Scientific Reports

NUMBER 42 MARCH 1983

ABDALLAH ABDEL-AZIZ

Evaluation of the Jordan Fertility Survey 1976

INTERNATIONAL STATISTICAL INSTITUTE
Permanent Office. Director: E. Lunenberg
428 Prinses Beatrixlaan, PO Box 950
2270 AZ Voorburg
Netherlands

WORLD FERTILITY SURVEY
Project Director:
Halvor Gille
35–37 Grosvenor Gardens
London SW1W 0BS, UK

The World Fertility Survey is an international research programme whose purpose is to assess the current state of human fertility throughout the world. This is being done principally through promoting and supporting nationally representative, internationally comparable, and scientifically designed and conducted sample surveys of fertility behaviour in as many countries as possible.
The WFS is being undertaken, with the collaboration of the United Nations, by the International Statistical Institute in cooperation with the International Union for the Scientific Study of Population. Financial support is provided principally by the United Nations Fund for Population Activities and the United States Agency for International Development.
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El proyecto está a cargo del Instituto Internacional de Estadística en cooperación con la Unión Internacional para el Estudio Científico de la Población y con la colaboración de las Naciones Unidas. Es financiado principalmente por el Fondo de las Naciones Unidas para Actividades de Población y por la Agencia para el Desarrollo Internacional de los Estados Unidos.
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ABDALLAH ABDEL-AZIZ

Department of Statistics
Amman

The recommended citation for this publication is:

Abdel-Aziz, Abdallah (1983). Evaluation of the Jordan Fertility Survey 1976. *WFS Scientific Reports* no 42. Voorburg, Netherlands: International Statistical Institute.

Typeset in the Netherlands by H Charlesworth & Co BV, Alphen a/d Rijn

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Preface

One of the major objectives of the World Fertility Survey programme is to assist the participating countries in obtaining high quality data through national fertility surveys. The high standards set by the WFS are expected to yield better quality data than typically obtained in the past, but this expectation in no way obviates the need for a detailed assessment of the quality of the data. It is recognized that such an evaluation will not only alert the analysts by identifying defects, if any, in the data, but also may throw light on the shortcomings of the WFS approach, which can be taken into account in the design of future fertility surveys.

It is in this context that, as part of its analysis policy, the WFS has initiated a systematic programme for a scientific assessment of the quality of the data from each survey. A series of data evaluation workshops are being organized at the WFS London headquarters with the dual objective of expediting this part of the work and of providing training in techniques of analysis to researchers from the participating countries. Working in close collaboration with WFS staff and consultants, participants from four or five countries evaluate the data from their respective surveys after receiving formal training in the relevant demographic and data processing techniques.

The second such workshop, involving researchers from five countries – Guyana, Indonesia, Jordan, Malaysia and the Philippines – was held between January and April in 1980. The present document reports on the results of the evaluation of the data of the Jordan Fertility Survey of 1976 and was prepared by Abdallah Abdel-Aziz, the participant from Jordan. Sundat Balkaran, Florentina Reyes, Bondan Supraptilah and Masitah Mohd. Yatim, the other participants, contributed to the present evaluation through their ideas and discussions.

Dr Shea Oscar Rutstein, as the co-ordinator of the workshop, assumed a major responsibility in the successful completion of the work, while many other staff members also made significant contributions to it. Dr Noreen Goldman provided much valuable assistance as consultant and in editing the report.

HALVOR GILLE
Project Director

Acknowledgements

I wish to express my appreciation of the staff of WFS, particularly those involved in the Asian Workshop; V.C. Chidambaram, Deputy Director for data analysis; and S. Farid, country co-ordinator.

My deep thanks to Shea Rutstein, co-ordinator of the workshop and to Noreen Goldman, WFS consultant, who gave a series of lectures on methodology and evaluation techniques. I am extremely grateful to Shea Rutstein, for providing all the necessary tabulations and for his patience and the many hours he spent reading through the drafts, suggesting corrections, additions, and amendments.

I also wish to acknowledge the invaluable assistance of Aqeel Ahmad, who taught us how to use the computer facilities, and Judith Rattenbury and Sakina Harji, who provided continuous assistance with the computer analysis. My gratitude is also extended to other WFS staff for their useful discussions and comments on the evaluation of survey data.

Finally, I am grateful to the Government of Jordan, in particular to the Department of Statistics, for nominating me to participate in the workshop.

1 Introduction

1.1 BACKGROUND

The first population census of Jordan was carried out on 18 November 1961. It still constitutes the only source of detailed demographic information of the total population. Prior to 1961 the only information about the size of the population of Jordan was from the 1952 Housing Census which provided only estimates of the total population.

Interest in studying the population of Jordan started in the late 1960s when the Government of Jordan recognized the need for accurate information on changes in the number, structure, and the distribution of the population. Consequently, in 1969 the Government requested the United Nations to advise and assist in conducting a national fertility survey. This request was accepted, but due to the local conditions at that time, the survey was postponed until 1972 (Rizk 1977). In 1976, the Jordan Fertility Survey (JFS) was carried out by the Department of Statistics and World Fertility Survey (WFS) as part of the WFS programme. Finally, a second census of the population was carried out by the Department of Statistics on 10 November 1979.

The occupation of the major part of Palestine in 1948 and of the West Bank of Jordan and Gaza Strip in 1967 resulted in a massive influx of refugees to the East Bank of Jordan. This migration plus the widening gap between the birth rate and the death rate resulted in a high rate of population growth. In 1952, according to the Housing Census, the population of the East Bank of Jordan amounted to 587 000 people. By November 1961 the population size was about 900 000, and according to the preliminary results of the 1979 census, the size of the total population was 2 152 000. The population of the East Bank increased 1.5 times between 1952 and 1961, and about 2.4 times between 1961 and 1979, resulting in average annual rates of growth of 4.7 per cent and 4.8 per cent, respectively.

The Jordanian population is young. As a result of high birth rates and declining death rates, more than half of the population is under 15 years of age. The population is characterized by a large family size, with an average of 6.6 in 1961 and no observed change before 1975 (El-Asad 1976).

The geographical distribution of the population is mainly determined by rainfall and cultivation patterns. The migration of several hundred thousand refugees, in addition to increasing urbanization, has also affected population growth. About 91 per cent of the population is concentrated in less than one-eighth of the total land area in the north-western quadrant of Jordan.

According to the 1979 census, about 63 per cent of the total population live in urban areas, not including the contiguous suburban areas, whereas according to the 1961 census, about 56 per cent were living in urban areas. Of the total growth between 1961 and 1979, 66 per cent occurred in urban areas.

1.2 THE JORDAN FERTILITY SURVEY

The Jordan Fertility Survey (JFS), conducted in 1976, was based upon a household, an individual, and a community-level questionnaire. This evaluation will consider only the first two questionnaires. The household survey covered 14 068 households which constituted 5 per cent of the population of the East Bank of Jordan. An extended household questionnaire collected information from each household member on: relationship to the head of household, place of residence, sex, age, survival status of parents and spouse, educational level, marital status, number of live births (for ever-married women), and date, sex and survival status of the last live birth. In addition, the household schedule obtained information on household members who died during the 24 months before the survey and characteristics of the dwelling.

For the individual interviews, a subsample of 1 in 4 households were selected in order to obtain a sample of about 3500 ever-married women of childbearing age. A total of 3610 eligible women aged 15–49 received individual questionnaires which elicited information on: respondent's background, maternity history, contraceptive knowledge and use, marriage history, fertility regulation and work history of both the women and current (last) husband.

1.3 THE NEED FOR EVALUATION

This report concentrates on assessing the quality of demographic data – levels and trends in nuptiality, fertility, and infant and child mortality – in the individual survey. We consider two types of evaluation: (1) internal consistency checks within the JFS, including comparisons between the household and individual survey, and (2) comparison with whatever external sources are available, ie the 1961 census and the 1972 National Fertility Survey (NFS). Since we were not able to match records from the individual survey to those in the household survey, comparisons between the two are restricted to the aggregate level.

Demographic estimates derived from the JFS may be biased by various types of error. These errors arise from numerous sources such as differential non-response, faulty sample design, incorrect determination of eligibility for the individual questionnaire, and ignorance on the part of the respondent. For the present analysis, we focus on the following three types of error: misreporting of the age of the respondent, omission of vital events, and displacement of dates of vital events.

Age misstatement is a common phenomenon, usually resulting from the respondent's lack of knowledge of her true age, with subsequent approximation. This often leads to a heaping of responses on preferred digits (such as rounding of multiples of five), with possible biases towards

higher or lower ages. The resulting age errors can produce significant distortions for many analyses.

The quality of retrospective history data is also highly dependent on the ability of the respondent to remember all events and the date at which each event occurred. A common error in retrospective surveys is the failure to report births, infant deaths, and marriages. Frequently older women omit births or infant deaths which occurred many years before the survey because of poor memory or a misunderstanding of the questionnaire. Since these omission errors usually vary with age and time period, they often produce incorrect estimates of levels and trends in fertility, mortality and nuptiality. In addition, the incorrect reporting of dates of events may lead to a concentration of events in certain periods and a deficit in others, and subsequently may distort estimates of demographic rates.

2 Age Reporting

The tendency of respondents or enumerators to understate or overstate true ages of the respondents or to report these ages at preferred digits can bias demographic estimates. Below we consider the reported age distributions in the household and individual surveys and examine in detail the extent of digit preference for the sample of interviewed women.

2.1 AGE DISTRIBUTION OF THE HOUSEHOLD SURVEY

Table 1 presents the five-year age distribution by sex of the household survey, together with those of the 1961 census and the 1972 National Fertility Survey. (Note that for all comparisons with the 1961 census, only the East Bank of Jordan was used.) Although the three sources indicate different percentages at the youngest and oldest ages, many of these differences may be due to changes in fertility and mortality between 1961 and 1976. For example, a comparison of the female age distribution in the household survey with stable and quasi-stable populations indicates large deviations, with notably higher proportions in the actual population under age 20. Lower than expected

Table 1 Five-year age distribution of population by sex according to the 1961 census, 1972 NFS and 1976 JFS

Age at survey	Females			Males		
	1961	1972	1976	1961	1972	1976
0–1	3.8	4.2	3.8	3.8	4.0	4.0
1–4	14.5	16.3	14.5	14.0	16.9	14.7
5–9	14.8	18.8	17.3	15.0	19.4	17.8
10–14	12.0	13.8	15.4	13.0	15.0	16.5
15–19	11.1	10.1	11.0	10.8	9.0	10.9
20–24	8.8	7.6	7.3	8.7	5.9	6.0
25–29	7.6	7.0	6.1	7.2	5.6	5.2
30–34	5.5	5.8	5.2	5.5	4.7	4.6
35–39	5.2	4.7	5.1	4.7	4.9	4.5
40–44	3.7	3.7	3.9	3.7	4.5	4.0
45–49	2.9	2.3	2.7	3.0	2.8	3.2
50–59	4.5	2.0	3.5	3.5	3.3	3.9
60+	5.6	3.7	4.2	6.1	4.0	4.9

Sources: The 1961 census figures are taken from Department of Statistics (1964). *The Final Results of the 1961 Population Census*, Volume 1, Amman. The 1972 NFS figures are taken from Department of Statistics (1976). *The National Fertility Survey in Jordan, 1972, Amman.*

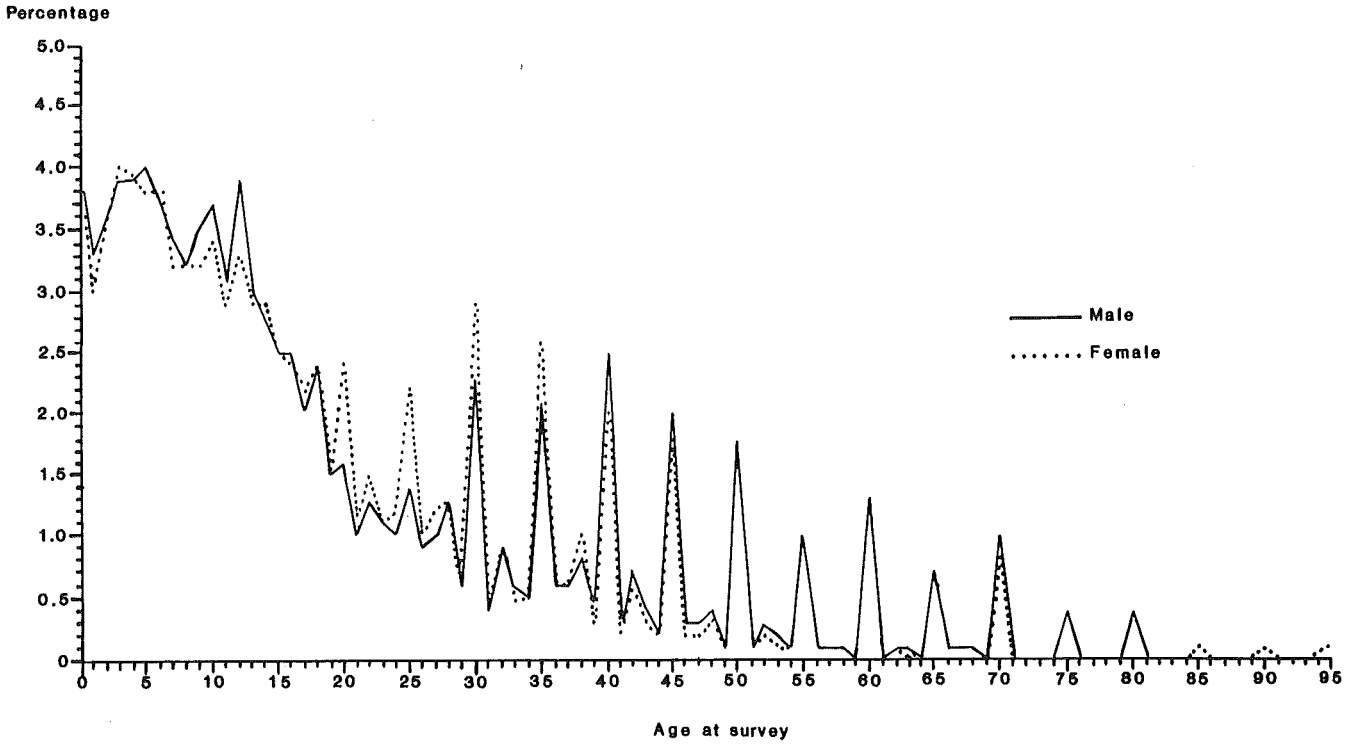

Figure 1 Reported single-year age distribution in the household survey, by sex

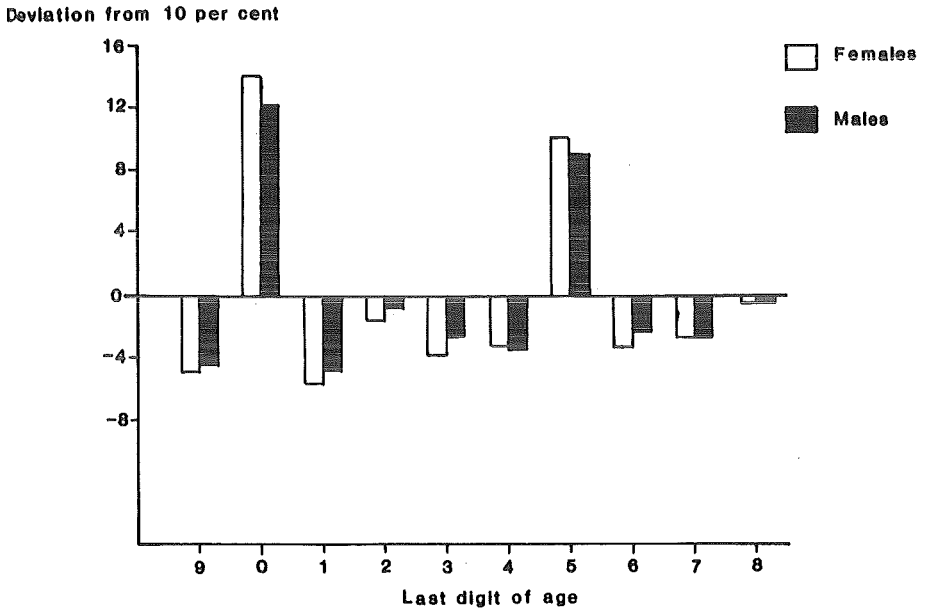

Figure 2 Preference for digits in the reporting of age (ages 10–79) in the household survey, by sex, measured by deviations from 10 per cent in the calculation of Myers' index

proportions for ages 20–35 in the household survey, especially for males, is in large part due to emigration.

Figure 1 presents the single-year age distribution of the male and female population in the household survey. For both males and females, reported ages are heavily concentrated at preferred digits, most notably digits 0 and 5. Myers' index for ages between 10 and 79 equals 49 for females and 42 for males on a scale of 0–180. Figure 2 shows the deviations from 10 per cent of Myers' blended per cent distribution and suggests that the heaping on 0 arises equally from digits 1 and 9 and similarly that the heaping on 5 arises from digits 3, 4, 6, and 7. These data do not indicate any obvious bias in reported age.

A comparison of the reported single-year age distribution for women who reported their own age in the household survey with the distribution for women whose ages were reported by a proxy, for women aged 20–50, is shown in figure 3. Surprisingly, self-reporting women are just as likely as proxies to report their ages with preferred digits.

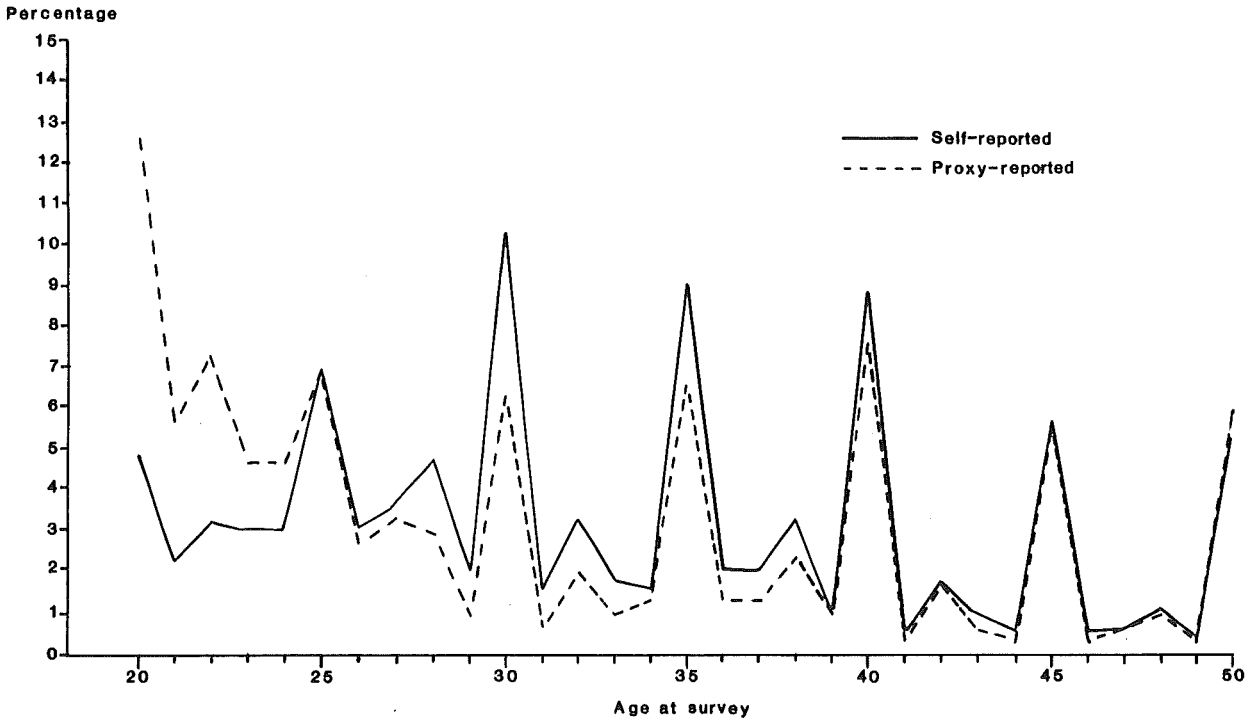

Figure 3 Reported single-year age distribution in the household survey, ages 20–50, according to informant status

2.2 AGE DISTRIBUTION OF THE INDIVIDUAL SURVEY

Respondents in the individual survey were initially asked the month and year of their birth; those who could not supply this information were subsequently asked to estimate their current age. Of the 3610 ever-married women in the sample, only 1072 supplied both the month and year of birth; another 592 supplied only the year of birth. Hence, over 50 per cent of the interviewed women had to estimate or guess their age. An examination of year of birth for women who reported a year (not shown) indicates some heaping, especially on years 1936, 1946 (aged 40 and 30) and 1948, years which were politically important ones for Jordan. Hence, even among women who supplied a date of birth, reported ages may be inaccurate.

Figure 4 compares the single-year age distribution for ever-married women aged 15–49 in the individual survey and the household survey. Although heaping is less prevalent in the former, women who were individually interviewed do indicate a strong preference for digits 0 and 5. In general, the reported age distributions from the two questionnaires are quite similar.

Myers' index (unblended) for the individual survey equals 35. Figure 5 shows the preference for each of the digits. Note that the preference for 0 is at expense of 1 rather than 9 and that the preference for 5 is even greater than that for 0. Unlike a number of other surveys, there is no general preference for the even digits: in fact, fewer than expected respondents report ages ending in digits 2, 4 and 6, and there is only a slight preference for 8. Overall, there appears to be an upward shifting of age, ie a preference for the five-year age group in the latter part of the decade. The degree of shifting between five-year age groups could be reduced by using non-conventional age groups, especially with last digits 9–3 and 4–8 (eg 29–33 and 34–38).

Separate calculations of Myers' index by region of residence and literacy (not shown) for women in the individual survey indicate better reporting for urban and literate women: the index equals 31 and 46 for women in urban and rural areas respectively, and 17 and 40 for literate and illiterate women respectively. It is interesting to note that whereas illiterate women indicate strong preferences for digits 0 and 5, and for only these digits, literate women show moderate preferences for digits 0 and 8, and only a very slight preference for 5. Digit preference among the literate women appears to result in little transference between five-year age groups.

Table 2 compares the age distribution by five-year age groups for ever-married and all women aged 15–49 in the individual survey and the household survey. In the third

Table 2 Percentage distribution by age group of ever-married women and all women aged 15–49, according to the individual (Ind.) and household (HH) surveys

Age group	Ever-married women		All women	
	Ind.	HH	Ind.[a]	HH
15–19	9.1	7.5	30.6	26.6
20–24	16.5	15.6	17.1	17.5
25–29	19.6	19.1	14.9	15.0
30–34	17.4	17.3	12.1	12.5
35–39	15.0	17.6	10.2	12.4
40–44	12.0	13.6	8.2	9.5
45–49	10.3	9.4	6.9	6.6

[a]Estimated by dividing by the proportions ever married from the household survey

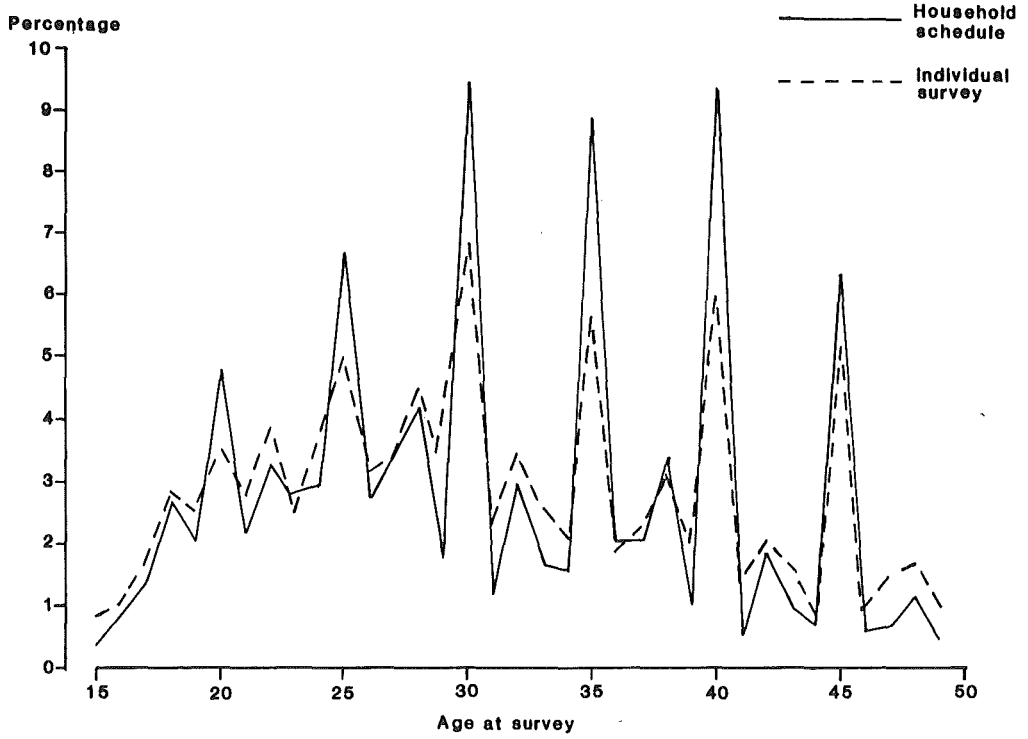

Figure 4 Reported single-year age distribution of ever-married women aged 15–49, household and individual surveys

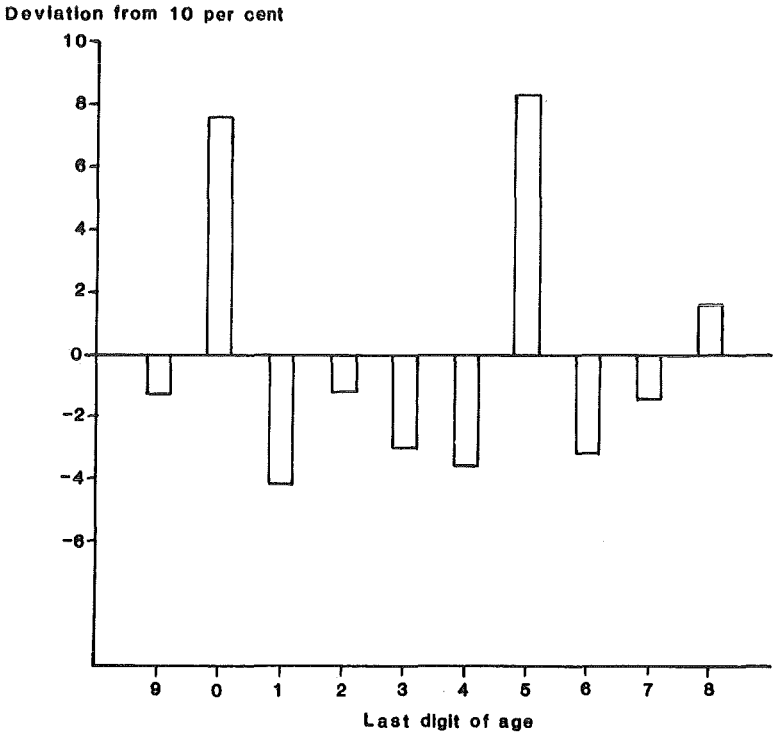

Figure 5 Preference for digits in the reporting of age in the individual survey, measured by deviations from 10 per cent in the calculation of Myers' index

column the number of women of all marital statuses, which is used for allowance rates, was estimated by dividing the number of women in the individual survey (only ever married) by the proportion ever married from the household survey (see section 3 on nuptiality). Evident from this table is that the 15–19 year age group seems overly large in the household survey and even more so from the estimated numbers of the individual survey. However, while the household survey produces erratic proportions for both all and ever-married women at ages over 30, the individual survey shows a smooth distribution of the estimated numbers of all women and only slight distortions for ever-married women of groups 35–39 and 40–44, possibly due to a transfer from the latter to the former.

3 Nuptiality

Marriage is practically universal in Jordan and all fertility occurs within marriage. Hence, only ever-married women were interviewed in the individual survey.

In the household survey, marital status was ascertained by four questions:

1 Has (he/she) ever been married?
2 Is (he/she) now married, divorced, or widowed?
3 Has (he/she) been married more than once?
4 If the answer to (3) is 'yes', Is (his first wife/her first husband) alive?

In the individual survey a complete marriage history was obtained for each respondent, including current marital status, date of onset of each marriage, and date and nature of dissolution for each marriage which terminated.

Respondents were asked to supply the month and year that each marriage began (and ended); respondents who could not supply dates were subsequently asked to estimate age at the time of marriage or how many years ago the marriage occurred. With respect to the first marriage, respondents were asked when they began living together with their husbands, not the date of the marriage contract. Generally in Jordan, cohabitation does not occur immediately after the formal marriage ceremony and the period between the two events can extend to as much as several years.

An examination of the single-year distribution of age at first marriage and years since the onset of first marriage (not shown) reveals only slight heaping on preferred digits. For the entire ever-married sample of women aged 15–49, the mean and median ages at first marriage equal 17.1 and 16.1 years respectively, with about three-quarters of marriages occurring between 14 and 20 years of age.

Below, we attempt to assess the quality of reporting in the marriage histories by comparisons with data available from the 1961 census and the 1972 NFS, by an examination of trends by cohort and period, and by application of the Coale nuptiality model. Since only ever-married women supplied the nuptiality histories, most estimates presented here incorporate the percentage of women who have ever been married, by age group, as reported in the household survey.

3.1 COMPARISON OF THE 1976 JFS WITH THE 1961 CENSUS AND THE 1972 NFS

The availability of marriage history data in the JFS allows us to reconstruct marital status distributions for dates prior to 1976. Table 3 shows the percentage of women who have ever been married as reported in the 1961 census, the 1972 NFS and the 1976 JFS, as well as percentages reconstructed from the marriage histories in the JFS for the years 1961 and 1972. A glance at the values for the age groups 15–19 and 20–24 reveals marked declines in percentages ever married over time, ie a rise in age at marriage. Changes in age at marriage by cohort, period, and subgroup will be described in detail in later sections.

Table 3 Percentage of women ever married by age group in 1961, 1972 and 1976, as reported in the 1961 census, 1972 NFS and 1976 JFS, and as reconstructed from reported dates of marriage in the 1976 JFS

Age at census or survey	1961		1972		1976
	Census	JFS	NFS	JFS	JFS
15–19	31.2	44.9	30.5	31.3	19.5
20–24	77.0	84.2	73.0	73.1	64.1
25–29	91.0	94.6	92.9	90.8	87.4
30–34	95.6	97.5	96.4	96.0	95.3
35–39	97.6	–	97.4	97.1	92.4
40–44	97.9	–	98.2	97.9	98.0
45–49	97.3	–	98.4	–	98.3

Source: See table 1

A comparison between reported values in the 1972 NFS and reconstructed values for 1972 from the JFS suggest considerable agreement between the two sources. On the other hand, there are large discrepancies between the 1961 census and the JFS for the age groups 15–19 and 20–24 with lower percentages ever married reported in the census. According to all three sources, over 97 per cent of women are married by approximately age 35. The discrepancies between the census and the JFS could be due to errors in either source, but the close agreement between the NFS and the JFS suggests an under-reporting of married women in the 1961 census. One possibility is that women living with their husbands' families were mistakenly reported as daughters of the household in the census. It is also possible that age misstatement or misstatement of date of marriage for women over 30 in the JFS produced overestimates of proportions ever married.

Table 4 shows the percentages of women married, widowed and divorced in 1961 and 1972 as reported in the census and in the NFS and as reconstructed from data in the JFS. As suggested above, the discrepancy in 1961 is due to differences in reported proportions currently married between the census and the JFS. Proportions widowed or divorced in the young age groups are too low to affect the comparison. The comparison for 1972 shows general agreement for proportions married and proportions widowed but suggests an under-reporting of divorced women in the

Table 4 Percentages of women currently married, widowed and divorced in 1961 and 1972, as reported in the 1961 census and 1972 NFS and as reconstructed from reported dates of marriage in the 1976 JFS

Age at census or survey	Married		Widowed		Divorced[a]	
	Census	JFS	Census	JFS	Census	JFS
A 1961						
15–19	30.7	44.7	0.1	0.0	0.4	0.1
20–24	75.5	83.1	0.5	0.4	1.0	0.4
25–29	89.0	93.0	1.1	1.4	0.9	0.2
30–34	92.2	93.9	2.5	–	0.9	–
35–39	92.0	–	4.8	–	0.8	–
40–44	86.5	–	10.4	–	1.0	–
45–49	80.1	–	16.0	–	1.2	–
B 1972						
15–59	29.5	31.0	0.1	0.0	0.6	0.3
20–24	69.5	71.5	1.5	0.8	2.0	0.8
25–29	89.6	89.6	1.0	0.6	2.3	0.5
30–34	90.3	93.5	3.4	1.2	2.6	0.6
35–39	92.7	91.6	3.2	4.6	1.5	0.2
40–44	90.6	90.8	5.9	6.4	1.8	0.4
45–49	80.2	–	12.1	–	3.1	–

[a]Including separated.
Sources: See table 1

JFS, perhaps because of the stigma associated with divorce. Since divorce is still uncommon in Jordan, the absolute differences between the NFS and the JFS are small.

3.2 TRENDS IN AGE AT MARRIAGE BY COHORT AND BY PERIOD

The retrospective nuptiality data available from the JFS also enable us to estimate cohort and period trends in age at marriage. Based on reported dates of first marriage, table 5 presents the percentage of women ever married as of successive ages by cohort. The marriage experience of each cohort is censored at the youngest age of the cohort since marriages cannot have occurred at ages greater than the current age.

The data in table 5 indicate only moderate changes in age at first marriage from the cohort aged 45–49 to the cohort aged 30–34. There is no indication that the oldest cohorts have misreported date of first marriage – specifically, a displacement of the date toward the survey date as was common in some other WFS surveys (Chidambaram, Cleland, Goldman and Rutstein 1980). The data indicate a fairly recent rise in age at first marriage: eg the percentage ever married by age 15 declined from 20 to 5 from the cohort 30–34 to the cohort 15–19; similarly the percentage ever married by age 20 declined from 71 to 54 for the cohorts 30–34 to 20–24.

The matrix in table 6 shows the percentages of women ever married at successive dates five years in the past. Values for a given cohort lie along the diagonals so that proportions married at a given age group for different years occupy the same row. These data highlight the findings noted above: little change in age at first marriage prior to 10 or 15 years ago; marked declines in the last decade in the proportions married by age group 15–19 and 20–24; almost universal marriage by about age 35; and no clear evidence of reporting errors for the oldest cohorts.

Since the marriage experience of a cohort is necessarily truncated at its current age, one has to fit model schedules to the observed data in order to obtain estimates of the mean age at first marriage for each cohort at the end of its lifetime. Model first marriage schedules (Coale 1971) have been fitted to the reported experience of each cohort (eg the data in table 5), using a procedure developed by Rodríguez and Trussell (1980). We assume that 98 per cent of each cohort eventually marry (ie $C = 0.98$).

The fitted values in table 7 indicate a continued rise in age at marriage, with notable increases between cohorts younger than 30. Although the fits for the three youngest cohorts (not shown) are not very close, in part due to some heaping of reported age or year of marriage, the trend is quite plausible. If correct, the data suggest a one-year increase in age at marriage between successive five-year cohorts in the past decade.

3.3 AGE AT MARRIAGE BY AREA OF RESIDENCE AND LEVEL OF EDUCATION

Before we begin to study differentials by residence and education, let us take a look at the sample composition by these variables. Table 8 shows the percentages residing in urban areas and with at least completed primary education, according to age group, for all women aged 15–49 in the household survey and the respondents (ever-married women) in the individual survey. While the percentages with urban residence of all women tends to be close to 70 per cent across the age groups, for ever-married women the percentages rise substantially from 59 per cent urban at 15–19 years to 79 per cent at 45–49 years, with a noticeable dip of about 4 per cent at 35–39 years, possibly due to age misreporting.

There is an extremely large change in educational attainment of all women according to age, as can be seen from column three. Whereas only 12 per cent of women aged 45–49 completed at least primary schooling, 78 per cent of 15–19 year olds have done so. Reflecting the effect of education upon age at marriage for ever-married women, the percentages with at least complete primary schooling are substantially lower at ages under 30. The only anomaly to be seen in the educational proportions is that individual survey respondents aged 45–49 have slightly higher percentages than all women aged 45–49 and higher than individual survey respondents aged 40–44, which may be a result of selective age transference to above 50 years.

Table 9 shows the percentage of women who have ever been married by age group, according to type of place of residence – urban vs rural – and level of education – less than or at least completed primary school. The data indicate substantial differences in age at marriage with younger ages for rural women and for women with little education.

Table 10 shows the estimated mean ages at marriage for each cohort, based on the fitted Coale nuptiality model. The fitted values suggest a substantial rise in age at marriage

Table 5 Cumulative percentages of women ever-married by successive ages and by age group at survey

Exact age	Age group at survey						
	15–19	20–24	25–29	30–34	35–39	40–44	45–49
11	0.0	0.0	0.0	0.9	0.4	1.1	0.5
12	0.3	0.5	1.4	2.6	2.0	2.7	2.4
13	0.4	1.9	3.1	5.9	6.4	9.0	9.7
14	1.7	4.3	3.6	12.6	12.5	18.0	19.0
15	5.5	9.9	17.1	20.3	23.8	27.2	31.2
16		20.1	25.8	32.8	33.6	38.0	44.7
17		28.1	36.2	45.1	45.4	48.6	53.1
18		40.0	47.1	55.0	54.3	56.7	63.7
19		47.6	56.7	63.3	65.0	65.9	72.9
20		53.9	64.1	71.1	74.7	74.3	79.5
21			70.5	76.4	80.6	82.1	81.9
22			75.1	80.2	84.2	85.0	86.7
23			78.4	83.3	87.6	88.0	89.6
24			81.9	86.8	90.6	91.1	91.7
25			84.0	89.3	91.9	92.9	93.3
26				90.2	92.8	94.0	94.1
27				91.6	94.2	94.7	95.4
28				92.3	95.4	95.2	97.0
29				93.6	95.6	95.4	97.0
30				94.3	95.8	95.8	97.2
31					96.2	95.8	97.8
32					96.2	95.8	97.8
33					96.2	96.7	97.8
34					96.5	97.0	97.8
35					96.7	97.0	98.0
Number of ever-married women	329	596	709	628	543	435	372

Source: JFS 1976

Table 6 Percentage of women ever married by age group at five-year intervals before survey

Age at specified period	Years before the survey						
	0	5	10	15	20	25	30
15–19	19.5	31.8	39.1	43.8	46.3	45.1	51.5
20–24	64.1	74.7	77.8	83.9	83.4	83.9	
25–29	87.4	91.5	95.3	95.0	95.4		
30–34	95.3	96.4	96.4	98.0			
35–39	97.4	97.5	98.3				
40–44	98.0	98.3					
45–49	98.3						

Source: JFS 1976

Table 7 Mean age at first marriage, estimated from Coale nuptiality model[a]

Age at survey	Mean age at first marriage
15–19	21.9
20–24	21.0
25–29	19.9
30–34	18.6
35–39	18.2
40–44	17.9
45–49	17.1

[a]Based on the assumption that 98 per cent of each cohort eventually marries (C=.98).
Source: JFS 1976

Table 8 Percentage of all and ever-married women, living in urban areas and with at least elementary completed education, by age group

Age group	Percentage urban		Percentage with at least elementary education	
	All women[a]	Ever-married[b]	All women[a]	Ever-married[b]
15–19	72.8	59.2	77.6	53.8
20–24	70.8	64.1	62.0	51.0
25–29	69.6	70.7	44.7	40.0
30–34	70.2	73.2	29.0	28.2
35–39	70.5	69.2	18.5	18.1
40–44	70.3	74.5	12.9	12.5
45–49	75.2	79.4	11.7	12.6
Total	71.3	70.1	33.9	31.6

[a]From household schedule.
[b]From individual questionnaire.

Table 9 Percentage of women ever married by age group, according to type of place of residence and level of education

Age at survey	Type of place of residence		Level of education	
	Urban	Rural	Less than completed primary school	At least completed primary school
15–19	16.2	29.0	38.5	14.3
20–24	58.1	77.7	78.2	55.1
25–29	84.6	94.0	93.8	79.6
30–34	94.2	97.2	96.3	92.2
35–39	96.4	99.6	98.1	93.6
40–44	97.7	98.6	98.0	98.3
45–49	98.1	99.1	98.4	97.3

Source: JFS 1976

over the past decade for all subgroups. The data are internally consistent and once again provide no evidence of misreporting for the older cohorts even among less educated women. The data indicate a two to three year difference in age of first marriage between women residing in urban and in rural areas and a difference of about six years according to whether or not women had a complete primary school education! The fitted model for the youngest cohort which completed primary school suggests a mean age as late as 26.5 years.

Table 10 Mean age at first marriage, estimated from Coale nuptiality model, by type of place of residence and level of education

Age at survey	Mean age at first marriage			
	Type of place of residence		Level of education	
	Urban[a]	Rural[b]	Less than completed primary school[a]	At least completed primary school[a]
15–19	22.5	20.2	19.8	26.5
20–24	22.0	18.8	18.9	25.5
25–29	20.6	18.0	18.3	23.6
30–34	19.4	17.3	17.8	22.7
35–39	18.5	17.3	17.5	21.5
40–44	18.2	16.6	17.5	21.4
45–49	17.4	16.5	17.1	18.7

[a]Based on the assumption that 98 per cent of each cohort eventually marries (C = 0.98).
[b]Based on the assumption that 99 per cent of each cohort eventually marries (C = 0.99).
Source: JFS 1976

In summary, the data in the marriage histories of the JFS appear to be consistent with those in the 1972 NFS and to be internally consistent when analysed by cohort, by period, and by subgroup of women. Although the reconstructed proportions ever married as of 1961 show large deviations from values reported in the 1961 census, the differences are likely due to an under-reporting of married women in the census since there is no evidence of displacement error in reported dates of marriage for the older cohorts. However, comparisons with the 1972 NFS do suggest an under-reporting of divorced women in the JFS.

Analyses of age at first marriage by cohort and by time period indicate a substantial rise in the past decade with the youngest cohort estimated to experience a mean age of 22 as compared with 17 for the oldest cohort. Estimates for women aged 15–19 who had completed primary school indicate a mean age higher than 26.

4 Fertility

The household schedule incorporated simple questions with respect to the total number of live births (separated into the number living at home, the number living away from home, and the number who died) and the date of the most recent live birth. The maternity history in the individual survey included a more comprehensive set of questions on the total number of children ever born, the date (month and year) of each birth and the age at death for each child who died before the survey date. If accurate, these data can provide estimates of trends in fertility as well as infant mortality for periods 20–30 years before the survey.

Unfortunately, information collected from retrospective fertility surveys is frequently affected by reporting errors such as age misstatement, omission of births and displacement of dates of birth. As noted earlier, these errors can distort estimates of both levels and trends in demographic rates. In the following sections we attempt to assess the extent of misreporting in the birth histories by the following procedures: a comparison of reported parity in the JFS with reported parities in the 1961 census and the 1972 NFS; an examination of trends in fertility by time period and by cohort; use of the P/F ratio method applied to cohort-period fertility rates; an examination of fertility rates by place of residence and level of education; and simple tests for omission of births.

4.1 COMPARISON OF CUMULATIVE FERTILITY WITH THE 1961 CENSUS AND THE 1972 NFS

Both the 1961 census and the 1972 NFS collected data on numbers of children ever born. Table 11 shows cumulative fertility by five-year age group of women as reported in these sources, and as reconstructed from dates of birth in the JFS for the years 1961 and 1972. In addition, cumulative fertility as reported in both the household survey and the individual survey of the JFS are shown.

The comparison for 1961 suggests an omission of births in the 1961 census: eg if the JFS is correct, women between ages 25 and 34 in the census reported about 0.5 births too few on average. On the other hand, the agreement between the NFS and the JFS for ages below 40 in 1972 is remarkable: the two sources differ by at most 0.2 births in a given age group. Clearly, reported parities in the NFS for ages above 40 are too low: parity for women aged 40–44 is about 0.7 births lower in the NFS than the JFS and the data for 1976 suggest that the reported parity for women aged 45–49 is perhaps 1.4 births too low. In summary, comparisons with outside sources indicate omission of births for all age groups in the 1961 census and for women aged 40 and above in the 1972 NFS, but the very close agreement between the NFS and the JFS for ages below 40 and the reasonable increase in parity for ages above 40 in the JFS yield no indication of omission in the JFS.

Table 11 Average number of children ever born by age group according to the 1961 census, 1972 NFS and 1976 JFS (household survey and individual survey), and as reconstructed for 1961 and 1972 from the 1976 JFS

Age at census or survey	1961		1972		1976	
	Census	JFS	NFS	JFS	JFS Household	Individual
15–19	0.20	0.39	0.23	0.26	0.17	0.18
20–24	1.46	1.80	1.73	1.72	1.52	1.57
25–29	3.18	3.73	3.99	3.92	3.55	3.70
30–34	5.16	5.62	5.85	5.61	5.62	5.62
35–39	6.84	–	7.16	7.38	7.22	7.08
40–44	7.30	–	7.64	8.36	8.09	8.40
45–49	7.63	–	7.21	–	8.42	8.64

Sources: See table 1

The comparison between the household survey and the individual survey indicates slightly higher values for most age groups in the latter. One would expect the more detailed individual questionnaire, which checks the number of children listed in the birth history against earlier questions on the number of sons and daughters who live in the household, live away from the household and have died to yield a higher count of births. In the absence of any omission of births, the reported values in table 11 indicate a completed parity for women aged 45–49 of 8.6 children per woman. This value is considerably higher than any parity obtained from either the 1961 census or the 1972 NFS.

Figure 6 shows reported numbers of children ever born by single years of age for the household and individual surveys. Although there is close agreement between responses in the two questionnaires for ages below 40, both show higher than expected values for ages 20 and 25. This finding is similar to that observed in the Nepal Fertility Survey (Goldman, Coale and Weinstein 1979), in which the authors speculated that the high reported fertility (and proportion ever married) for women aged 20 was due to differential age misstatement according to fertility (and marital status): ie women in their teens may have had their age overstated to age 20 by interviewers *because* they already had several children (or were married). The phenomenon of rounded ages being associated with high fertility seems to have occurred for the older ages as well: women aged 35, 40 and 45 report more children than do women in the neighbouring age groups, on average. Figure 6 also suggests that older women in the household survey, or their proxies, omitted some births in their reports of children ever born.

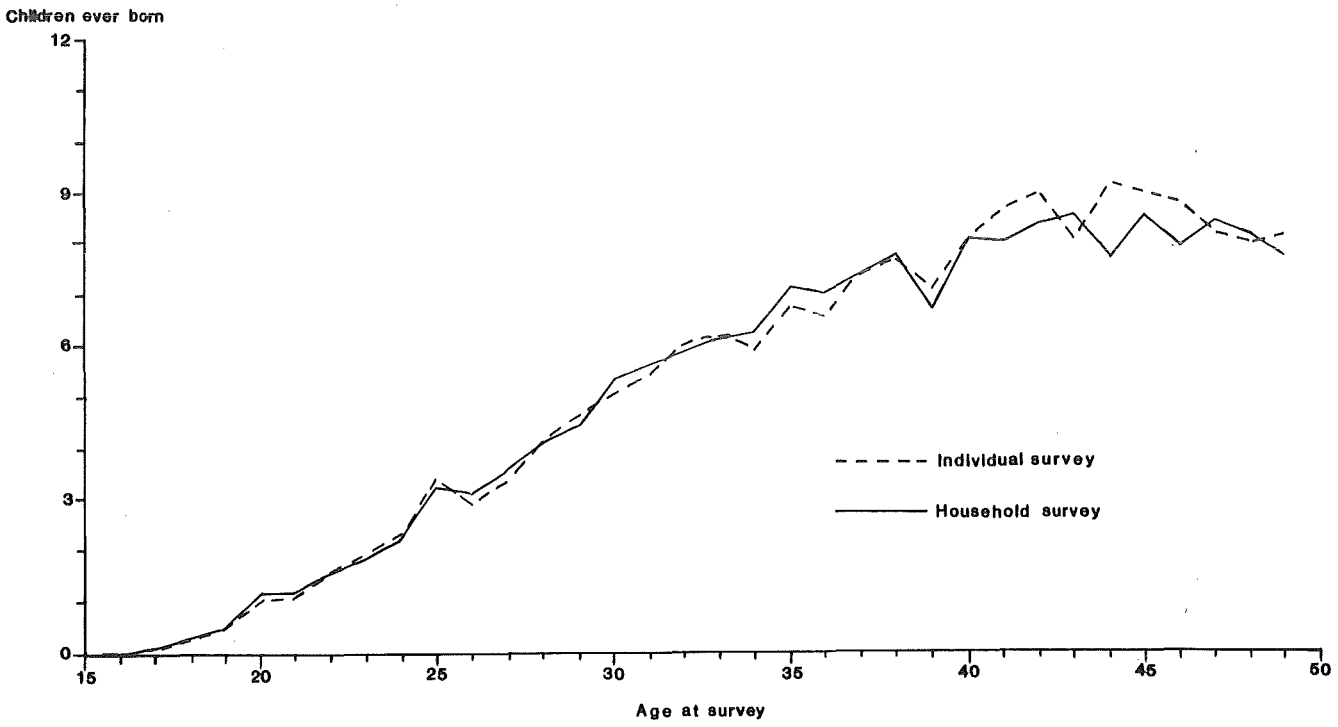

Figure 6 Mean number of children ever born by single years of age, according to the household survey and the individual survey

4.2 AGE-SPECIFIC FERTILITY RATES BY CALENDAR YEAR

Using births by age of woman at the time of birth in the numerator and total number of women by age in the denominator (ie number of ever-married women in the individual survey divided by the proportion ever married as obtained in the household survey), we calculated conventional age-specific fertility rates (ASFRs) by calendar year. ASFRs by single calendar years (not shown) revealed substantial fluctuations due to both sample size and reporting errors. Higher rates for 1960, 1965, and 1970 than for either of the corresponding neighbouring years (1959 and 1961, etc) in almost all age groups suggest a heaping of reported dates of birth in 'preferred' calendar years.

By the very nature of a retrospective survey in which the oldest women are aged 49, one can only obtain rates through $49-x$ for a period x years ago. Hence, in order to calculate a total fertility rate (TFR) for x years ago, one has to impute ASFRs for ages between $49-x$ and 49. In figure 7, TFRs from 1960 to 1975 have been calculated by assuming rates at the older ages equal to those in the nearest calendar year for which the rates are available. The figure also shows a three-year moving average of the TFRs which eliminates

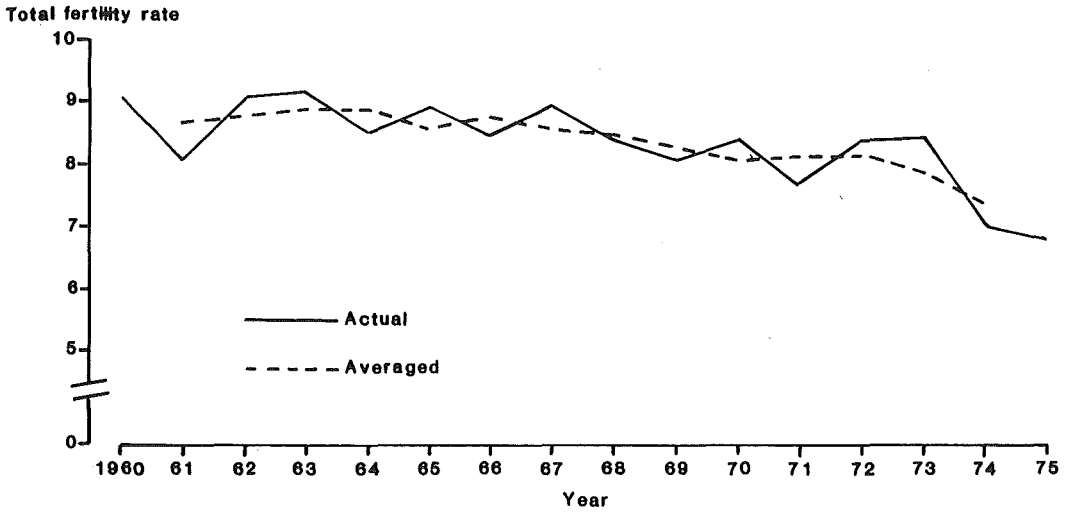

Figure 7 Estimated total fertility rate by calendar year, reported and three-year mean

some of the heaping on rounded calendar years. The moving average shows a very high level of fertility, a TFR which ranges between 8.2 and 8.9 through the 1960s and averages to 8.6, one which agrees perfectly with reported parity of women aged 45–49 (table 11). These data further suggest that there is little, if any, omission of births by the older cohorts (unless, of course, there was a rise in fertility).

Table 12 presents ASFRs and TFRs for the three most recent five-year calendar periods. The data indicate more clearly the recent decline in fertility, from a TFR of 8.5 in 1966–70 to one of 7.7 in 1971–5. The values indicate a very notable decline in the age group 15–19, one which we previously saw was due to declines in proportions married at the young ages. Changes in fertility will be described in more detail in the next section.

4.3 EXAMINATION OF COHORT-PERIOD FERTILITY RATES

A more detailed analysis of the birth history data, to examine both errors and trends in reported fertility, can be undertaken by calculation of fertility rates by cohort and by period. For the analysis throughout the next few sections, we define cohorts in terms of five-year age groups at the time of the survey (or five-year intervals of duration since marriage or first birth) and periods by five-year intervals before the survey date. These rates are obtained by a straightforward tabulation of births by period of occurrence and by age of mother at survey date.

Fertility rates by age

Panel A of table 13 shows the cohort-period fertility rates by age for the 1976 JFS. Note that these measures differ from the conventional ASFRs of the previous section. For example, births during the five years preceding the survey to the cohort aged 25–29 at the survey date occurred to women between ages 20 and 29, a span of ten rather than five years; on average, these births occurred to women aged 25. Nevertheless, the cohort-period rates are directly comparable to one another: eg the fertility rate for women aged 25–29 during the five years before the survey (0.370) refers to the same underlying ages as does the rate for women aged 30–34 during the period five to ten years before the survey (0.392), etc. For ease of reference, these rates are said to be *centred* on age 25. Note that in panel A, rates which are centred on the same age lie along a row of the table, rates which belong to the same cohort lie along a diagonal, and rates for the same period fall along a column.

Table 12 Age-specific fertility rates for five-year periods, 1961–75

Age group	Age-specific fertility rate		
	1961–5	1966–70	1971–5
15–19	197	178	133
20–24	368	374	344
25–29	415	401	358
30–34	381	346	336
35–39	244	251	245
40–44	–	134	104
45–49	–	–	11
TFR[a]	8.75	8.47	7.66

[a]The TFRs for 1961–5 and 1966–70 were estimated by assuming values for the age group 40–44 from 1966–70 and for the age group 45–49 from 1971–5.
Source: JFS 1976

Overall, the fertility rates in panel A suggest a fairly consistent pattern with relatively constant fertility until the decline of the past decade. A comparison between rates in the two or three most recent periods indicates some fertility decline for all ages, with an especially notable decline for age groups 15–19 and 20–24. There are, however, some unexpected patterns for the two oldest cohorts. Specifically, the cohort aged 45–49 reported lower than expected fertility in the period 20–24 years before the survey, and the cohort aged 40–44 reported lower than expected fertility for the same period as well as higher than expected fertility between 10 and 19 years ago. Various patterns of omissions, displacement of dates of birth and age misstatement could account for these anomalies: eg a pushing forward of dates of birth from the period 20–24 years ago for the cohort aged 40–44 or a net overstatement of age for especially fertile women 35–39 which transferred them into the next cohort, most likely to age 40 or 42. Note that a displacement of dates of early births toward the survey date is a type of error which was found in the reports of the oldest cohorts for other WFS surveys (Chidambaram *et al* 1980) and is known as the 'Potter effect' (Potter 1977). However, if this type of error occurred in the JFS, it did not result in underestimates of fertility in the earliest periods – 25–29 and 30–34 years before the survey – as was the case in other WFS surveys.

Panel B of table 13 shows cohort-period rates cumulated over time for each cohort, ie the mean parities (P) that each cohort had achieved at the end of each five-year period. For example, the cohort 25–29 had 3.70 children at survey date, and only 1.85 children five years earlier. The values show the constancy of fertility across most cohorts – eg parity at ages 25–29 ranged only from 3.7 to 3.9 among the five oldest cohorts – and indicate reduced fertility for the youngest two cohorts.

Panel C shows cohort-period rates cumulated over cohorts for each time period (F). Note that the TFR for the most recent five-year period equals 7.83, a value which is probably about one child lower than that 10 or 20 years earlier. Comparisons of F values for younger ages show the deficit of fertility in the period 20–24 years before the survey and the excess in the period 10–14 years before the survey. An over-reporting of fertility in the period 10–14 years before the survey is a frequent result of a forward displacement of dates of birth (Potter 1977) and can easily result in overestimates of fertility declines for the most recent decade.

Panel D presents P/F ratios by age cohort and by period. Although the P/F procedure was originally developed by Brass as a technique for the estimation of recent fertility, it has since been used as a tool for the detection of errors in birth history surveys (see, for example, Hobcraft, Goldman and Chidambaram 1982; Brass 1978; Guzmán 1980; Hobcraft 1980). In the absence of changes in fertility, deviations of P/F values from unity may provide evidence

Table 13 Cohort-period fertility rates, cumulative cohort and period fertility, and P/F ratios by age at survey

Age group of cohort at end of period	Number of women ever-married in cohort	Years before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Cohort-period fertility rates								
15–19	329	.035	.060	.078	.075	.079	.083	.083
20–24	596	.254	.290	.304	.284	.257	.287	
25–29	709	.370	.392	.394	.411	.365		
30–34	628	.350	.362	.411	.372			
35–39	543	.297	.328	.336				
40–44	435	.188	.209					
45–49	372	.073						
B Cumulative fertility of cohorts at end of period (P)								
15–19		.176	.301	.398	.388	.403	.422	.430
20–24		1.570	1.850	1.909	1.824	1.707	1.864	
25–29		3.698	3.867	3.792	3.763	3.690		
30–34		5.616	5.600	5.818	5.548			
35–39		7.083	7.459	7.229				
40–44		8.398	8.276					
45–49		8.640						
C Cumulative fertility within periods (F)								
15–19		.175	.300	.394	.379	.408	.423	.426
20–24		1.444	1.752	1.915	1.800	1.693	1.857	
25–29		3.292	3.710	3.882	3.856	3.519		
30–34		5.041	5.518	5.938	5.715			
35–39		6.524	7.158	7.619				
40–44		7.464	8.205					
45–49		7.827						
D P/F ratios								
20–24		1.087	1.056	.997	1.013	1.008	1.004	
25–29		1.123	1.042	.977	.976	1.049		
30–34		1.114	1.015	.980	.971			
35–39		1.086	1.042	.949				
40–44		1.125	1.009					
45–49		1.104						

Source: JFS 1976

of errors of omission and of reference period error. For example, the low ratios for the two oldest cohorts in the periods 10–14 and 15–19 years before the survey suggest the types of displacement error noted above. Note that the fairly constant set of P/F ratios for the most recent five-year period suggests reference period error in the order of a 10 per cent understatement of fertility for these five years. However, a further examination below of P/F ratios by duration of marriage and duration since first birth (Hobcraft *et al* 1982) suggests that the high ratios are produced by declines in fertility, with no indication of an under- or overstatement of fertility for the most recent five-year period.

Fertility rates by duration of marriage and of motherhood

Analyses of fertility by years since the onset of marriage and first birth not only provide estimates of fertility change since marriage (ie independent of changes in age at first marriage), but allow a more refined examination of P/F ratios. Specifically, if age at marriage has been rising, but marital fertility has remained constant, P/F ratios by age will be greater than one whereas P/F ratios by marriage duration (and duration since first birth) will equal one, in the absence of reporting errors.

Tables 14 and 15 present cohort-period fertility rates and P/F ratios by duration since first marriage and duration since first birth respectively. The marital fertility rates show a rise at the low durations – due to rising age at marriage and hence less teenage subfecundity – and a substantial decline over the past decade at durations above 15 years. The low rates for the oldest cohorts in the earliest periods are not due to displacement error but rather to truncation bias (and a lower age at marriage): since no women in the JFS are older than 49, women married for long durations were necessarily married at young ages (eg women married

Table 14 Cohort-period fertility rates and P/F ratios by duration of marriage

Marriage duration group of cohort at end of period	Number of women ever-married in cohort	Years before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Cohort-period fertility rates								
0–4	725	.477	.446	.441	.403	.346	.339	.315
5–9	696	.470	.475	.459	.434	.402	.423	
10–14	596	.389	.410	.431	.418	.393		
15–19	574	.326	.355	.385	.380			
20–24	471	.247	.286	.344				
25–29	333	.163	.210					
30–34	196	.058						
B P/F ratios								
5–9		.972	.992	.960	.971			
10–14		.982	.956	.936				
15–19		.970	.952					
20–24		.979						

Source: JFS 1976

Table 15 Cohort-period fertility rates and P/F ratios by duration of motherhood

Motherhood duration group of cohort at end of period	Number of mothers in cohort	Years before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Cohort-period fertility rates								
0–4	724	.793	.777	.806	.813	.782	.779	.963
5–9	693	.456	.456	.472	.447	.421	.454	
10–14	601	.373	.400	.423	.402	.395		
15–19	538	.303	.336	.374	.397			
20–24	400	.219	.252	.305				
25–29	266	.105	.156					
30–34	107	.021						
B P/F ratios								
5–9		1.000	1.010	.978	.974			
10–14		1.007	1.005	.949				
15–19		1.022	.988					
20–24		1.024						

Source: JFS 1976

for 35 years must have been married before age 15), and hence were subfecund at the low durations of marriage. Because of this bias for the upper cohorts, the P/F values in panel B are presented only up to duration 20–24. The ratios for the most recent five-year period are consistently close to unity, because of the counterbalancing effects of the fertility rises at the low durations and declines at the higher durations.

A more useful assessment of the extent of reference period error in the recent past is provided by the data in table 15. Since fertility subsequent to the first birth is less likely to change than is fertility in the early durations of marriage, the P/F ratios by duration since first birth are least apt to be distorted by changing fertility. The values in table 15 for the most recent five-year period, which range between 1.00 and 1.02, indicate that recent births were accurately dated. In other words, the reported TFR of 7.8 (table 13) for the approximate period of 1972–6 appears to be correct. Excluding the potentially biased values for the two oldest cohorts, we note that the fertility rates in panel A for the two most recent periods indicate almost no change in fertility in the ten years since the onset of mother-

Table 16 Cohort-period fertility rates by age at survey, by type of place of residence

Age group of cohort at end of period	Number of ever married women in cohort	Years before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Urban								
15–19	195	.022	.044	.070	.072	.075	.080	.081
20–24	382	.220	.273	.291	.288	.252	.293	
25–29	501	.354	.385	.393	.422	.368		
30–34	460	.323	.351	.411	.367			
35–39	376	.270	.322	.328				
40–44	324	.174	.190					
45–49	295	.061						
B Rural								
15–19	134	.038	.089	.088	.072	.086	.081	.081
20–24	214	.336	.331	.325	.270	.261	.260	
25–29	207	.422	.409	.383	.374	.353		
30–34	168	.422	.393	.393	.382			
35–39	167	.363	.349	.366				
40–44	111	.232	.288					
45–49	77	.127						

Source: JFS 1976

hood, but about a 10 per cent decline at higher durations. Note also that the rates for the period 10–14 years before the survey appear to be exaggerated, most likely due to displacement error.

4.4 FERTILITY BY AREA OF RESIDENCE AND LEVEL OF EDUCATION

Area of residence

Cohort-period fertility rates, by five-year age group and five-year period, according to type of place of residence, are shown in table 16. The rates indicate a recent decline in fertility at all ages for urban women and at the youngest and oldest ages for rural women, but a *rise* in fertility for rural women in their twenties and thirties. It is not clear whether this apparent rise is real – due perhaps to reductions in breastfeeding, improved health, or selective migration to the cities – or the result of reporting errors.

The reporting errors for the oldest cohorts noted earlier are most apparent in the data for urban women. For example, reported parities for the two oldest cohorts are almost equal in the urban areas (8.3 vs 8.4), but not in rural areas (8.4 vs 9.3). The comparison of parities in table 17 together with the actual rates in table 16 suggests an overstatement of fertility among urban women aged 40–44. Since it is unlikely that women reported more births than they actually had, the exaggerated fertility, which appears mostly in periods 10–14 and 15–19 years before the survey, is probably the result of age misstatement. Although an understatement of age would on average lead to an overestimate of fertility, age transference from a true age of 45 to a reported age 40, for example, would lead to exaggerated rates 20–29 years before the survey, not 10–19 years before the survey. It appears as if the high reported fertility for 40–44 year olds is the result of selective transference of high parity women from neighbouring age groups, especially 35–39, to ages 40–44. It is interesting to note that although a high parity for women aged 40–44 is apparent from tables 16 and 17, this cohort does not seem to have reported 'too high' proportions ever married (table 6).

Cumulation of the rates in table 16 for the most recent five-year period yields a TFR of 9.7 and 7.1 for women in rural and urban areas respectively. The latter value appears to be about one child lower than that for the period 5–9 years before survey.

Table 17 Average number of children ever born by age group, according to type of place of residence and level of education

Age at survey	Type of place of residence		Level of education	
	Urban	Rural	Less than completed primary school	At least completed primary school
15–19	0.1	0.2	0.3	0.1
20–24	1.3	2.1	2.2	1.0
25–29	3.5	4.2	4.4	2.6
30–34	5.4	6.1	6.0	3.8
35–39	6.9	7.5	7.5	4.2
40–44	8.3	8.4	8.6	5.5
45–49	8.4	9.3	8.9	6.9

Source: JFS 1976

Table 18 Cohort-period fertility rates by age at survey, by level of education

Age group of cohort at end of period	Number of ever-married women in cohort	Years before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Less than completed primary school								
15–19	152	.063	.090	.100	.084	.082	.083	.081
20–24	292	.340	.358	.331	.299	.264	.289	
25–29	425	.421	.417	.409	.417	.366		
30–34	450	.377	.390	.416	.375			
35–39	445	.323	.338	.353				
40–44	380	.193	.226					
45–49	325	.081						
B At least completed primary school								
15–19	177	.021	.026	.030	.024	.046	.048	.079
20–24	304	.181	.192	.185	.182	.131	.273	
25–29	283	.297	.299	.275	.324	.442		
30–34	177	.248	.200	.276	.346			
35–39	98	.140	.207	.176				
40–44	54	.117	.049					
45–49	47	.012						

Source: JFS 1976

Level of education

The corresponding fertility rates and parities for women with and without a completed primary school education are shown in tables 18 and 17 respectively. Note that the rates for the oldest two cohorts in the more educated group are highly erratic because of small sample sizes. It is interesting to note that the much lower fertility among the more educated women is not a recent phenomenon: even 10–14 years before the survey, rates for the more educated group were almost half those of the less educated and uneducated women. For the most recent five-year period, the TFRs equal 9.0 and 5.1 for the less and more educated women respectively, a substantial differential indeed!

The parities given in table 17 suggest an overstatement of fertility for the less educated cohort aged 40–44, a not surprising result since women who have not completed primary school comprise the overwhelming majority of women of that age group. The parities also indicate the large difference in fertility between the two educational groups for all cohorts.

Summary

In summary, an examination of cohort-period fertility rates for the entire sample of ever-married women as well as for subgroups provides little evidence of omission of births by the older cohorts. An earlier comparison in figure 6 suggested slight underreporting for women aged 47–49, which might be the result of age transference of the more fertile women to ages 40–44. The data in tables 13–18 do suggest some distortion, producing high estimates of fertility 10–19 years before the survey, and somewhat low estimates 20–24 years before the survey; completed parity for women aged 40–44, especially for women in urban areas, appears to be overestimated. These errors may be the result of a forward displacement of dates of birth or of age misreporting. Nevertheless, the fertility data in the JFS are undoubtedly of much higher quality than those in the 1972 NFS or in the 1961 census.

The data indicate accurate reporting of the level of recent fertility, with a TFR for the most recent five-year period of 7.8, in comparison with completed parity of 8.6 for the oldest cohort. For the subgroups analysed here, the recent TFR ranged from 5.1 for women who completed primary school to 9.7 for women residing in rural areas. The data indicate little change in fertility for the total population until the past 10 or 15 years, with the recent decline being most prominent in the young ages, a result of rising age at marriage, but present also at higher durations of marriage and motherhood.

4.5 TESTS FOR OMISSIONS OF LIVE BIRTHS

So far, the analysis has provided some indication of displacement error in the reporting of dates of birth, but little evidence that women have omitted births. However, from some of the analyses in earlier sections, it is difficult if not impossible to separate errors of omission from those of date misreporting since both can lead to over- or underestimates of fertility in different periods. The two tests below focus on selective omissions of births: examination of sex ratios at birth and proportions dead of children ever born may indicate whether female births or children who died before the survey date were more likely to be omitted from the maternity histories.

Sex ratios at birth

Table 19 presents sex ratios at birth for five-year periods before the survey, along with the size of the denominators. The overall ratio of 105 male births to 100 female births is

Table 19 Sex ratio at birth (males per 100 female births) for five-year periods before the survey

Years before the survey	Number of female births	Sex ratio
0–4	2719	103.0
5–9	2407	102.7
10–14	1902	106.7
15–19	1286	105.8
20–24	694	114.4
25–29	336	116.1
Total	9450	105.3

Source: JFS 1976

consistent with expectation. The higher values of about 115 for the periods 20–24 and 25–29 years before the survey suggest failure of the older women to report all female births, but the very high sampling errors associated with these sex ratios make it difficult to feel certain of such omission.

Proportions dead of children ever born

Proportions dead of children ever born, by sex of child and age group of mother, are given in table 20 for both the household survey and the individual survey. As one would expect, the proportions for both sexes combined generally increase with increasing age of mother; the only exception is for women aged 15–19 but excess infant mortality for teenage mothers is not surprising. However, the separate calculations by sex of child indicate a low value for female children of mothers aged 45–49 as reported in the individual survey. This value (0.154) is considerably less than that reported for the same age group of women in the household survey (0.207). In fact, for almost all ages, the household survey yields higher estimates of proportions dead than does the more detailed fertility history. This is a surprising

Table 20 Proportion dead of children ever born, by sex and age of mother at survey, household (HH) and individual (IND) surveys

Age at survey	Total		Male		Female	
	HH	IND	HH	IND	HH	IND
15–19	0.087	0.085	0.093	0.075	0.081	0.094
20–24	0.091	0.080	0.087	0.074	0.095	0.086
25–29	0.094	0.086	0.093	0.089	0.095	0.083
30–34	0.114	0.094	0.110	0.088	0.117	0.101
35–39	0.140	0.153	0.135	0.105	0.145	0.119
40–44	0.174	0.166	0.169	0.151	0.178	0.182
45–49	0.208	0.170	0.208	0.184	0.207	0.154
Total	0.141	0.122	0.139	0.119	0.144	0.125

Source: JFS 1976

finding since the latter questionnaire obtained the survival status of each birth, whereas the household schedule obtained only the number of births which later died. These discrepancies suggest either a selection bias through which women who experienced higher infant and child mortality (eg women of lower socio-economic status) were less likely to be selected for the individual interview or an under-reporting of mortality (especially of female deaths) in the interview. It would seem that if the former bias occurred, we would find differences in reported fertility between the two questionnaires, with higher reported fertility in the household survey. However, the comparisons of reported parity in table 11 show higher values for most cohorts from the individual survey. A comparison of fertility in the one year prior to the survey shows equal TFRs (7.3) from both questionnaires (Department of Statistics 1979: 52), although it does indicate higher values for the oldest cohorts from the household survey. The analyses in the next section describe in more detail reported trends and possible errors in the estimates of infant and child mortality.

5 Infant and Child Mortality

For each child reported in the maternity history who died before the survey date, interviewers obtained estimates of the month and year of death. These data can be used to derive direct estimates of infant and child mortality for periods before the survey. Alternatively, estimates of the proportions of births surviving to or dying before specified ages (ie 2, 3, 5) can be obtained by indirect estimation techniques (Brass and Coale 1968) from reported proportions dead of children ever born, collected in both the household and individual interviews.

If the reported data are accurate, certain expected patterns of infant and child mortality should emerge: increases in the proportions dead with increasing current age of woman; a U-shaped pattern of infant mortality with age of mother at the time of birth; declines in infant mortality rates over time. Below we determine whether the data in the JFS show significant deviations from the expected patterns, deviations which might indicate selective omission of dead children or incorrect reporting of the dates of death. In addition, we further compare estimates from the household and individual interviews.

5.1 COMPARISON BETWEEN THE HOUSEHOLD AND INDIVIDUAL SURVEYS

The data in table 20 indicated lower proportions dead reported in the individual interview than in the household schedule. Table 21 shows the estimate values of $_2q_0$, $_3q_0$ and $_5q_0$ as derived by indirect estimation (Brass and Coale 1968) from the data in table 20. Not surprisingly, the probabilities derived from data in the individual survey are as much as 15 per cent lower than those derived from the household survey. Both interviews indicate higher female than male mortality, a sex difference opposite to that in developed countries but one which suggests better feeding and medical care of male infants in Jordan.

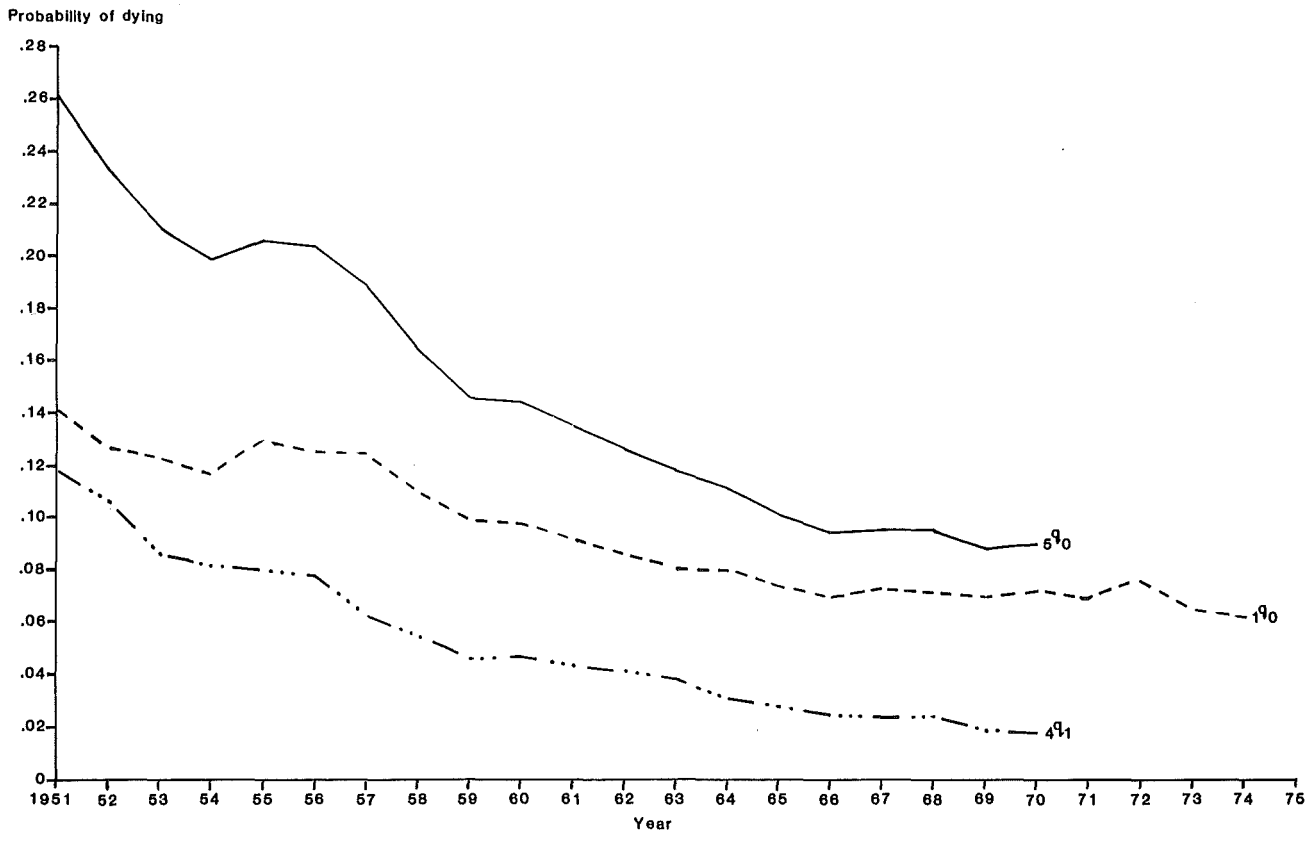

Figure 8 Probabilities of dying (three-year moving averages) within one ($_1q_0$) and five ($_5q_0$) years of birth and between one and five years ($_4q_1$), by calendar year, 1951–75

Table 21 Probabilities of dying before ages 2, 3 and 5, by sex, as calculated from proportions dead of children ever born,[a] reported in the household (HH) and individual (IND) surveys

	Probability of dying before age x					
	Total		Male		Female	
x	HH	IND	HH	IND	HH	IND
2	0.098	0.085	0.095	0.079	0.102	0.092
3	0.095	0.088	0.095	0.091	0.096	0.085
5	0.114	0.096	0.112	0.090	0.115	0.104

[a]The estimation procedure is described in Brass and Coale (1968).
Source: JFS 1976

Table 22 Probabilities of dying within one ($_1q_0$) and five ($_5q_0$) years of birth and between one and five years ($_4q_1$) by five-year calendar period

Period	$_1q_0$	$_4q_1$	$_5q_0$
1951–55	0.125	0.094	0.207
1956–60	0.115	0.057	0.165
1961–65	0.083	0.037	0.117
1966–70	0.069	0.021	0.089
1971–75	0.067	*	*

*Incomplete exposure.
Source: JFS 1976

5.2 INFANT AND CHILD MORTALITY RATES FOR PERIODS IN THE PAST

Probabilities of dying in the first year of life ($_1q_0$), the first five years ($_5q_0$) and between the first and fifth year ($_4q_1$), by calendar year, are shown graphically in figure 8. Because of the sampling fluctuation and heaping for single calendar years, these rates are three-year moving averages. The rates are also shown by five-year calendar period in table 22.

The data indicate a fairly continuous decline in both infant and child mortality from the 1950s to the 1970s, as infectious and parasitic diseases have been brought under control. For example, infant mortality ($_1q_0$) declined by almost 50 per cent from 1951–5 to 1971–5 and childhood mortality ($_4q_1$) declined by almost 80 per cent in the shorter period from 1951–5 to 1966–70. (Note that childhood rates cannot be calculated for 1971–5 because births during most of the period will not have experienced five years of exposure prior to the survey date.) The most recent estimates indicate an infant mortality rate of about 60 deaths per 1000 births for the mid-1970s. Keep in mind, however, that comparisons with the household schedule suggest that these rates might be underestimates. The data in figure 8 also suggest some under-reporting of infant deaths in the early 1950s.

Table 24 Probability of dying in the first year of life ($_1q_0$) by five-year periods[a] before the survey and sex

Years before the survey	Male	Female
1–4	0.056	0.074
5–9	0.066	0.070
10–14	0.079	0.080
15–19	0.115	0.100
20–24	0.111	0.143
25–29	0.192	0.128

[a]See footnote [a] in table 23.
Source: JFS 1976

Table 23 shows probabilities of dying in the first year of life by period before the survey and by age of mother at the time of the child's birth. As has been the case for all retrospective tabulations, rates for earlier periods are progressively truncated at younger ages, and hence estimates for the oldest ages are available only from the most recent periods. The data for the most recent period indicate a U-shaped pattern of infant mortality by age of mother, with the lowest rates at ages 30–34. However, the rates for the periods 5–9 years ago and 10–14 years ago suggest minimum infant mortality at ages 35–39, and rates for the former period yield a non-expected pattern by age. A typical curve (eg Bouvier and van der Tak 1976) is charac-

Table 23 Probability of dying in the first year of life ($_1q_0$) for five-year periods[a] before the survey, by age of mother at birth

Age of mother at birth	Years before the survey						
	Total	1–4	5–9	10–14	15–19	20–24	25–29
15–19	0.105	0.070	0.090	0.091	0.117	0.157	0.162
20–24	0.080	0.072	0.057	0.071	0.112	0.106	0.147
25–29	0.074	0.062	0.069	0.076	0.097	0.100	–
30–34	0.071	0.048	0.079	0.085	0.097	–	–
35–39	0.059	0.067	0.051	0.058	–	–	–
40–44	0.081	0.081	0.079	–	–	–	–

[a]Rates for the most recent period are based on 1–4 years before the survey (rather than 0–4) to allow for complete exposure to death in the first year of life.
NOTE: a dash (–) indicates insufficient sample size or data unavailable.
Source: JFS 1976

terized by minimum rates at ages 20–34. It appears as if the low rates for ages 35–39 between 5 and 14 years ago may be the result of a selective omission of children who died in the fertility reports of the two oldest cohorts.

Probabilities of dying in infancy by sex of child, for five-year periods before the survey, are shown in table 24. The rates for the earliest periods are rather erratic, but this may be partly the result of small sample sizes for these periods (see table 19). For most years, female rates are higher than male rates, but the low female value for 25–29 years may indicate omission of female deaths. Note that, if accurate, these data indicate a large improvement in the male infant mortality rate over the past decade and almost no change in the female rate.

Separate calculations of infant mortality by area of residence and level of education (not shown) do not provide further clues as to the nature of the reporting errors, in part because the sample sizes in early periods become quite small. The calculations suggest large declines in all subgroups over the past two decades, with recent levels of infant mortality (mid-1970s) of approximately 75 and 55 in rural and urban areas respectively, and 70 and 40 for women who have not and who have completed primary school respectively.

6 Summary and Conclusions

The goal of this report has been to assess the quality of demographic data in the 1976 JFS, in order to determine the usefulness of estimates of age at marriage, fertility, and infant and child mortality. The JFS collected a considerable amount of information not hitherto available in Jordan. The few comparisons which could be made with earlier sources (only the 1961 census and the 1972 NFS results were available at the time of this investigation) indicate much more complete reports of marriages and births in the JFS than in the 1961 census and at least as complete reports as in the 1972 NFS.

Analyses of proportions ever married, reconstructed for periods in the past by cohort and by age group, provide no indication of misreporting of the date of first marriage even for the oldest cohorts. Marital status distributions as derived from the JFS for 1972 and as reported in the NFS are in close agreement with one another, except for what appears to be an understatement of divorce in the JFS.

Estimates derived from the marriage histories indicate a very modest increase in age at marriage between 15 and 30 years prior to the survey, but a substantial increase in the last decade, ie for the cohorts 15–19 and 20–24. Data for women in their thirties and forties indicate that 97 per cent of women have had a first marriage by about age 35 and 98 per cent eventually marry. Estimates for the youngest cohort suggest an eventual mean age at marriage of 22, with a value as high as 26.5 for women with at least a primary school education.

Comparisons of reported parities between the JFS and the 1961 census and 1972 NFS show highest values in the JFS. The close agreement between the NFS and the JFS for ages under 40 and the higher parities in the individual survey than in either the NFS or the household survey for ages over 40 suggest fairly complete reporting of births in the individual interviews.

When calculated by single years of age, reported parities in the JFS are higher at ages divisible by five which may indicate selective age misstatement (ie overstatement) for the more fertile women. The reported parities for ages 47–49 appear to be somewhat low, perhaps because of age misstatement or of a slight omission of births. Reported sex ratios at birth for the earliest periods (20–29 years before the survey) do suggest incomplete reporting of female births, some of which appear to be of infants who died prior to the survey.

Analyses of cohort-period fertility rates, as well as of cumulative fertilities by cohort and by period and P/F ratios, indicate underestimates and overestimates of fertility in the periods 20–24 and 10–19 years before survey respectively. These errors may be largely the result of either forward displacement of dates of birth or selective age misstatement for the highly fertile women, among respondents with reported ages of 40–44. The resulting anomalies in estimated fertility rates are especially apparent for women living in urban areas.

An examination of P/F values by duration of motherhood suggests that the reported level of fertility for the most recent five-year period is correct. The estimated TFR of 7.8, for approximately 1972–6, appears to be almost one child lower than that of earlier periods: estimates of the TFR for the 1960s indicate a TFR of about 8.6, a value equal to the reported parity of 45–49 year olds. Comparisons of recent fertility with rates for the period 10–14 years before the survey yield a larger estimate of fertility decline, but the estimates for this period appear to be exaggerated because of reporting errors for the oldest cohorts, ie the Potter effect.

Some fertility decline appears in all age groups, but the change is largest at the young ages: eg a 25 per cent decline in fertility for ages 15–19 from 1966–70 to 1971–5. This decline is clearly the result of rising age at marriage; for example, a 40 per cent decline in the percentage of women ever married at ages 15–19 over the five years prior to the survey date! Nevertheless, analyses by duration of marriage and duration of motherhood indicate declines of 10–20 per cent at the higher durations, between the two most recent five-year periods.

An examination of infant mortality rates calculated from reported dates of death in the maternity histories, and comparisons with rates calculated from proportions dead of children ever born reported in the household survey, provide an indication of some omission of infant deaths. Specifically, comparisons between the individual and household interviews show lower proportions dead for women of all ages in the former interview. Whether these differences are due to a selection bias in the sampling of ever-married women from the households or an under-reporting of deaths in the individual interviews, they suggest that the mortality rates calculated from the maternity histories are underestimates, perhaps by 10–15 per cent. Note that since the difference between the two interviews appears in all age groups, estimated trends in infant mortality might not be greatly affected by this bias.

Analysis of estimates by time period, age of mother at time of birth, and sex show plausible patterns: declining rates over time, with an almost 50 per cent decline in ${}_1q_0$ over the 20 years prior to the survey; highest rates at the youngest and oldest ages of mother; and slightly higher female mortality rates than male rates, probably as a result of differential attention and medical care. Nevertheless, these investigations reveal some anomalies, all of which seem to affect the earliest periods or oldest cohorts: low infant mortality rates (${}_1q_0$) in the early 1950s relative to the mid-1950s (figure 8); an apparent under-reporting of female deaths in the period 25–29 years before the survey (table 24); and under-reporting (or misreporting of dates)

of infant deaths by the oldest two cohorts (table 23), especially of female deaths by the oldest cohort (table 20).

The data show continuous declines in both infant and childhood mortality and indicate a probability of dying in infancy ($_1q_0$) of about 60 in the mid-1970s. Note that this is in contrast to a value of 125 for the period 1951–5. However, the recent decline in infant mortality has been much more notable for males than for females, indicating a 29 per cent decline in $_1q_0$ for males and only an 8 per cent decline for females from the period 10–14 years before survey to 1–4 years before the survey.

In summary, this research shows higher quality of reporting in the JFS than in either the 1961 census or the 1972 NFS, with most apparent errors in the maternity history being restricted to the earliest periods or the oldest cohorts. Undoubtedly, the wealth of data contained in the JFS, much of which had not been previously available, will continue to provide useful information on demographic trends and family planning in Jordan. The recency of many demographic changes – eg the increase in age at marriage and the decrease in marital fertility – highlights the importance of continuing analysis of these data. In addition, the JFS should prove extremely useful for assessing the quality of reporting in the 1979 census.

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