AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

March 2, 1984

MEMORANDUM

TO : Distribution

FROM : ST/POP/R, John E. Lawson, Jr. JL

191-S

SUBJECT : POPLAB Demographic Report - Jordan

828

The attached report, prepared by the International Program of Laboratories for Population Statistics (POPLAB) of the University of North Carolina, is the sixth in a series presenting the major findins of surveys conducted in countries participating in the POPLAB program. This report summarizes the findings of the 1981 Jordan Demographic Survey.

Highlights:

1. Sample size: 14,386 households interviewed.

2. Population Characteristics: The population of Jordan is relatively young and urban with slightly more than half the population under age 15 and more than 70% living in urban areas. Marriage is universal; nearly all men and women in the age group 45-49 either were married or had been married. Only 0.8% of men and 2.7% of women in that age group reported that they were single (i.e., never married). The age at first marriage appears to be increasing. The 1981 survey data show the average age at first marriage to be 26.8 years for men and 22.6 years for women. Comparable estimates from the 1976 Fertility Survey were 26.0 and 21.6 years, respectively.

3. Fertility: The average number of children ever born to these women was 3.4. Comparable estimates from surveys conducted in 1972 and 1976 are 3.8 and 3.5, respectively. This apparent reduction in the average number of children ever born is due partly to underreporting of births in 1972 by women in the older age groups. However, among the younger age groups, the average number of children has declined between each period.

The CRUDE BIRTH RATE was estimated to be 38 per 1000 population. The estimated TOTAL FERTILITY RATE was 7.1. As expected, rural fertility was generally higher than urban fertility. This difference was most pronounced among women under age 25, due in part to differences in the age at first marriage. Compared to data from the 1976 Fertility Survey, there is some evidence that fertility rates for women under 30 have declined slightly, but for older women there is no clear trend.

4. Mortality: The infant mortality rate was estimated to be about 64 per 1000 births. That is, about 6.4% of the infants die within the first year after their birth. The infant mortality rate is slightly higher for males than for females and somewhat higher for rural areas than for urban areas. The average life expectancy was estimated to be almost 65 years for males and 70 years for females.

Attachment: as stated

Distribution:

ST/HP, JSarn/FHerder
ST/POP/DIR, SSinding/DGIllespie
ST/POP/R, JDShelton
ST/POP/R, RCornelius
ST/POP/PDD, JChao
ST/POP/DIR, JBurdick
NE/TECH/HPN, CJohnsen
NE/TECH/HPN, LSlobey
NE/ME, RBrown
OES/CP, RBenedick
Pop Institute, JBrackett
Westinghouse, LSmith
PRB, LBouvier
CDC, LMorris
ST/POP/R, JBailey
WFS, HGille
ST/DIU/Library
NCHS, RHartford/SNotzon

Laboratories for Population Statistics
Summary Series No. 6
June 1983

The 1981 Jordan Demographic Survey: A Summary of Results

by POPLAB Staff

International Program of Laboratories for Population Statistics
Arjun L. Adlakha, Director

The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina 27514

The International Program of Laboratories for Population Statistics (POPLAB) of the University of North Carolina at Chapel Hill is involved in a project entitled "Birth and Death Data Collection" sponsored by the United States Agency for International Development. The basic objective of this project is to assist developing countries in collecting and analyzing data on levels and trends in fertility and mortality through the use of sample surveys. These surveys are of three types: (1) add-on, adding fertility/mortality questions to existing household surveys, (2) new, initiating new fertility/mortality surveys, and (3) broad surveys, new or add-on, which include collection and analysis of data on variables such as socio-economic status, labor force participation, migration, use of family planning, as well as basic fertility/mortality questions. POPLAB provides technical and financial assistance in the design, organization, implementation, and analysis of all three types of surveys.

ISBN 0-89383-082-8

Contents

THE 1981 JORDAN DEMOGRAPHIC SURVEY: A SUMMARY OF RESULTS

POPLAB Staff

BACKGROUND

Since its inception in 1950, the Hashemite Kingdom of Jordan has devoted considerable time and effort on demographic matters and their effects on the economic and social framework of the country. Declining mortality in recent years coupled with continuing high fertility has resulted in a considerable increase in the population. In 1952 the population of the East Bank was approximately 587,000 persons. In 1961, the population was estimated to be 900,000 and the census in 1979 indicated the total population to be approximately 2,152,000 persons. In between the population and housing censuses of 1961 and 1979, several sample surveys have been conducted on migration, labor force participation, economic productivity, fertility and population changes. Prominent among these surveys was the National Fertility Survey of 1972 and the Jordan Fertility Survey conducted in 1976 under the jurisdiction of the Department of Statistics. These censuses and surveys provide several measurement points for the continuing study of levels and trends in population growth of the country. The 1981 Jordan Demographic Survey (JDS), the subject of this report, provides yet another measurement on the demographic trend line for comparative purposes over time.

The overall objective of the present collaboration between the Department of Statistics, Government of Jordan, and the International Program of Laboratories for Population Statistics (POPLAB) of the University of North Carolina at Chapel Hill was to use 1979 census data in redesigning the multiround household survey program for the East Bank territory of the Hashemite Kingdom of Jordan, and to carry out one survey round of this newly designed program for demographic purposes. The design and results of the survey are described in the following sections.

THE SURVEY

The 1981 Jordan Demographic Survey was designed for the purpose of yielding estimates of demographic parameters for urban and rural areas of Jordan. Using 1979 census data, a self-weighting, replicated, multi-stage sample design with stratification in the primary stage by urbanization, geographic location (rural only), and socioeconomic status (urban only) was designed by POPLAB in 1980-81 for Jordan's future use in its Multi-Purpose Household Survey program. This probability sample involved 21 independent replicates, each expected to yield completed interviews from approximately 1,000 households. The Jordan Demographic Survey, the first application of

the new sample design, involved 14 of the 21 replicates, or approximately 14,000 households.

The sample was selected to be representative of the population of Jordan, and of the urban and rural components, excluding residents of the occupied West Bank, nomad families living in remote areas, and residents of hotels and prisons. The survey collected information on over 96,000 persons living in 14,386 households. The field work for the survey was carried out in November 1981 - January 1982 by a staff of 32 interviewers, 8 field editors and 8 supervisors.

FINDINGS

Age and Sex Distribution

A total of 96,318 persons was enumerated in the sample, 71.6 percent of which lived in urban areas. Almost two-thirds of the urban population resided in the cities of Amman, Zarka and Irbid. The percentage distribution of the sample population by age, sex and rural-urban residence is presented in Table 1.

Overall, the Jordan population is relatively young, with 51.2 percent under age 15 and 2.5 percent in ages 65 and over. The population pyramid (Figure 1) has a very broad base and narrows rapidly as age increases, a pattern typical of relatively high fertility and a young population.

Some variation exists in the age distribution by urban-rural residence. The percent of total population under age 15 is higher in the rural (53.9) than in the urban areas (50.1). The percent of population aged 65 and over is slightly higher in rural areas (2.9) than in urban (2.3).

With regard to sex composition of the population, sex ratios (the ratio of males to females) are shown in Table 2 separately for urban and rural residence. The data indicate that there are approximately 104 males for every 100 females in Jordan. Most past demographic surveys and censuses in Jordan report an excess of males over females, although male excess of such magnitude is not common in most populations. The sex ratios vary by age for both urban and rural areas. Two points are worth noting: (1) a deficiency of males in the age groups 25-44, perhaps a result of greater male migration over the past several years to nearby countries (especially the Gulf States) to work and, (2) an excess of males in age groups 55 and over, which is contrary to general expectations because males have higher mortality than females. A combination of factors, however, including greater under-enumeration of older women than men, differential age misreporting by sex, and possibly higher female mortality in the past, could be responsible for this situation.

TABLE 1. Percentage Distribution of Population by Age Group and Sex, Urban and Rural, Jordan, 1981

Age Group	Total		Urban		Rural	
	Males	Females	Males	Females	Males	Females
0-4	9.3	8.9	8.9	8.6	10.3	9.7
5-9	8.8	8.2	8.5	8.1	9.5	8.7
10-14	8.3	7.7	8.3	7.7	8.2	7.5
15-19	6.5	6.2	6.8	6.4	5.7	5.9
20-24	3.8	3.5	4.0	3.7	3.1	3.1
25-29	2.3	2.5	2.4	2.5	2.0	2.7
30-34	1.8	2.2	1.8	2.3	1.7	2.2
35-39	2.0	2.3	2.2	2.3	1.8	2.2
40-44	1.8	1.9	1.9	1.9	1.6	1.9
45-49	1.7	1.4	1.8	1.4	1.6	1.2
50-54	1.4	1.6	1.4	1.6	1.3	1.6
55-59	0.9	0.8	1.0	0.8	0.9	0.8
60-64	0.8	0.7	0.8	0.6	1.0	0.9
65+	1.4	1.1	1.3	1.0	1.7	1.2
Total	50.9	49.1	51.1	48.9	50.4	49.6
Persons in Sample	49,010	47,309	35,214	33,744	13,796	13,565

FIGURE 1. Population Pyramid by Five-Year Age Groups, Jordan, 1981

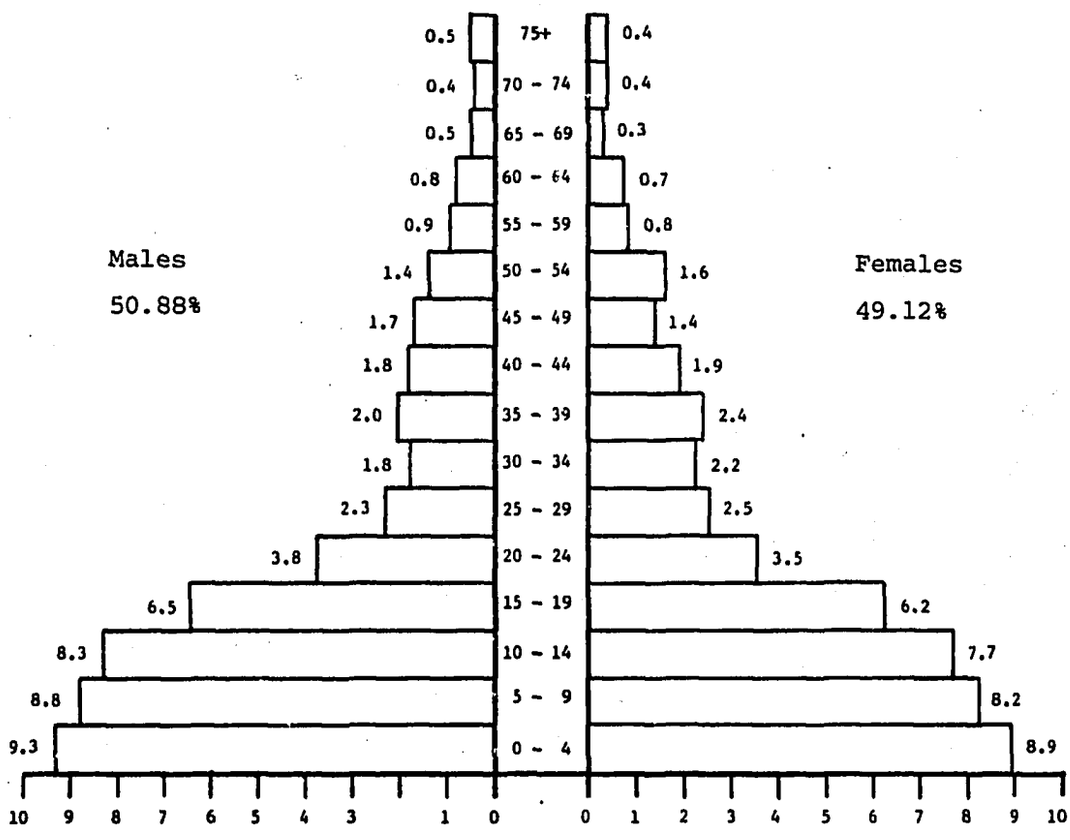

TABLE 2. Sex Ratios by Age Group, Urban and Rural, Jordan, 1981

Age Group	Total	Urban	Rural
0-4	104	104	106
5-9	107	106	109
10-14	108	108	109
15-19	104	106	98
20-24	107	108	102
25-29	91	98	74
30-34	81	82	78
35-39	89	93	80
40-44	95	98	86
45-49	127	126	128
50-54	87	89	81
55-59	118	124	103
60-64	117	119	113
65+	128	121	145
TOTAL	104	104	102

Marital Status

Data on the current marital status of males and females are presented in Table 3 by age group for urban and rural areas and for the country as a whole.

As is evident from the data, marriage is universal in Jordan. Nearly all men and women in the age group 45-49 either were married or had been married, and only .8 percent of men and 2.7 percent of women were in the single state at that age. The percentage of men and women who were divorced was very small. As expected, widowhood increased with age.

Overall, differentials in the marital status distribution by urban-rural residence are small. Apparently, men and women in rural areas tend to marry younger than urban men and women. For men, for example, the percent reported as single at age 25-29 in urban areas is 39.1 as compared to 34.5 in rural areas. Similarly for women, the percent reported as single at age 20-24 is 47.9 in the urban areas and only 40.9 in rural areas.

TABLE 3. Percentage Distribution of Males and Females by Marital Status, by Area of Residence and Age Group, Jordan, 1981

Area of Residence	Age Group	MALES				FEMALES			
		Single	Married	Widowed	Divorced	Single	Married	Widowed	Divorced
Total	15-19	99.2	0.8	0.0	0.0	87.1	12.8	0.0	0.1
	20-24	85.0	14.9	0.0	0.1	46.2	52.7	0.3	0.9
	25-29	37.9	61.4	0.0	0.7	17.3	80.6	0.8	1.4
	30-34	12.8	87.0	0.1	0.2	6.9	90.8	1.7	0.6
	35-39	3.5	96.0	0.1	0.5	3.6	92.7	3.2	0.5
	40-44	1.2	98.3	0.3	0.2	2.9	91.6	4.8	0.7
	45-49	0.8	98.6	0.4	0.2	2.7	88.7	8.1	0.5
Urban	15-19	99.3	0.6	0.0	0.0	88.3	11.5	0.0	0.2
	20-24	85.8	14.0	0.0	0.2	47.9	50.9	0.3	0.9
	25-29	39.1	60.0	0.1	0.7	18.2	79.5	0.9	1.4
	30-34	13.9	86.0	0.1	0.1	6.8	90.8	1.7	0.7
	35-39	3.8	95.6	0.4	0.5	3.8	92.5	3.1	0.6
	40-44	1.1	98.2	0.5	0.2	3.4	91.4	4.5	0.6
	45-49	0.8	98.4	0.9	0.3	3.0	87.7	8.9	0.4
Rural	15-19	98.8	1.2	0.0	0.0	83.6	16.3	0.0	0.0
	20-24	82.4	17.5	0.0	0.1	40.9	58.0	0.1	0.9
	25-29	34.5	65.0	0.0	0.6	15.0	83.2	0.5	1.4
	30-34	10.2	89.2	0.2	0.4	7.1	90.7	1.7	0.5
	35-39	2.3	97.3	0.0	0.4	3.3	93.2	3.3	0.2
	40-44	1.6	98.4	0.0	0.0	1.6	92.2	5.5	0.8
	45-49	0.9	99.1	0.0	0.0	1.8	91.6	6.0	0.6

Since changes in the proportion of women who ever marry by age have implications for the level and age pattern of fertility, a comparison of such data from the 1981 Jordan Demographic Survey with similar data from the 1972 National Fertility Survey and the 1976 Jordan Fertility Survey is shown in Table 4.

TABLE 4. Percentage of Women Ever Married by Age, Jordan, 1972, 1976, 1981

Age Group	NFS[1] 1972	JFS[2] 1976	JDS 1981
15-19	30.4	19.5	12.9
20-24	73.0	64.1	53.8
25-29	92.9	87.4	82.7
30-34	96.4	95.3	93.1
35-39	97.4	97.4	96.4
40-44	98.2	98.0	97.1
45-49	95.4	98.3	97.3

Sources: [1]Department of Statistics. (1976). *The National Fertility Survey in Jordan, 1972.* Amman: Department of Statistics, Hashemite Kingdom of Jordan. p. 28.

[2]_____. (1979). *Jordan Fertility Survey, 1976, Principal Report, Volume 1.* Amman: Department of Statistics, Hashemite Kingdom of Jordan. p. 27.

For almost all age groups there has been a decline in the proportion of ever-married women from 1972 to 1981. This decrease is more pronounced for women under 30 years of age and indicates a trend in rising age at marriage of women in Jordan.

The mean age at which men and women first marry can be approximated by an indirect measure called singulate mean age at marriage (SMAM). This measure is computed from cross-sectional data on proportion of men and women reported as single in a census or survey (Shryock and Siegel, 1971) and provides an estimate of number of years lived in the single state by those who marry before age 50. The SMAM values for men and women from the 1981 JDS are shown in Table 5.

The SMAM values indicate that, on average, men remain single for 26.8 years and women remain single for 22.8 years before they marry for the first time. Similar estimates from the 1965 Jordan Fertility Survey were 26.0 for males and 21.6 for females, further evidence of an increase in age at marriage in recent years.

TABLE 5. Singulate Mean Age at First Marriage by Sex, Urban and Rural, Jordan, 1981

Area of Residence	Males	Females
Total	26.8	22.8
Urban	27.0	23.0
Rural	26.4	22.4

Fertility

In the Jordan Demographic Survey, data on fertility were obtained in terms of: (1) children ever born, (2) births in recent reference period, and (3) "own-children" method. Summaries of the results pertaining to the analyses of these three types of data follow.

Children Ever Born. Data on children ever born were obtained by asking each ever-married woman for the number of her own sons and daughters (1) who lived in the household, (2) who lived elsewhere, and (3) who were deceased. Since, in Jordan, almost all childbearing occurs within marriage, these data are appropriate for computing average parity for all women.

Table 6 shows data on mean number of children ever born per woman by age of women for urban and rural areas, and for the country as a whole.

TABLE 6. Mean Number of Children Ever Born Per Woman by Age of Women, Urban and Rural, Jordan, 1981

Age Group of Women	Total	Urban	Rural
15-19	.10	.09	.13
20-24	1.18	1.11	1.38
25-29	3.33	3.21	3.60
30-34	5.38	5.28	5.66
35-39	7.04	7.02	7.07
40-44	8.09	7.94	8.48
45-49	8.40	8.35	8.54
15-49	3.41	3.33	3.60

For all age groups, mean number of children ever born is lower in urban areas than in rural areas. Differences between urban-rural residence are proportionately greater for women under 25 years of age than for women over 25 years. This is probably due to differences in timing of marriage.

Data on mean number of children ever born per woman for Jordan from the 1981 Jordan Demographic Survey are presented in Table 7 along with similar data from the 1972 National Fertility Survey and the 1976 Jordan Fertility Survey. All three surveys show a very high level of fertility. However, a comparison of the data over the three time periods shows some evidence of a fertility decline. Between 1972 and 1976, the data indicate that mean number of children declined for women under 35 years of age and increased for women 35 and over. An earlier study (Abdel-Aziz, 1983) suggests that this increase in mean number of children was a result of underreporting of births in 1972 by women 35 years old and over. This appears to be confirmed by the findings of the 1981 survey as mean number of children of women 35 and over are compatible with those from the 1976 survey, but higher than those from the 1972 survey. Between 1976 and 1981, mean number of children also declined for all age groups under 40 years of age but remained unchanged for women 40 and above.

TABLE 7. Mean Number of Children Ever Born Per Woman by Age of Women, Jordan, 1972, 1976, and 1981

Age Group of Women	NFS[1] 1972	JFS[2] 1976	JDS 1981	% Change	
				1972 to 1976	1976 to 1981
15-19	.23	.17	.10	-26.1	-41.2
20-24	1.73	1.52	1.18	-12.1	-22.4
25-29	3.99	3.55	3.33	-11.0	-6.2
30-34	5.85	5.62	5.38	-3.9	-4.3
35-39	7.16	7.22	7.04	+0.8	-2.5
40-44	7.64	8.09	8.09	+5.9	-0.0
45-49	7.21	8.42	8.40	+16.8	-0.2
15-49	3.77	3.48	3.41	-7.7	-2.0

Sources: [1]Department of Statistics. (1976). *The National Fertility Survey in Jordan, 1972*. Amman: Department of Statistics, Hashemite Kingdom of Jordan. p. 47.

[2]Abdel-Aziz, A. (1983). *Evaluation of the Jordan Fertility Survey, 1976*. Scientific Reports, No. 42. London: World Fertility Survey. p. 17.

Reference Period Data. Information on current fertility was obtained by asking a series of questions of each ever-married woman about her last live birth and about pregnancies occurring before and after that event. For each birth that was identified, date of birth and information as to whether it occurred before, or after Eidul Fitr (an important Moslem religious observance which occurred on August 23, 1979) were obtained. On the basis of this information, births which occurred between the 1979 Eidul Fitr and the survey date served as the basis for estimates of current fertility.

Estimates of age-specific fertility for Jordan by urban-rural residence are presented in Table 8, along with estimates of total fertility rates and crude birth rates. The fertility rates for both urban and rural areas were low at ages 15-19, increased at ages 20-24 reaching a peak at ages 25-29, and declined thereafter. Estimates for the rural areas are higher at every age group than for urban areas.

TABLE 8. Age-Specific Fertility Rates per 1,000 Women, Total Fertility Rate, and Crude Birth Rate by Area of Residence, Jordan, 1981

Age Group	Total	Urban	Rural
15-19	87	83	99
20-24	252	243	277
25-29	340	330	365
30-34	316	305	344
35-39	239	228	269
40-44	134	122	168
45-49	49	42	70
Total Fertility Rate (per woman)	7.1	6.8	8.0
Crude Birth Rate (per 1000 population)	38.4	37.2	41.3

The total fertility rate for Jordan was estimated at 7.1 children per woman with a crude birth rate of 38.4 births per 1,000 population. Urban rates are lower than rural.

Estimates of age-specific fertility rates and total fertility rates from the 1981 JDS are compared in Table 9 with the two sets of estimates for 1975-76 from the 1976 JFS based on individual women survey data (Col. 3) and household survey data (Col. 4).

TABLE 9. Estimates of Age-Specific Fertility Rates and Total Fertility Rates From 1981 JDS and 1976 JFS, Jordan

Age	1981 JDS (1979-81)	1976 JFS[1]		% Change Between 1975-76 and 1979-81 Using Estimates of	
		Women Survey (1975-76)	Household Survey (1975-76)	Women Survey	Household Survey
15-19	87	93	71	-6.5%	+22.5%
20-24	252	335	300	-24.8%	-16.0%
25-29	340	386	367	-11.9%	-7.4%
30-34	316	311	332	+1.6%	-4.8%
35-39	239	229	240	+4.4%	-0.4%
40-44	134	83	112	+61.4%	+19.6%
45-49	49	25	47	+96.0%	-4.3%
TFR	7.09	7.32	7.34	-3.1%	-3.4%

Source: [1]Department of Statistics. (1979). *Jordan Fertility Survey, 1976 Principal Report, Volume 2.* Amman: Department of Statistics, Hashemite Kingdom of Jordan. p. 52.

From this comparison there is some evidence that fertility rates of women under 30 declined. For women over 30, there is no clear trend. The household survey and individual survey estimates for 1975-76 are not completely consistent with each other and thus a definite conclusion about changes in the fertility of women over 30 is difficult to make. Overall, these data indicate that there was a slight decline of about 3% in the TFR of women between 1975-76 (7.3) and 1979-81 (7.1).

Own-Children Method. Estimates of fertility for Jordan were also obtained by use of the own-children technique (Cho, 1973) applied to data from the 1981 survey. This technique reconstructs the fertility experience of women enumerated in the survey. Estimates of age-specific fertility rates for Jordan for the 8-year period from 1971-73 to 1979-81 are shown in Table 10, along with the total fertility rate.

In general, estimates shown in Table 10 indicate a declining trend in fertility during the 1970's. The trend, however, is not smooth. The total fertility rate begins with a level of 9.1 children in 1971-73, declines to 8.3 in 1973-75, remains constant until 1977-79 and declines again to reach a level of 7.5 children in 1979-81. All age groups of women show declines in fertility. The declines were relatively greater for women under 25 years of age due largely to increasing age at marriage, and for women over 40 years.

TABLE 10. Age-Specific Fertility Rates and Total Fertility Rates for Various Time Periods Based on Own-Children Method, Jordan, 1981

Time Period	Age Group of Women							Total Fertility Rate
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
1971-73	154	359	406	374	295	174	61	9.1
1972-74	144	338	389	364	287	165	51	8.7
1973-75	131	337	386	351	276	154	46	8.4
1974-76	120	339	381	351	269	144	46	8.3
1975-77	114	344	392	351	265	150	48	8.3
1976-78	104	344	395	359	274	156	51	8.4
1977-79	92	322	399	361	277	158	52	8.3
1978-80	79	309	383	351	268	145	50	7.9
1979-81	72	290	367	336	256	139	46	7.5
Percent Decline from 1971	53.2	19.2	9.6	10.2	13.2	20.1	24.6	17.5

It should be pointed out that the total fertility rate of 7.5 children for 1979-81 is slightly higher than the total fertility rate of 7.1 for almost the same time period previously shown for reference period data. Since estimates from varying sources and methodology are subject to different types of error, it is not possible at this time to state which of these estimates is the more accurate.

Mortality

In the 1981 Jordan Demographic Survey, information on recent deaths was obtained to provide direct measures of mortality by relating reported deaths to the population enumerated in the survey. Data on child survivorship, parent survivorship, and spouse survivorship were collected to produce indirect measures of mortality.

With regard to direct measures of mortality, respondents in each household were asked about deaths occurring to members of the household since the 1979 Eidul Fitr. Based on data thus obtained, the calculated crude death rate was 3.6 deaths per 1,000 population. This rate is implausibly low. Under-reporting of recent deaths is common in surveys of developing populations due to reference period error, forgetfulness, lack of knowledge about

or deliberate concealment of deaths on the part of respondents, and possibly other reasons. Therefore, reliance was placed on indirect estimation techniques to determine levels of child and adult mortality for Jordan. Mortality estimates shown in this section are based on indirect techniques of analysis.

Infant and Child Mortality. Indirect estimates of infant and early childhood mortality were derived from data on children ever born to ever-married women and children who had died. Data on children ever born and children dead were classified by five-year age groups of ever-married women and, from this classification, statistics on the proportions of children who had died were computed and were converted into mortality rates, i.e., probability of dying from birth to exact age of early childhood, by existing demographic models. Various models have been developed to transform proportion dead statistics into mortality rates (Brass, 1975; Sullivan, 1972; Trussell, 1975; and Feeney, 1980). All of these models produce estimates which are essentially quite similar, and involve various restrictive assumptions.

For the 1981 Jordan Demographic Survey, data on proportion dead statistics were converted into mortality probabilities by the use of the Sullivan model, using the South regional variant because there is evidence that the age pattern of early child mortality in Jordan approximately resembles the South variant (Sullivan *et al.*, 1982). The estimation of mortality rates was made from data provided by women 20-24, 25-29, 30-34 years old. Since the mortality estimates reflect an average mortality level prevailing a number of years prior to the survey, it is useful to provide a point in time to which each of the mortality rates apply. The time reference of the estimate was obtained by using the Trussell model (Coale and Trussell, 1978) which assumes a linear change in mortality over time.

Estimates of infant mortality rates for Jordan are provided in Table 11. The total infant mortality rate from data of women 20-24, 25-29, and 30-34 years old, respectively, are 64.4 (1980), 64.1 (1978) and 65.2 (1976). These estimates imply a constant infant mortality in Jordan during approximately a 5-year period prior to the survey. However, these individual estimates may be subject to biases that may differ in magnitude and direction.

Various estimates of infant mortality of males (69.1, 62.1, 69.8) and of females (59.5, 66.0, 60.4) do not show a consistent pattern of sex differentials. However, when rates for the three age groups are averaged, the average estimate of the infant mortality rate for males (67.0) is higher, by 8 percent, than the average rate for females (61.9). This pattern of higher infant mortality of males than females is common to most populations.

Estimates of infant mortality rates by area of residence are also presented in Table 11. These estimates, overall, show expected differentials with higher rates in rural areas than in urban areas. The average infant mortality rate is 61.0 for urban areas and 72.5 for rural areas.

TABLE 11. Estimates of Infant Mortality Rates by Sex Using Childhood Survivorship Data Jordan, 1977-80

Age Group of Women	Approximate Time Reference of Estimate	Proportion Dead of Children Ever Born	Estimated Probability of Dying Between Birth and Exact Age *a*		Infant Mortality Rate (per 1000 births)
			a	*q(a)*	
			Total		
20-24	1980	0.0657	2	.0732	64.4
25-29	1979	0.0740	3	.0772	64.1
30-34	1977	0.0808	5	.0830	65.2
			MALE		
20-24	1980	0.0701	2	.0782	69.1
25-29	1979	0.0699	3	.0731	62.1
30-34	1977	0.0860	5	.0884	69.8
			FEMALE		
20-24	1980	0.0611	2	.0697	59.5
25-29	1979	0.0783	3	.0816	66.0
30-34	1977	0.0754	5	.0773	70.4
			URBAN		
20-24	1980	.0611	2	.0684	60.7
25-29	1979	.0676	3	.0708	59.7
30-34	1977	.0761	5	.0783	62.6
			RURAL		
20-24	1980	.0768	2	.0842	72.7
25-29	1979	.0871	3	.0899	72.7
30-34	1977	.0921	5	.0937	72.2

Adult Mortality. In the 1981 Jordan Demographic Survey, information was obtained about survival of parents (all respondents) and survival of first spouse. From this information it is possible to derive estimates of adult mortality by the use of indirect models. This section presents adult mortality estimates from orphanhood data.

In separate sections of Table 12, the proportions of respondents whose fathers were still alive, and whose mothers were still alive, are shown by age of respondents (Col. 2). These proportions by themselves are indicators of mortality. However, in order to make these proportions readily understandable, they must be converted into probabilities of surviving from one exact age to another exact age. Various models have been developed for accomplishing this transformation. The one used in this analysis was developed by Brass and Hill (1975).

The Brass and Hill model uses as input data the survivorship proportions in two consecutive age groups and mean age of parents at the time of the respondent's birth. In the case of females, the method produces conditional probability of surviving from a fixed age 25 to age 25+*N* where *N* is the central age of two consecutive age groups. In the case of males, the method arrives at a conditional probability of surviving from age 32.5 to 35+*N*.

For each sex, the method provides a series of survivorship probabilities, each of which pertains to different age intervals. The lower boundary of each age interval is the same, but the upper boundary varies according to the value of *N*. Thus, different survivorship probabilities are not directly comparable with each other. It is, however, possible to represent each of the survivorship probabilities by a single index in terms of mortality level in a family of model life tables. In this application, the South family of Coale and Demeny (1966) model life tables was selected. When mortality has been declining, as is the case in Jordan, different estimated levels represent mortality situations of different time periods in the recent past. Therefore, a time reference for each estimated life table mortality level is estimated by the use of a model developed by Brass and Bamgboye (1981).

Results of this analysis for males and females are presented in Table 12. For males, the life table mortality level is around 20.3 from 1973 through 1977 and lower for the years 1967 through 1972. Since lower life table mortality levels imply higher death rates, the implication is that mortality declined between 1967 and 1973. Similarly, estimates for females also indicate a declining trend in adult mortality. The life table mortality level is about 21.4 from 1972 through 1978 but lower for the years 1967 through 1971, implying higher mortality in the earlier years. The expectations of life at age 5 based on life table mortality levels for the most recent years (20.3 for males and 21.4 for females) is 65.8 years for males and 71.2 years for females.

TABLE 12. Estimates of Male and Female Adult Mortality Based on Orphanhood Data

A. Male Mortality (Paternal Orphanhood)

Age Group of Respondent	Proportion with Father Alive	Central Age N	Estimated Probability of Surviving from Age 32.5 to 32.5+N $\ell(32.5+N)/\ell(32.5)$	Life Table Mortality Level	Time Reference of Estimate
5-9	.9770	10	.9638	20.3	1977
10-14	.9488	15	.9375	20.2	1975
15-19	.9187	20	.8981	20.2	1973
20-24	.8593	25	.8262	19.4	1972
25-29	.7700	30	.7039	17.7	1970
30-34	.6388	35	.5573	16.6	1969
35-39	.5236	40	.4079	16.9	1968
40-44	.4091	45	.2560	18.1	1967
45-49	.2929	50	.1459	NA	NA

B. Female Mortality (Maternal Orphanhood)

Age Group of Respondent	Proportion with Mother Alive	Central Age N	Estimated Probability of Surviving from Age 25 to 25+N $\ell(25+N)/\ell(25)$	Life Table Mortality Level	Time Reference of Estimate
5-9	.9908	10	.9887	21.3	1978
10-14	.9831	15	.9817	21.4	1975
15-19	.9719	20	.9722	21.4	1973
20-24	.9549	25	.9624	21.8	1972
25-29	.8979	30	.9125	19.6	1971
30-34	.8314	35	.8634	18.9	1970
35-39	.7214	40	.7536	16.9	1969
40-44	.6128	45	.6487	16.9	1968
45-49	.4833	50	.5014	17.1	1967

Overall Mortality. By linking the childhood mortality estimates described above with the adult mortality estimates described above, it is possible to obtain estimates of mortality which relate to the general population. Two such measures were calculated from the 1981 survey data, expectation of life at birth (64.9 years for males and 69.7 years for females) and the crude death rate (7.3 for males and 5.5 for females). While it is difficult to assign a precise reference time for these estimates, they may be considered as representing average mortality, for a period of approximately five years prior to the survey.

REFERENCES

Abdel-Aziz, A. (1983). *Evaluation of the Jordan Fertility Survey, 1976.* Scientific Reports, No. 42. London: International Statistical Institute, World Fertility Survey.

Brass, W. (1975). *Methods for Estimating Fertility and Mortality from Limited and Defective Data.* Occasional Publication. Chapel Hill, N.C.: International Program of Laboratories for Population Statistics, University of North Carolina at Chapel Hill.

_____, and Bamgboye, E.A. (1981). The Time Location of Reports of Survivorship: Estimates for Maternal and Paternal Orphanhood and the Ever-Widowed. Working Paper No. 81. London: Centre for Population Studies, London School of Hygiene and Tropical Medicine, University of London.

_____, and Hill, K.H. (1973). Estimating Adult Mortality from Orphanhood. *International Population Conference Proceedings Vol. 3.* Liege, Belgium: International Union for the Scientific Study of Population.

Cho, L.J. (1973). The Own-Children Approach to Fertility Estimation: An Elaboration. *International Population Conference Proceedings Vol. 2.* Liege, Belgium: International Union for the Scientific Study of Population.

Coale, A.J., and Demeny, P. (1966). *Regional Model Life Tables and Stable Populations.* Princeton, N.J.: Princeton University Press.

_____, and Trussell, T.J. (1978). Estimating the Time to Which Brass Estimates Apply. Annex I to Fine-Tuning Brass-Type Mortality Estimates with Data on Ages of Surviving Children, by Samuel Preston and Alberto Palloni in *Population Bulletin of the United Nations,* no. 10-1977. New York: United Nations.

Feeny, G. (1980). Estimating Infant and Childhood Mortality Under Conditions of Changing Mortality. *Population Studies.* 34 (1): 109-128.

Shryrock, H.S., and Siegel, J.S. (1971). *The Methods and Materials of Demography.* Washington, D.C.: U.S. Bureau of the Census.

Sullivan, J.M. (1972). Models for the Estimation of the Probability of Dying Between Birth and Exact Ages of Early Childhood. *Population Studies.* 26 (1): 79-97.

_____, Adlakha, A. L., and Suchindran, C.M. (1982). A Methodology for Studying the Levels, Time Trends and Determinants of Infant and Child Mortality with Data from the 1976 Jordan Fertility Survey. Department of Biostatistics, University of North Carolina. Paper presented at Population Association of America Meetings, Pittsburgh, April, 1983.

Trussell, T.J. (1975). A Re-estimation of the Multiplying Factors for the Brass Technique for Determining Survivorship Rates. *Population Studies*. 29 (1): 97-107.

POPLAB STAFF

James R. Abernathy, *Statistician*

Arjun L. Adlakha, *Demographer, Director*

Richard E. Bilsborrow, *Economist-Demographer*

LaVan Covert, *Secretary*

Michael O. Cushman, *Computer Programmer*

David C. Fugate, *Computer Programmer*

William D. Kalsbeek, *Sampling Statistician*

Connie A. Padgett, *Administrative Manager*

Jeremiah M. Sullivan, *Demographer*

Stephen E. Wilson, *Consultant*