent variable that was dropped from the final version of the models was the total number of children that had ever been born to the respondent by the time of the survey. The preliminary hypothesis was that the more children a woman had had, the less exactly she would remember details like the weight, month of birth, and weaning age of any one of them. This hypothesis seemed plausible, based on casual empirical observations of large families of the author's acquaintance; a more sophisticated source of the same hypothesis would be the theory of "interference" in the psychology of memory. Another possibility would be that the greater number of children to discuss in the MFLS interview would cause both interviewers and respondents to hurry through the questions about each child. The results of the analysis did not support either hypothesis; the total number of children was not related to the probability of inaccurate answers on any of the questions studied here.

The household income reported by respondents (also not included in the final version of the models) did not have any significant or consistent effects on the probability of an inaccurate answer to these four questions. Respondents with higher incomes did in fact report fewer inexact answers in the MFLS, but this seems to be due to greater literacy and higher education rather than to any other factors associated with higher incomes.

**Length of the Recall Period**

The logit regression models can also be used to study the effect of the length of the recall period on the quality of the MFLS data. Figure 11 shows the predicted probabilities of a peak-value breastfeeding duration and of an approximate birthweight, graphed against the number of years separating the time of the birth and the interview date, for various combinations of the other independent variables.

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Baddeley (1979) discusses the findings of psychologists concerning memory and their implications for survey researchers. His research on the ability of British rugby players to recall details about matches in which they had played years before supported the "interference" hypothesis.
Fig. 11 -- Predicted probability of digit preference in reported duration of breastfeeding, by ethnic group, urban residence, and length of recall period, MFLS retrospective data
Because the effect of a longer recall period was expected to be non-linear, various transformations of the length of recall period were entered into the model. There is not a great deal of empirical work in psychology to guide the choice of a functional form for a "forgetting curve," but Baddeley's (1979) results suggested that the ability to recall precise information from the past declines with the logarithm of the recall period. The fit of the equations to the data was improved somewhat by including the term for YEARS squared, as well. The combined effect of these three variables in the models is to raise the estimated probability of a peak-value or approximate answer, the further back in time the birth being discussed in the interview (Fig. 11).

The ability of respondents to remember is not the only factor affecting the quality of the MFLS data as measured by the dependent variables used here. (The differences between ethnic groups and more and less educated women are unlikely to be explained in terms of better memories.) It seems reasonable to suppose that respondents' memories would have an effect on the quality of data from the earlier periods covered by the pregnancy histories.

In both of the models of peak-value responses, the curves are steepest for the years immediately before the interview data. The answers tend to be more inexact the farther back in time the birth being discussed, but the data on births occurring twenty months before the interview are not much more accurate than data on births seven years before the interviews. In the models of missing birth months and approximate weights, the relationship between data quality and the length of the recall period is more nearly linear, with peak-value response patterns becoming more apparent for long-ago births.

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*Baddeley's (1979) Fig. 1 summarizes results on the effect of the length of recall period on the recall of events, recognition of the names of racehorses, and recognition of the faces of famous people in Great Britain. Sudman and Bradburn (1974) also model "memory decay" in survey responses as a function of the logarithm of the recall period, citing the 19th-century experimental work of Ebbinghaus. Unfortunately for survey researchers, most research on memory follows the Ebbinghaus tradition in examining fairly short-term memory using lists of nonsense material. As Ross and Milsom (1970) pointed out: "[E]xplanations of forgetting processes have been chiefly based on retention of lists of unrelated items...[T]here is almost no theory about retention of thematic material."
What is remarkable is that the effects of a longer recall period (in the range in which most MFLS data lie, 0-25 years) are not so pronounced as the effects of the respondent characteristics. That is, the answers from an educated Chinese woman about events that took place decades before the date of the interview are less likely to show the sorts of inaccuracy considered here than are the answers of a Malay woman about events that took place one or two years before the interview.

The "penalty" associated with lengthening the recall period to get more data may not be so great as is usually assumed, or at least, it may not be so great a threat to data quality as other factors. The World Fertility Survey, carried out in 38 countries in the 1970's, collected retrospective data on the duration of breastfeeding only for the last and next-to-last children born to respondents before the date of the interview. This was due partly to the need to keep the interview reasonably short, but also, it seems, to the decision that information about events taking place long before the date of the interview would be too unreliable. The MFLS results suggest that if such retrospective data are going to be collected at all, they can be collected for as many previous years as the analysts care to study.

This conclusion needs to be tempered. It would be worthwhile to investigate the relationship between data quality and recall period in surveys of other populations before making generalizations. As our analysis of the effects of respondent characteristics shows, social and cultural differences between groups seem to influence the success of household surveys. Also, it would be helpful to replicate this analysis using better measures of data quality than those that were available in the MFLS, since the measures used here are only indirect proxies for "accuracy." In particular, it would be interesting to derive curves like those of Fig. 11 using a data set in which data on individuals could be checked for accuracy against external sources of information.
SUMMARY AND CONCLUSIONS

This Note concerns the accuracy of retrospective life history data from the MFLS. The quality of data on a number of topics—fertility, contraceptive use, infant and fetal mortality, breastfeeding, education—were studied, using comparisons with external sources of information, checks of the reliability of answers to a few questions asked more than once, and checks of internal consistency and plausibility of patterns in the data. The types of error investigated include omission or overreporting of events, and misreporting of the timing of events or the duration of intervals between events.

The data on fertility from the pregnancy histories seem to be highly accurate. Both the number of births reported by MFLS respondents and the dates of those births seem to correspond with what can be learned from external sources of data (fertility surveys and censuses). There is no evidence that the births of girls or of infants who died before the date of the interview were underreported, as has often been the case in surveys in other countries. The age-specific fertility rates calculated for various periods covered by the MFLS agree closely with the rates calculated from vital statistics during the same periods.

The frequency distribution of retrospectively reported birthweights corresponds surprisingly closely with the distribution in vital statistics. For those infants whose birthweights were reported only approximately, the proportions in different categories of a five-point scale were as would be expected from a normal probability distribution. Since birthweight is an important background or intervening variable in many health and nutrition studies, the possibility that reasonably accurate data can be elicited retrospectively deserves further methodological research.

The reporting of infant deaths seems to have been reasonably complete, and the reporting of the age at which children died also appears accurate. Comparisons were made between MFLS data and vital statistics and life tables calculated from them. Registration of infant mortality in Malaysia in considered to be virtually complete, so the
external sources provide a useful benchmark against which to check the MFLS data. Low birthweights reported for infants in the MFLS sample correlate as expected with infant mortality rates.

On some other possibly sensitive topics, the reporting in the MFLS seems less complete. Fetal deaths are almost certainly underreported. The usage of modern contraceptives also appears to be underreported, especially by younger women.

Answers to the question whether or not infants were breastfed seem quite reliable, as measured by the correlation between answers to the same questions asked on different rounds of the survey. The patterns of breastfeeding prevalence and ages at weaning accord with what is known from other sources about age-group, ethnic, and urban/rural differences in the Malaysian population and about trends over time. The correlations between duration of breastfeeding and reported lengths of postpartum amenorrhea are high, as would be expected.

A major problem for users of these data is that both breastfeeding and amenorrhea tend to be reported with a marked preference for certain digits. The frequency distributions show "peak values" at multiples of six months, which are implausible for biological reasons in the case of amenorrhea, and, in the case of breastfeeding, because they disagree with what is known from other sources or can be inferred from data on current breastfeeding. Because the digit preference is correlated across observations, any attempt to relate amenorrhea durations to breastfeeding durations will be subject to bias. Because of the importance of changing patterns of breastfeeding in developing countries, and because good data from sources other than retrospective studies are hard to come by, it would be worthwhile for survey researchers to experiment with ways to elicit data of better quality on this topic.

Comparisons of MFLS data with external sources show the data on women's level of formal education to be accurate in each of the ethnic and rural/urban MFLS subsamples studied. For the small group of women educated to secondary level, the life histories do not report schooling at the age of fifteen, though the women reported being in school at that age in a later round of the survey. This appears to be due to omissions in the life histories. A fairly crude check of the agreement of MFLS
and census data shows that the MFLS data on housing quality and amenities are plausible.

Multivariate statistical methods were used to investigate in more detail how the accuracy of MFLS data on fertility, breastfeeding, and amenorrhea varied with characteristics of the respondents and with the length of the recall period. Proxy variables for data accuracy measured inexact reporting of birth dates and birthweights and the digit preference in the reporting of durations. The biggest differences in data quality, as imperfectly measured by these proxies, were among the ethnic groups. In every case, the data from the Chinese respondents seem to have been the most accurate by far, even when the effects of greater education and literacy are accounted for. This result was unexpected, and merits further investigation. Users of the MFLS data need to be aware that differences in the quality of the reporting may affect substantive conclusions, especially about differences between Malaysia's ethnic groups.

These analyses also showed, as expected, that more highly educated and literate respondents answered survey questions more exactly, and probably more accurately. As has been found in some other, univariate studies of the accuracy of survey data, urban respondents were likely to give better data than rural residents; the multivariate analyses showed that this difference is mostly due to differences in education.

The effect of the length of the recall period on data quality was also investigated. In all cases, an increase in the recall period was associated with a decrease in the quality of the data. Particularly with the problem of digit preference, this effect is nonlinear. The data from decades before the date of the survey do not exhibit much worse digit preference than the data from a few years before the survey. Respondent characteristics (ethnicity and education) more strongly affected the quality of the data than did the length of the recall period.

This suggests that errors commonly associated with retrospective survey data may differ greatly in their severity depending on the population being sampled. The retrospective nature of the data, even of data pertaining to events taking place long before the time of the survey, need not exact a major penalty in terms of accuracy, as the MFLS
data from Chinese respondents show. It may be possible to reduce recall error considerably by many of the same techniques used to improve the quality of cross-sectional or prospective panel data, such as careful pretesting of questionnaires and design of probing questions.
APPENDIX
SELECTED QUESTIONS FROM MFLS QUESTIONNAIRE MF2

Summary Page:

A. Did you attend school/college/university at any time after your fifteenth birthday? If YES, at what age did you complete your education?
B. At what age were you first married?
C. How many children have you had? At what age did you have your FIRST/NEXT child?

Question List:

1(a) Did you have any other pregnancies, including any lasting for even a short time, before the birth of FIRST CHILD?
1(e) Was there any pregnancy after that before you became pregnant with SECOND, THIRD, etc. CHILDREN?
1(h) How much did this baby weigh at birth?
1(i) Where is this child now?
1(j) IF CHILD DIED, in what year did this child die? What was the date? PROMPT, how many weeks old?
2(a) Did you breastfeed NAME OF CHILD?
2(b) IF YES, how long did you breastfeed CHILD?
3(a) How long after the termination of EACH pregnancy did you first menstruate again? By that I mean the first month when your menstruation was normal or regular again.

INTERVIEWER SHOWS CARD WITH LIST OF CONTRACEPTIVES AND DIAGRAMS

4(a) Between the time of your MARRIAGE, FIRST, etc. PREGNANCY and your FIRST, SECOND, etc. PREGNANCY, did you or your husband do anything that would have reduced the chance of your becoming pregnant?
4(b) IF YES, what did you or your husband do? PROMPT, anything else?
4(d) Are you and your husband doing anything at present to reduce the chance of your becoming pregnant?

FOR ANY INTERVAL BETWEEN PREGNANCIES GREATER THAN TWO YEARS DURING WHICH NO CONTRACEPTIVE USE REPORTED

I notice that the time between ______ and ______ is rather long. Could it be that there was another pregnancy between these two that I have not written down yet?

5. Now I would like to review with you the things we have been talking about.

After the birth of ______, who weighed ______ pounds and ______ ounces, you breastfed him/her for ______ weeks/months and you had your first period ______ months later.

FOR EACH HOUSE LIVED IN SINCE AGE FIFTEEN OR FIRST MARRIAGE

10(g) Did the house have piped water?
10(h) Was the water piped into the house or outside the house?
10(j) Was (is) there electricity in the house?
10(k) Did (does) this house have toilet facilities?
10(l) IF YES, to [10(k) Was (is) that a flush toilet or other kind?
10(o) During the time you lived in this house, did any of the things we have been talking about change? PROMPT, Did you get piped water? Electricity?
REFERENCES


