COMPARATIVE STUDIES 2

FERTILITY

DHS Demographic and Health Surveys

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Demographic and Health Surveys
Comparative Studies No. 2

Fertility Levels and Trends

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Contents

Tables

Figures

Preface

An important part of the DHS program is the comparative analysis and further analysis of data obtained from DHS surveys. Standard recode files have been prepared for most surveys and researchers worldwide are encouraged to use the datasets for further analysis.

Much of the comparative analysis of DHS data, particularly for major topics such as fertility, mortality, contraceptive use, and maternal and child health, is being carried out by DHS staff in Columbia, Maryland. The results of these analyses are published in the *DHS Comparative Studies* series. A total of 15 *Comparative Studies* are planned.

The studies in the series are based on the standard recode files which were available in early 1990. These include datasets for 25 standard DHS surveys carried out from 1985 to 1989. Data for El Salvador, Ondo State (Nigeria), and Sudan may not be included in all reports because some of the El Salvador and Ondo State data are not comparable with data from other DHS surveys and the Sudan survey was not completed until mid-1990.

Reports in the *DHS Comparative Studies* series provide detailed tables and graphs comparing the results of DHS surveys for countries in sub-Saharan Africa, the Near East/North Africa, Asia, and Latin America/Caribbean. The reports also discuss various issues such as questionnaire comparability, survey procedures, and data quality. Where appropriate, data from previous survey programs, primarily the World Fertility Survey (WFS), are used to evaluate trends over time.

The *DHS Comparative Studies* series is intended to provide analysts and policymakers with readily available comparisons of data between countries. The studies will also be useful to others in the fields of international population and health.

During the second phase of the DHS program (1988-1993), data will be collected for a further 25 countries. An update of the comparative study of fertility (including data from DHS-II countries) will be published later in the program.

Martin Vaessen
Project Director

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1 Introduction

Data collected in previous international survey programs, such as the World Fertility Survey (WFS) and the Contraceptive Prevalence Surveys (CPS) established that, although fertility declines had occurred in many developing countries by the mid-1980s, the level of childbearing was still high and well above the replacement level (London et al., 1985). Fertility declines were particularly evident in some countries in Latin America and the Caribbean and in parts of Asia, the Near East, and North Africa. There was no evidence, however, to suggest that fertility was decreasing in sub-Saharan Africa and, in some cases, it even appeared that fertility had increased slightly. Data from the Demographic and Health Surveys (DHS) program provide an opportunity to examine fertility levels and trends in the mid- to late 1980s. In addition, by combining DHS data with earlier census and survey data, it is now possible to examine trends in fertility in some countries over a period of 20 or more years.

The purpose of this report is to analyze fertility levels and trends in 25 developing countries which took part in the Demographic and Health Surveys program. In addition to various measures of current and past fertility, the report presents information on two of the components that determine fertility–age at first birth and infertility. The report uses standard recode data files which were available at the time this report was prepared–for 13 African countries, 3 Asian countries, and 9 countries in Latin America and the Caribbean.

2 Fertility Levels

2.1 DATA AND MEASUREMENT OF RATES

The fertility rates presented here are based on data collected in the reproduction section of the DHS questionnaire. First, each woman was asked questions about the number of sons and daughters living with her, the number living elsewhere, and the number who had died. Next, a complete birth history (live births) was collected, including the sex and date of birth of each child and its survival status. If the child had died, the mother was asked the age at death. For children who were still alive at the time of the survey, information was collected on whether they were living with their mother.

Age-specific fertility rates (ASFR) are calculated from the birth history by dividing the number of births to women in a specified age group, during a specified time period, by the number of woman-years of exposure during the same period:

$$ASFR\ [i,t] = b[i,t]/e[i,t]$$

where i = five-year age groups 15-19 to 40-44, b[i,t] = births to women in age group i during time period t, and e[i,t] = woman-years of exposure among women in age group i during time period t. In surveys which included only ever-married women, the denominator of the rate is inflated to encompass all women, using the proportion ever married from the household schedule.

The total fertility rate (TFR) at time t is calculated by summing the age-specific fertility rates for five-yeas age groups and multiplying by 5, as follows:

$$TFR[t] = 5 \sum_{i=1}^{6} ASFR\ [i,t],$$

where i_1=15-19, i_2=20-24,...., i_6=40-44.

The total fertility rate represents the number of children an average woman would have from age 15 to age 44 if she experienced the age-specific fertility rates observed during the period for which the rate is calculated. The rates are calculated for women up to age 44 in order to minimize the bias introduced by truncation in the age group 45-49 for periods more than one year prior to the survey. The TFR is a synthetic cohort measure and, thus, does not represent the experience of any real age cohort. The mean number of children ever born by age is presented here as a measure of real cohort experience.

Duration-specific marital fertility rates and total marital fertility rates are calculated in the same manner except that the calculations are restricted to ever-married women, and births and exposure are summed over five-year groups of duration since first marriage, instead of age. It is not possible to estimate fertility rates which include only exposure within marriage because a complete marriage history was not collected in DHS surveys. Thus, the marital fertility rates presented in this report may underestimate the true level of fertility within marriage.

2.2 AGE-SPECIFIC AND TOTAL FERTILITY RATES

Age-specific and total fertility rates for women 15-44 for the period 0-2 years prior to the survey[1] are presented in Table 2.1 and Figure 2.1. Overall, the total fertility rates range from 2.23 in Thailand to 7.20 in Uganda; however, there are large differences between regions. The three Asian countries have the lowest rates, 2.23 to 3.03 children per woman. The highest rates are found in sub-Saharan Africa where, with the exception of Botswana (4.68) and Zimbabwe (5.27), rates are all over 6.0 children per woman. In North Africa (Egypt, Morocco, and Tunisia), rates are lower, ranging from 4.13 to 4.51. Total fertility rates for Latin American and the Caribbean range from 3.05 in Trinidad and Tobago to 5.50 in Guatemala. Guatemala and Bolivia stand out as having significantly higher fertility than other countries in the region.

The age-specific fertility rates show that the largest differences between countries are generally found in the youngest and oldest age groups. In the youngest age group, the fertility rate is closely related to the age at which women first marry. For example, the fertility rate for women 15-19 in the sub-Saharan countries ranges from 51 in Burundi–a country with a median age at first marriage of over 19–to 206 in Mali, where the median age at marriage is under 16. Aside from Burundi, the rates for the youngest women are lowest in Morocco, Tunisia and the three Asian countries. The rate of teenage childbearing in Latin America falls between the high levels of sub-Saharan Africa and the low levels of North Africa and Asia. Among the Latin American countries, the highest levels of teenage fertility are found in Bolivia, the Dominican Republic, and Guatemala.

[1] These rates are based on births and exposure during the period 1-36 months prior to the interview.

Table 2.1 Total fertility rate for women 15-44 for the period 0-2 years prior to the survey, Demographic and Health Surveys, 1986-1989

Country	Year of Survey	Age-specific Fertility Rates (per 1000 women)						Total Fertility Rate (15-44)
		15-19	20-24	25-29	30-34	35-39	40-44	
SUB-SAHARAN AFRICA								
Botswana	1988	129	209	200	183	141	75	4.68
Burundi	1987	51	274	327	286	246	124	6.54
Ghana	1988	125	260	280	249	189	117	6.10
Kenya	1988/89	153	322	301	245	185	98	6.52
Liberia	1986	188	287	282	229	177	107	6.35
Mali	1987	206	302	299	268	205	108	6.94
Senegal	1986	154	270	271	261	196	89	6.21
Togo	1988	131	263	276	234	214	106	6.12
Uganda	1988/89	188	325	329	271	234	93	7.20
Zimbabwe	1988/89	102	251	250	212	158	80	5.27
NORTH AFRICA								
Egypt	1988/89	75	227	247	188	121	43	4.51
Morocco	1987	46	170	227	200	166	80	4.45
Tunisia	1988	27	156	234	222	130	56	4.13
ASIA								
Indonesia	1987	59	166	164	122	68	27	3.03
Sri Lanka	1987	32	140	160	112	67	22	2.67
Thailand	1987	53	125	128	73	46	20	2.23
LATIN AMERICA/CARIBBEAN								
Bolivia	1989	99	233	245	199	143	67	4.93
Brazil	1986	74	186	169	128	80	37	3.37
Colombia	1986	73	177	160	118	77	28	3.17
Dominican Republic	1986	100	202	195	127	71	32	3.64
Ecuador	1987	89	214	208	157	99	59	4.13
Guatemala	1987	134	268	263	206	148	82	5.50
Mexico	1987	86	214	212	149	105	33	3.99
Peru	1986	79	184	199	161	122	64	4.04
Trinidad & Tobago	1987	82	171	158	114	69	15	3.05

Large differences are also found at the upper end of the age range. Age-specific fertility rates for women 40-44 are less than 30 per thousand in Colombia, Indonesia, Sri Lanka, Thailand, and Trinidad and Tobago. In contrast, the rates exceed 100 per thousand in Burundi, Ghana, Liberia, Mali, and Togo, indicating that one out of every two women, on average, has a child during that period of her life.

Figure 2.2 shows the percentage contribution to the total fertility rate of fertility at ages 15-19, 20-34, and 35-44. The countries are arranged in order from lowest to highest total fertility. The figure suggests that countries may arrive at similar total fertility rates even though they have quite different age structures of fertility. For example, Ecuador and Tunisia have identical total fertility rates but fertility among teenagers constitutes 11 percent of the total in Ecuador and only 3 percent in Tunisia; fertility at age 35 and over contributes 19 percent to total fertility in Ecuador and 23 percent in Tunisia.

The contribution of women 20-34 varies little across countries, ranging from 63 percent in Mali to 77 percent in Sri Lanka. Botswana, the Dominican Republic, Liberia, Mali, Trinidad and Tobago, and Uganda are distinguished by large contributions (13 to 15 percent) at ages 15-19, while Burundi, Ghana, Morocco, and Togo are the only countries in which the contribution of women 35 and over amounts to one-quarter or more of the total fertility rate.

2.3 MARITAL FERTILITY RATES

Duration-specific and total marital fertility rates (TMFR) for the three years prior to the survey are shown in Table 2.2 and Figure 2.3. Marital fertility rates cumulated up to duration 29 years since first marriage vary between 2.85 in Thailand and 7.77 in Uganda. All of the sub-Saharan countries, except Botswana, have TMFRs over 6.0 children per woman. Relatively low marital fertility rates in Botswana may be the result of high levels of premarital childbearing and delayed entry into formal marriage

Figure 2.1 Total fertility rate (women 15-44) 0-2 years prior to the survey, Demographic and Health Surveys, 1986-1989

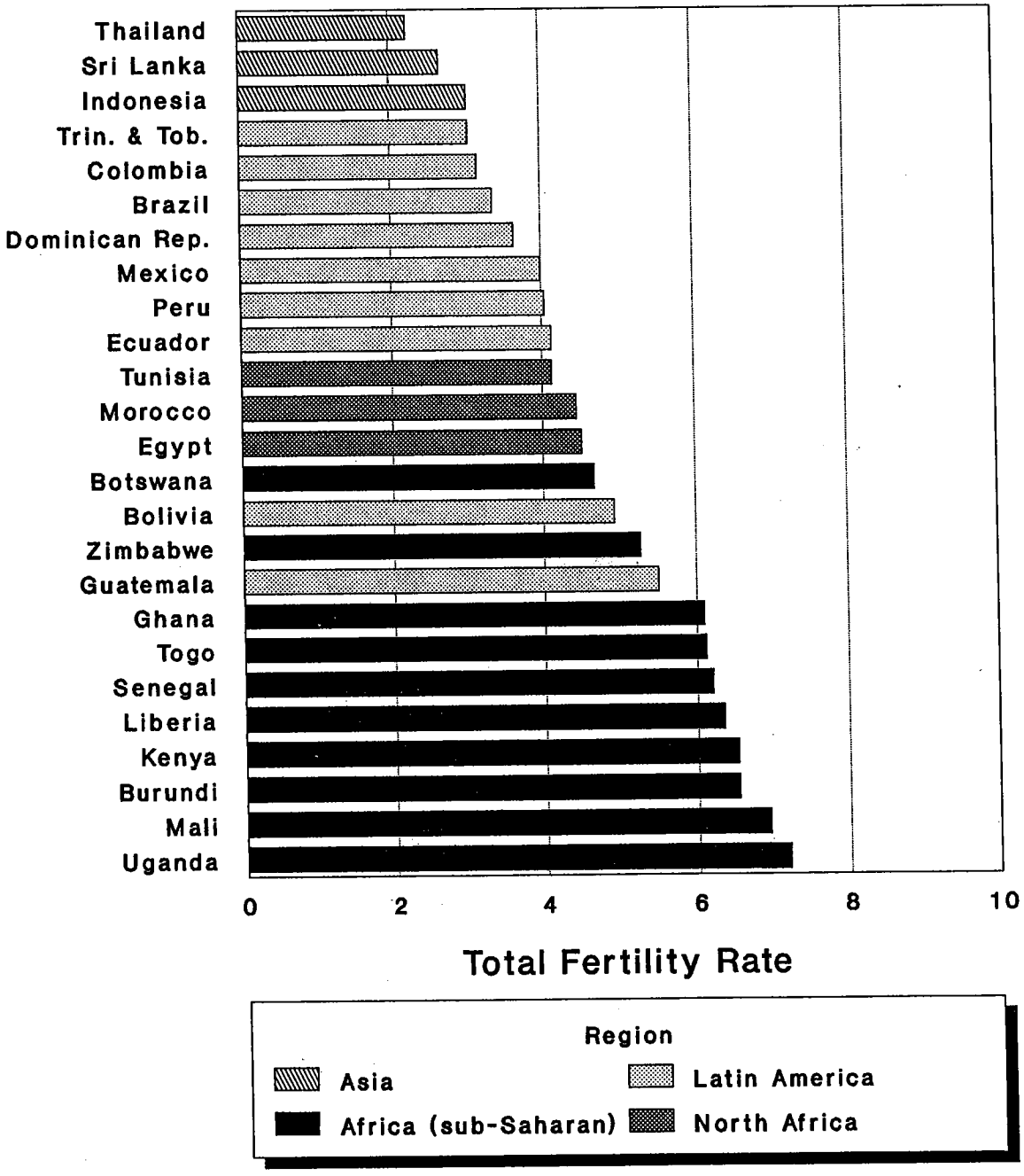
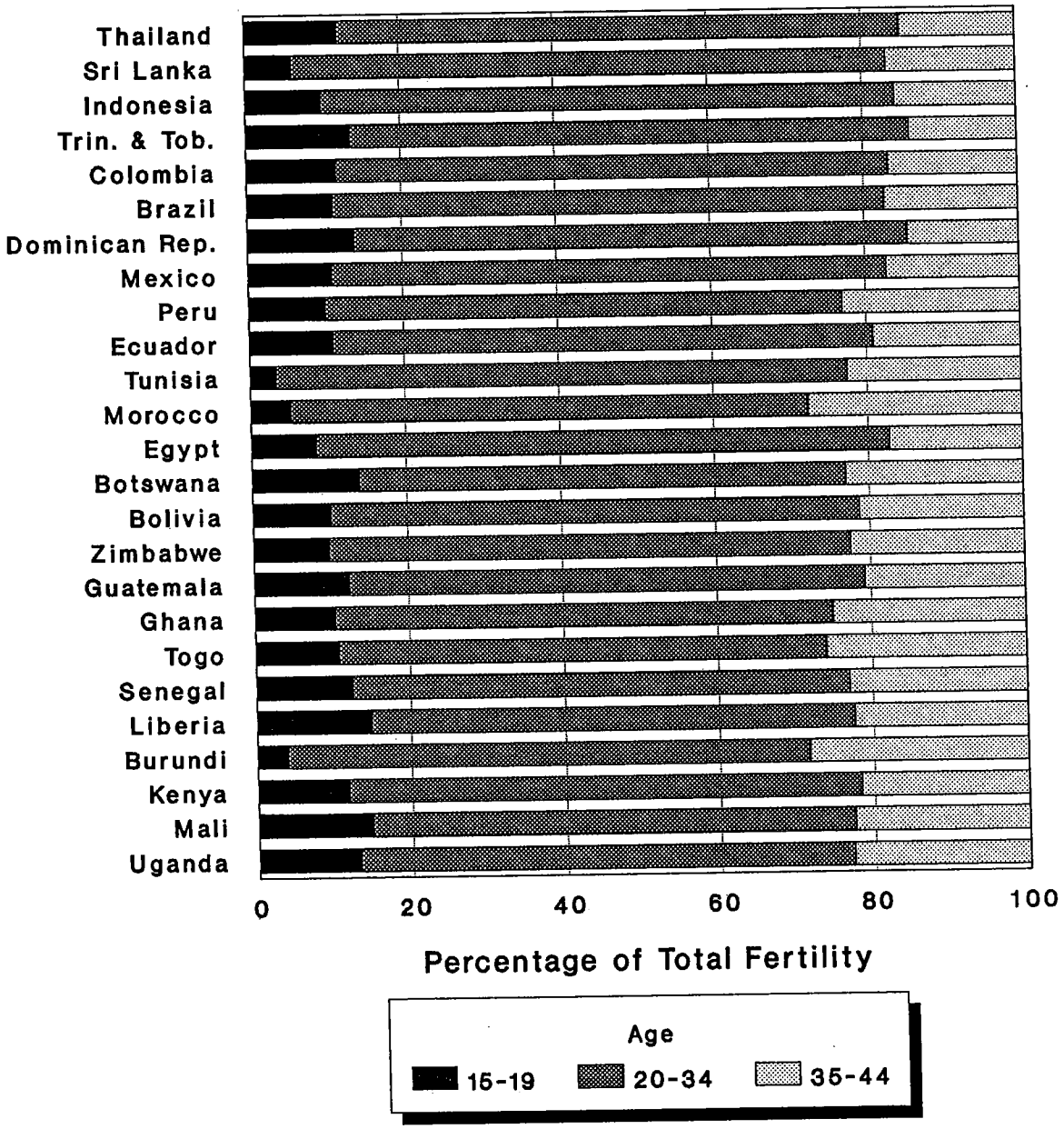


Figure 2.2 Percentage of total fertility, ages 15-19, 20-34, and 35-44, Demographic and Health Surveys, 1986-1989



Note: Countries are ordered according to total fertility rate.

(Lesetedi et al., 1989). Trinidad and Tobago also has unusually low marital fertility for its region; this is probably related to the large number of couples who live together without being married or who are involved in a visiting relationship (Heath et al., 1988). In Trinidad and Tobago, both types of relationships, which are characterized by lower fertility than formal marriages, are included in the calculation of marital fertility rates. This would tend to depress the overall level of marital fertility. Marital fertility in the Latin America/Caribbean region is between 3 and 5 births in all countries except Bolivia and Guatemala, where the marital fertility rate is 5.66 and 6.47, respectively.

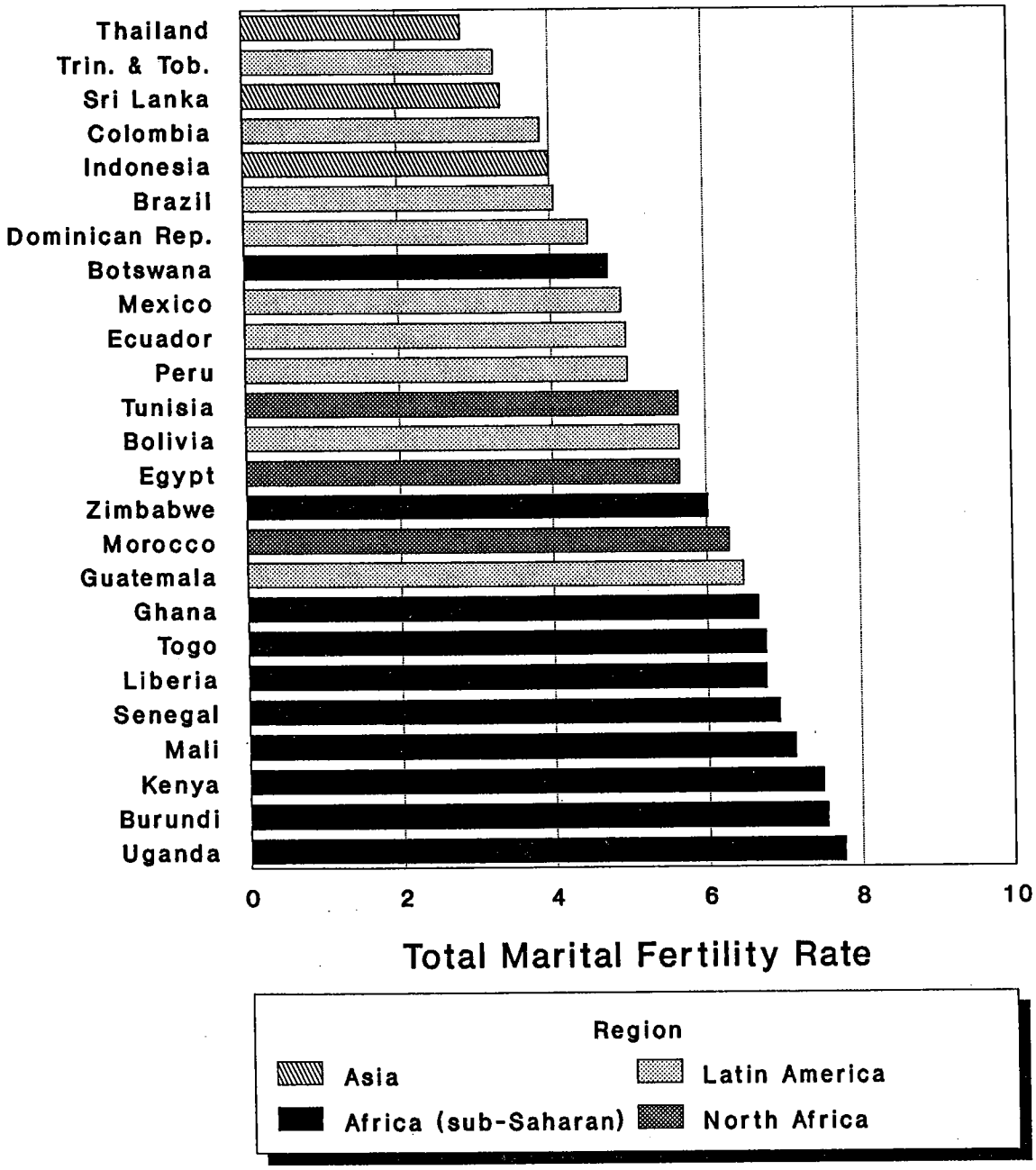
One striking difference between regions is the proportion of fertility which occurs in the first five years of marriage. In the sub-Saharan countries (and Morocco), between 20 and 30 percent of fertility during the 30 years since first marriage takes place during the first five years; for the countries of Latin America and the Caribbean (plus Egypt and Tunisia), this percentage is between 30 and 43 percent, and in the Asian countries, it is between 37 and 49 percent. Thus, there is a much greater concentration of fertility in the early years of marriage in Asia, Latin America, and the Caribbean. Marital fertility in sub-Saharan Africa is distributed more evenly among the marital duration groups.

Table 2.2 Total marital fertility rate and duration-specific marital fertility rate for the period 0-2 years prior to the survey, Demographic and Health Surveys, 1986-1989

Country	Year of Survey	Duration-specific Fertility Rates (per 1000 women)[a]						Total Marital Fertility Rate (0-29 years)
		0-4	5-9	10-14	15-19	20-24	25-29	
SUB-SAHARAN AFRICA								
Botswana	1988	279	205	188	146	94	40	4.76
Burundi	1987	390	343	314	250	155	59	7.55
Ghana	1988	322	296	264	228	140	81	6.66
Kenya	1988/89	447	331	275	225	154	70	7.50
Liberia	1986	336	287	276	222	131	102	6.76
Mali	1987	278	321	291	247	188	104	7.14
Senegal	1986	323	292	283	240	172	75	6.93
Togo	1988	341	279	271	240	162	60	6.76
Uganda	1988/89	397	336	312	255	187	68	7.77
Zimbabwe	1988/89	372	256	219	192	110	55	6.02
NORTH AFRICA								
Egypt	1988/89	376	270	211	153	89	33	5.66
Morocco	1987	323	287	247	193	139	68	6.29
Tunisia	1988	393	273	216	140	71	38	5.65
ASIA								
Indonesia	1987	294	188	132	100	60	24	3.99
Sri Lanka	1987	323	181	91	45	24	7	3.36
Thailand	1987	280	139	74	39	26	12	2.85
LATIN AMERICA/CARIBBEAN								
Bolivia	1989	413	266	194	139	84	36	5.66
Brazil	1986	323	186	119	75	55	53	4.05
Colombia	1986	337	177	116	91	38	16	3.88
Dominican Republic	1986	348	241	142	84	58	26	4.50
Ecuador	1987	371	231	158	111	79	48	4.98
Guatemala	1987	388	289	230	178	138	71	6.47
Mexico	1987	370	236	164	118	67	30	4.92
Peru	1986	376	219	158	134	71	41	5.00
Trinidad & Tobago	1987	247	185	111	78	27	7	3.27

[a] Duration (in years) since first marriage

Figure 2.3 Total marital fertility rate (0-29 years) 0-2 years prior to the survey, Demographic and Health Surveys, 1986-1989



Note: Rates are based on durations (0-29 years) since first marriage.

3 Children Ever Born and Children Surviving

Table 3.1 shows the mean number of children ever born (CEB) and the mean number surviving among all women. As expected, the number of children ever born increases across age cohorts. Among women 45-49, CEB is a measure of the completed fertility of this age cohort. Completed fertility ranges from a high of 7.77 children in Uganda to a low of 4.90 children in Sri Lanka. In all of the African countries except Botswana, the number of children ever born among women aged 45-49 exceeds 6.0. In the Latin American countries which included women up to age 49, this number also exceeds 6.0 in every country except Bolivia and Trinidad and Tobago. In the Asian countries, women who are at the end of their childbearing years have an average of 5.61 children in Indonesia and close to 5.0 children in Sri Lanka and Thailand.

The effect of mortality on completed family size can be seen in the difference between the mean number of children ever born and the number surviving. For example, in Mali women aged 45-49 have given birth to an average of 7.14 children; of these, only 4.32 or about 61 percent, were surviving at the time of the survey. In contrast, the mean number of children ever born in Tunisia is about one child less than in Mali, yet the number of children surviving is 0.7 children more than in Mali. The proportion of children surviving is greater among younger cohorts than among older. This pattern is partly due to the decrease in infant and child mortality rates in most countries and partly due to the longer average exposure to the risk of dying among children of older mothers.

Table 3.1 Mean number of children ever born and children surviving, by age of woman, Demographic and Health Surveys, 1986-1989

	Age of Woman						
Country	15-19	20-24	25-29	30-34	35-39	40-44	45-49
SUB-SAHARAN AFRICA							
Botswana							
Children ever born	0.26	1.17	2.55	3.70	5.09	5.42	5.75
Children surviving	0.25	1.11	2.39	3.48	4.67	4.90	5.20
Burundi							
Children ever born	0.04	0.89	2.66	4.22	5.61	6.57	7.27
Children surviving	0.03	0.78	2.22	3.48	4.54	4.98	5.39
Ghana							
Children ever born	0.22	1.25	2.65	4.18	5.47	6.58	7.25
Children surviving	0.20	1.08	2.26	3.50	4.57	5.39	5.65
Kenya							
Children ever born	0.28	1.58	3.47	5.01	6.47	7.36	7.63
Children surviving	0.25	1.44	3.19	4.49	5.80	6.53	6.55
Liberia							
Children ever born	0.46	1.76	3.17	4.19	5.32	5.87	6.75
Children surviving	0.38	1.39	2.42	3.25	3.94	4.32	4.67
Mali							
Children ever born	0.62	1.90	3.39	5.01	5.97	6.99	7.14
Children surviving	0.48	1.43	2.56	3.55	4.04	4.49	4.32
Senegal							
Children ever born	0.32	1.57	3.09	4.74	6.17	6.83	7.27
Children surviving	0.27	1.30	2.47	3.72	4.51	4.91	5.11
Togo							
Children ever born	0.26	1.38	2.87	4.60	5.73	6.89	7.28
Children surviving	0.23	1.21	2.46	3.76	4.65	5.35	5.58
Uganda							
Children ever born	0.39	1.86	3.65	5.04	6.79	7.24	7.77
Children surviving	0.34	1.53	3.00	4.10	5.55	5.76	5.97

Table 3.1–*Continued*

Country	Age of Woman						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Zimbabwe							
Children ever born	0.19	1.30	2.89	4.35	5.54	6.40	6.87
Children surviving	0.17	1.21	2.64	3.99	4.98	5.69	5.98
NORTH AFRICA							
Egypt							
Children ever born	0.10	1.02	2.48	3.76	5.16	5.80	6.14
Children surviving	0.09	0.90	2.14	3.19	4.25	4.55	4.65
Morocco							
Children ever born	0.06	0.67	2.12	3.81	5.20	6.69	7.34
Children surviving	0.05	0.60	1.88	3.31	4.46	5.60	5.97
Tunisia							
Children ever born	0.02	0.52	1.71	3.38	4.67	5.53	6.12
Children surviving	0.02	0.49	1.60	3.12	4.20	4.82	5.01
ASIA							
Indonesia							
Children ever born	0.11	0.96	2.20	3.37	4.27	5.19	5.61
Children surviving	0.10	0.87	1.95	2.95	3.66	4.32	4.55
Sri Lanka							
Children ever born	0.04	0.54	1.41	2.36	3.00	4.03	4.90
Children surviving	0.04	0.53	1.36	2.25	2.85	3.74	4.51
Thailand							
Children ever born	0.09	0.60	1.39	2.18	3.03	3.91	4.98
Children surviving	0.09	0.57	1.34	2.05	2.81	3.52	4.36
LATIN AMERICA/CARIBBEAN							
Bolivia							
Children ever born	0.18	1.07	2.58	3.72	4.54	5.43	5.89
Children surviving	0.16	0.95	2.25	3.15	3.87	4.38	4.52
Brazil							
Children ever born	0.13	0.88	1.90	2.94	3.82	4.65	NA
Children surviving	0.12	0.81	1.73	2.62	3.39	4.08	NA
Colombia							
Children ever born	0.13	0.91	1.92	2.82	3.80	4.87	6.12
Children surviving	0.12	0.87	1.82	2.66	3.48	4.44	5.42
Dominican Republic							
Children ever born	0.19	1.05	2.24	3.45	4.61	5.50	7.02
Children surviving	0.17	0.96	2.07	3.11	4.03	4.80	5.96
Ecuador							
Children ever born	0.18	1.04	2.38	3.45	4.46	5.40	6.03
Children surviving	0.16	0.97	2.18	3.07	3.86	4.70	5.02
Guatemala							
Children ever born	0.26	1.46	3.00	4.30	5.20	5.87	NA
Children surviving	0.24	1.32	2.62	3.75	4.41	4.96	NA
Mexico							
Children ever born	0.18	1.07	2.33	3.51	4.30	5.43	6.38
Children surviving	0.17	1.02	2.19	3.20	3.87	4.88	5.51
Peru							
Children ever born	0.14	0.87	2.21	3.50	4.88	5.73	6.34
Children surviving	0.12	0.79	1.99	3.07	4.19	4.79	5.22
Trinidad & Tobago							
Children ever born	0.14	0.89	1.86	2.69	3.24	3.87	4.95
Children surviving	0.13	0.85	1.80	2.60	3.05	3.64	4.63

NA = Not available

4 Fertility Trends

4.1 INTRODUCTION

The assessment of fertility trends is one of the most important objectives of demographic surveys. Since a decline in fertility is the primary goal of most national family planning programs, reliable data on the current level of fertility, as well as past levels, are critical for monitoring change. In countries where censuses or vital registration systems are absent or incomplete, surveys often provide the most reliable fertility data available. The availability of survey data for the estimation of fertility trends has increased significantly since the mid-1970s as a result of international survey programs, such as the World Fertility Survey (WFS), the Contraceptive Prevalence Surveys (CPS) and the Demographic and Health Surveys (DHS).

One advantage of using survey data to estimate trends in fertility is that, when a complete birth history is collected from female respondents, it is possible to examine trends using a single survey. This feature of survey data is especially important in countries where vital registration is incomplete or a series of population censuses and surveys does not exist. Where a series of surveys does exist, birth history data can be used to evaluate long-term fertility trends and fertility rates for overlapping time periods.

The main disadvantage of measuring fertility trends with birth history data is that they depend on complete and accurate reporting by women of their own birth dates and the birth dates of their children. Birth history data are known to suffer from several types of errors which directly affect the assessment of trends. These errors are described in detail elsewhere (see e.g., Chidambaram et al., 1980; Goldman et al, 1985; United Nations, 1987) and their occurrence in DHS surveys has been evaluated (Arnold, 1990). The following is a summary of the results of the analysis of the quality of DHS birth history data as they affect the assessment of fertility trends.[2]

Differential rates of omission of births by older and younger respondents will affect fertility trends as estimated from a survey. Undercoverage of births is typically greater for older women and for births that occurred further in the past. The evaluation of the extent of this problem in DHS surveys uncovered no evidence of gross underreporting of births in any country. There is some evidence of selective omission of female births 25 or more years before the survey in Burundi, Mali, and the Dominican Republic, but the large sampling errors associated with these estimates make firm conclusions about selective omission impossible. In addition, the patterns of age at first birth across age cohorts suggest that some omission of early births or displacement of births forward in time by older women has occurred in half of the surveys, predominantly those in sub-Saharan Africa. However, these problems are generally restricted to the cohort of women 40-49; consequently, they affect fertility primarily for periods 15 or more years before the surveys (Blanc and Rutenberg, 1990).

Displacement of births in time is potentially a greater problem for the estimation of trends in fertility than is the omission of births. Several DHS surveys show evidence of significant shifting of births from the calendar year five years prior to the survey to the calendar year six years prior to the survey. This type of displacement is most likely the result of interviewers increasing the age of children in order to avoid asking an extensive series of questions related to the health status of children born since January 1 of the fifth year before the survey. For most of the surveys conducted in Asia, Latin America and the Caribbean, there is little indication that displacement of this type has occurred, except in Guatemala. The problem is much more severe, however, in the majority of African countries, especially Botswana, Burundi, Liberia, Mali, and Togo.

The consequences of this type of displacement for the analysis of trends in fertility are potentially important if births are shifted across the time boundary used in the calculation of the fertility rates. Thus, a fertility rate based on births in the five years (60 months) prior to the survey will be affected by births transferred across the five-year boundary. The effect will be more pronounced if the survey is conducted in the beginning of the year because in these surveys most of the oldest children eligible for inclusion in the health section are four years old (i.e., between 48 and 59 months old). If their age is increased by one year, they will be transferred across the five year boundary. For surveys conducted late in the year, the problem is less severe because most of the oldest children eligible for inclusion are already 5 years old; if their age is increased by one year, they are not transferred across the boundary. In spite of the relatively large number of births displaced in some countries, it should be noted that the effect on total fertility is comparatively minor. For example, in the absence of any displacement, the total fertility rate for the most recent five-year period in Liberia,

[2] The data quality analysis does not include Bolivia, Egypt or Kenya since these data sets were not available at the time the analysis was conducted.

the country with the most displacement, would have been 6.5 instead of 6.3.

Although it is conventional to report period fertility rates for five-year periods, the displacement problem in some DHS countries would lead to a misleading impression of the magnitude of fertility decline over the period from 5-9 to 0-4 years prior to the survey. As a result, four-year periods are used throughout this section. The use of four-year rates should minimize the effects of displacement since, for most of the children, shifting their birth date will not cause them to be transferred across the boundary; i.e., most of the shifting should take place within the period 4-7 years prior to the survey. One drawback of using four-year rates, however, is that the level of precision associated with these rates is less than that associated with five-year rates. Sampling errors estimated for the four-year rates according to a procedure proposed by Little (1982)[3] are given for each country in the Appendix. The magnitude of the sampling errors ranges from 1 to 6 percent of the total fertility rate[4] and averages about 2.0 percent for the period 0-3 years prior to the survey and 2.3 percent for the period 4-7 years prior to the survey. Given the small size of the sampling errors, the four-year rates are judged to be acceptably precise for the analysis of trends in fertility at the national level. The sampling errors are used here to assess the statistical significance of differences between rates.[5] It should be noted, however, that non-sampling errors, such as age misreporting, may also produce distortions in the trend data.

4.2 RECENT FERTILITY CHANGE

Table 4.1 shows total fertility rates (TFR) for women 15-44 for two periods: 0-3 years prior to the survey and 4-7 years prior to the survey. It should be noted that the rate for the earlier period is based on data that are partially truncated beginning in the sixth year prior to the survey. Table 4.1 also indicates whether the rates for the two periods are significantly different, based on the sampling errors.

A decline of 15 percent or more in the total fertility rate has occurred over this short period in 13 of 25 countries. In five countries—Colombia, Ecuador, Indonesia, Peru, and Thailand—a decline of more than 20 percent is recorded. In absolute terms, the total fertility rate declined by more than one child in Ecuador, Indonesia, Morocco, Peru, Senegal, and Zimbabwe. Eight other countries experienced declines of at least 0.8 children.

All of the countries in Latin America and the Caribbean experienced fertility decreases during this period, ranging from 2 percent in Trinidad and Tobago to 21 percent in Colombia and Ecuador. The decline is statistically significant in every country except Trinidad and Tobago, which had the lowest TFR in both periods. The three Asian countries and the three North African countries also show statistically significant declines of between 7 and 26 percent.

The rates shown in Table 4.1 for sub-Saharan Africa suggest that a recent decline in fertility has occurred in all countries, except Uganda. The declines in Ghana and Liberia are very small—less than 6 percent—and not statistically significant. In the remaining countries, larger declines of 9 to 19 percent are recorded. In Botswana, Kenya and Zimbabwe these are probably attributable to moderately high and increasing proportions of women using modern contraception. Significant declines in fertility of more than 10 percent are also observed in Burundi, Mali, Senegal and Togo. Since fewer than 4 percent of married women in these countries use modern contraception, further investigation of fertility trends is merited.

In Senegal, the TFR is 7.55 for the period 4-7 years prior to the survey and 6.37 for the period 0-3 years prior to the survey, a decline of 1.18 children or 15.6 percent over the period. Overall, 11.4 percent of married women in Senegal reported current use of a method of contraception; 2.4 percent were using a modern method and the remaining 9.0 percent were using a traditional method, mainly prolonged abstinence. This is a substantial increase over the 3.9 percent prevalence rate for all methods reported in the 1978 WFS survey. The median age at marriage in Senegal has increased steadily from 16.1 years among women 40-44 to 17.2 among women 20-24. Age at first birth increased by less than half a year across the same age cohorts (Ndiaye et al., 1988).

The increase in age at marriage in Senegal suggests that declines in fertility should have occurred in the youngest age groups. The evidence on this point is inconclusive, however. DHS birth history data show declines over the

[3] The procedure is based on applying the estimated design effect of the general fertility rate to the standard error of the total fertility rate for a simple random sample.

[4] In Brazil and Guatemala, the relative errors for the earlier of the two periods are 6 and 5 percent, respectively. These errors are larger than those for other countries because these samples included women aged 15-44 rather than 15-49; thus, the earlier of the two rates is based on relatively few women.

[5] Note that the sampling errors are used to assess the statistical significance of the **absolute** difference between two rates. This does not necessarily imply that the relative (e.g., percentage) changes in rates are significant (Kish, 1965).

Table 4.1 Total fertility rate for women 15-44 for the periods 0-3 and 4-7 years prior to the survey, Demographic and Health Surveys, 1986-1989

Country	Year of Survey	Total Fertility Rate (Women 15-44) 0-3 Years Prior to Survey	Total Fertility Rate (Women 15-44) 4-7 Years Prior to Survey	Absolute Change	Percent Change
SUB-SAHARAN AFRICA					
Botswana	1988	4.78	5.56	-0.78*	-14.0
Burundi	1987	6.50	7.42	-0.92*	-12.4
Ghana	1988	6.06	6.43	-0.37	-5.8
Kenya	1988/89	6.46	7.09	-0.63*	-8.9
Liberia	1986	6.39	6.79	-0.40	-5.9
Mali	1987	6.84	7.70	-0.86*	-11.2
Senegal	1986	6.37	7.55	-1.18*	-15.6
Togo	1988	6.22	7.17	-0.95*	-13.3
Uganda	1988/89	7.18	7.11	+0.07	+1.0
Zimbabwe	1988/89	5.31	6.55	-1.24*	-18.9
NORTH AFRICA					
Egypt	1988/89	4.58	4.94	-0.36*	-7.3
Morocco	1987	4.58	5.63	-1.05*	-18.7
Tunisia	1988	4.26	5.07	-0.81*	-16.0
ASIA					
Indonesia	1987	3.21	4.32	-1.11*	-25.7
Sri Lanka	1987	2.72	3.31	-0.59*	-17.8
Thailand	1987	2.25	2.94	-0.69*	-23.5
LATIN AMERICA/CARIBBEAN					
Bolivia	1989	4.92	5.52	-0.60*	-10.9
Brazil	1986	3.63	4.50	-0.87*	-19.3
Colombia	1986	3.20	4.04	-0.84*	-20.8
Dominican Republic	1986	3.69	4.55	-0.86*	-18.9
Ecuador	1987	4.08	5.16	-1.08*	-20.9
Guatemala	1987	5.55	6.53	-0.98*	-15.0
Mexico	1987	4.01	4.52	-0.51*	-11.3
Peru	1986	4.20	5.28	-1.08*	-20.5
Trinidad & Tobago	1987	3.12	3.39	-0.08	-2.4

* Rates for the two periods are significantly different at the 5 percent level.

period from 4-7 to 0-3 years prior to the survey ranging from 11.5 percent for age group 15-19 to 16 percent for age group 35-39 and a decline of 35.1 percent among the oldest women (40-44) (see Table 4.2). A comparison of age-specific fertility rates for the period 0-4 years prior to the DHS survey and the WFS survey (1978), however, shows declines of 8 to 16 percent in the first three age groups and no change in the next three age groups.

As noted previously, misreporting of children's birth dates is a factor which can distort fertility trends. In Senegal, there is strong evidence that the number of children reported as born in the fifth year prior to the survey is underreported and the number of children born in the sixth year is overreported. This is especially true for dead children and children whose month of birth was not reported. While the calculation of TFRs for the periods 0-3 and 4-7 years prior to the survey should minimize the effects of the transference of births from 5 to 6 years prior to the survey, it is also possible that some births were displaced by more than a year. Faced with the problem of estimating the birth date of a child, especially a dead child, whose mother has no idea of the true date, it appears that the interviewers often opted to estimate an age or year of birth which would allow them to avoid asking a long series of questions regarding children born in the last 5 years. Although it is usually possible to detect the transference of births from 5 to 6 years before the survey, displacement of births by more than one year is more difficult to determine. However, it seems likely that in countries where the one-year displacement problem is severe, some births may also have been shifted by more than one year.

Table 4.2 Age-specific fertility rates (per 1000 women) for the periods 0-3 and 4-7 years prior to the survey, Demographic and Health Surveys, 1986-1989

Country	Age of Woman					
	15-19	20-24	25-29	30-34	35-39	40-44
SUB-SAHARAN AFRICA						
Botswana						
0-3 Years	127	213	202	187	146	82
4-7 Years	136	238	235	236	157	111
% Change	-6.6	-10.5	-14.0	-20.8	-7.0	-26.1
Burundi						
0-3 Years	51	268	321	290	241	129
4-7 Years	84	286	346	327	263	176
% Change	-39.3	-6.3	-7.2	-11.3	-8.4	-26.7
Ghana						
0-3 Years	130	258	279	243	186	116
4-7 Years	123	258	278	271	223	135
% Change	+5.7	0.0	+0.4	-10.3	-16.6	-14.1
Kenya						
0-3 Years	153	314	295	248	184	98
4-7 Years	175	320	308	282	210	123
% Change	-12.6	-1.9	-4.2	-12.1	-12.4	-20.3
Liberia						
0-3 Years	188	290	275	226	185	116
4-7 Years	193	293	274	252	187	158
% Change	-2.6	-1.0	+0.4	-10.3	-1.1	-26.6
Mali						
0-3 Years	209	288	293	266	199	114
4-7 Years	215	333	334	288	230	140
% Change	-2.8	-13.5	-12.3	-7.6	-13.5	-18.6
Senegal						
0-3 Years	161	274	274	265	200	100
4-7 Years	182	310	325	301	238	154
% Change	-11.5	-11.6	-15.7	-12.0	-16.0	-35.1
Togo						
0-3 Years	129	269	277	244	215	111
4-7 Years	147	301	303	286	237	160
% Change	-12.2	-10.6	-8.6	-14.7	-9.3	-30.6
Uganda						
0-3 Years	186	325	322	275	230	98
4-7 Years	200	326	305	283	196	114
% Change	-7.0	-0.3	+5.6	-2.8	+17.4	-14.0
Zimbabwe						
0-3 Years	103	247	246	222	160	85
4-7 Years	134	294	303	260	208	111
% Change	-23.1	-16.0	-18.8	-14.6	-23.1	-23.4
NORTH AFRICA						
Egypt						
0-3 Years	79	234	251	191	117	44
4-7 Years	102	244	268	202	126	48
% Change	-22.5	-4.1	-6.3	-5.4	-7.1	-8.3
Morocco						
0-3 Years	48	177	231	206	166	86
4-7 Years	76	240	263	253	183	112
% Change	-36.8	-26.3	-12.2	-18.6	-9.3	-23.2
Tunisia						
0-3 Years	29	162	242	225	133	60
4-7 Years	33	201	286	237	174	83
% Change	-12.1	-19.4	-15.4	-5.1	-23.6	-27.7
ASIA						
Indonesia						
0-3 Years	65	179	170	127	71	30
4-7 Years	113	227	213	157	103	50
% Change	-42.5	-21.2	-20.2	-19.1	-31.1	-40.0
Sri Lanka						
0-3 Years	34	144	158	117	68	23
4-7 Years	47	160	190	150	87	29
% Change	-27.7	-10.0	-16.8	-22.0	-21.8	-20.7
Thailand						
0-3 Years	52	127	127	75	50	19
4-7 Years	61	168	143	107	72	38
% Change	-14.8	-24.4	-11.2	-29.9	-30.6	-50.0
LATIN AMERICA/CARIBBEAN						
Bolivia						
0-3 Years	95	226	247	199	144	73
4-7 Years	112	261	250	220	169	91
% Change	-15.2	-13.4	-1.2	-9.5	-14.8	-19.8
Brazil						
0-3 Years	76	195	186	136	92	41
4-7 Years	87	215	216	170	105	107
% Change	-12.6	-9.3	-13.9	-20.0	-12.4	-61.7
Colombia						
0-3 Years	74	179	163	117	78	28
4-7 Years	99	207	201	141	98	60
% Change	-25.3	-13.5	-18.9	-17.0	-20.4	-53.3
Dominican Republic						
0-3 Years	103	208	192	127	76	32
4-7 Years	111	224	225	160	120	70
% Change	-7.2	-7.1	-14.7	-20.6	-36.7	-54.3
Ecuador						
0-3 Years	86	209	208	150	103	59
4-7 Years	119	261	235	187	147	83
% Change	-27.7	-19.9	-11.5	-19.8	-29.9	-28.9
Guatemala						
0-3 Years	136	271	262	205	153	83
4-7 Years	169	301	297	254	183	102
% Change	-19.5	-10.0	-11.8	-19.3	-16.4	-18.6

Table 4.2–*Continued*

Country	Age of Woman					
	15-19	20-24	25-29	30-34	35-39	40-44
Mexico						
0-3 Years	90	215	207	151	104	36
4-7 Years	115	232	215	163	122	57
% Change	-21.7	-7.3	-3.7	-7.4	-14.8	-36.8
Peru						
0-3 Years	80	188	202	175	131	65
4-7 Years	103	233	255	204	157	103
% Change	-22.3	-19.3	-20.8	-14.2	-16.6	-36.9
Trinidad & Tobago						
0-3 Years	85	177	162	112	70	18
4-7 Years	93	207	188	108	63	19
% Change	-8.6	-14.5	-13.8	+4.7	+11.1	-5.3

The increase in contraceptive use and age at first marriage is consistent with the small and very recent decline in fertility in Senegal. As a result of misreporting, however, the magnitude of the decline is probably overestimated in the DHS survey.

In Mali, there is a decline of 11.2 percent in the TFR for the periods 0-3 and 4-7 years prior to the survey. (The only previous national estimate of the total fertility rate for Mali is 7.24 for 1960-61 (Traoré et al., 1989).) The decline is negligible in the age group 15-19, relatively uniform among women 20-39 (8 to 14 percent) and largest among women 40-44 (19 percent). The percentage of married women using modern contraception is 1.3 percent with an additional 7.9 percent reporting use of a traditional method. Overall, only 29 percent of currently married women reported knowledge of a modern method, by far the lowest level of knowledge of contraception in any DHS country. Age at first marriage has remained low and stable at around 15.8 years and age at first birth has an erratic pattern across age cohorts.

Displacement of births in the Mali survey is severe and there is an inexplicably large number of births reported to have occurred in the year prior to the survey. As in Senegal, the displacement of births is particularly noticeable for dead children and those whose month of birth was not known. In addition, the Mali survey shows some evidence of forward displacement of births among older women resulting in an age at first birth for women 45-49 which is 1.7 years greater than that for women 40-44.

In Burundi, the TFRs show a decline in fertility of 0.92 births or 12.4 percent over the period from 4-7 to 0-3 years prior to the survey. As in the case of Mali, there is little evidence to explain such a decline. Age at first marriage and age at first birth are stable across age cohorts, and modern methods of contraception are used by only 1.2 percent of married women (Segamba et al., 1988). As in Senegal and Mali, there is a noticeable increase in the number of births in Burundi reported to have occurred in the sixth year prior to the survey.

A decline in recent fertility of 13.3 percent is estimated for Togo. The decline ranges from 9 to 15 percent among women 15-39 and is 31 percent among women 40-44. The use of modern contraception among married women in Togo is very low at 3.1 percent but 30.1 percent report using traditional methods. Most of the traditional use is attributable to prolonged (21.8 percent) and periodic (6.4 percent) abstinence. There is evidence of a small increase in age at first marriage in Togo but not in age at first birth (Agounké et al., 1989). The displacement of births from the fifth to the sixth year prior to the survey is also evident in Togo. In addition, there is a peak in the number of births in 1984 (the fourth year prior to the survey) which may be a consequence of the fact that children under age three (born after June 1985) were required to have anthropometric measurements taken. As in the case of displacement from the fifth to the sixth year, some shifting of births may have occurred as a result of the interviewers' desire to avoid the extra work required to measure young children.

Fluctuations in period fertility rates can occur as a result of shifts in the timing or spacing of births and do not necessarily signal the beginning of a sustained decline in completed family size. Examination of the cumulative fertility of successive age cohorts in Burundi, Mali, Senegal and Togo shows an erratic pattern for most age groups. There is no evidence of a consistent decline in cohort fertility.

Information on fertility preferences can also add to the analysis of fertility trends in these countries. The proportion of married women who want to wait at least 2 years before having another birth ranges from 32 percent in Mali to 53 percent in Togo (not available for Senegal) while the percent who want no more children is much lower, ranging from 17 percent in Mali to 25 percent in Togo. In contrast, the percentage of married women who want no more children in Botswana, Kenya, and Zimbabwe ranges from 32 to 49 percent while the percent who want to delay the next birth is between 26 and 35 percent. These differences suggest that the desire to limit family size is much less common in Burundi, Mali, Senegal and Togo than in Botswana, Kenya, and Zimbabwe while the desire to space births is more common.

In light of the misreporting evident in these four surveys, the low level of contraceptive use and the lack of change in such determinants of fertility as age at first marriage (except in Senegal) and age at first birth, it is difficult to conclude that completed family size has decreased appreciably. Recent changes in the timing of births could have contributed to temporary fluctuations in period fertility rates. The relative uniformity of decline in fertility rates across age groups is consistent with this interpretation. The declines recorded in the DHS surveys in these countries are most likely the result of both period changes in fertility rates and data errors. However, it is difficult to identify the specific effects of the two factors, especially since previous national level surveys in Burundi, Mali, and Togo (for comparison) are lacking.

Table 4.2 shows age-specific fertility rates for the two calendar periods. In countries where a significant decline in fertility has occurred, the reduction is most evident in the youngest and oldest age groups. For example, over the period covered by the two rates, the age-specific fertility rate for women 40-44 has decreased by one-third or more in Brazil, Colombia, the Dominican Republic, Indonesia, Mexico, Peru, Senegal, and Thailand. In fact, in all of the countries, declines ranging from 5 percent in Trinidad and Tobago to 62 percent in Brazil occurred in this age group. A change in the fertility of women 15-19 is also a significant factor in most of the countries in which a drop in fertility has occurred. In Morocco, fertility among teenagers decreased by about 37 percent or 28 births per 1000 women. In Indonesia, the age-specific fertility rate for women 15-19 was 113 in the period 4-7 years before the survey and 65 in the period 0-3 years before the survey (a 43 percent decline). Indonesia, Peru, and Zimbabwe are distinguished by the fact that substantial declines occurred in all age groups. All of the age-specific fertility rates in these three countries show declines of more than 14 percent over the two periods.

4.3 LONG-TERM FERTILITY DECLINE

Trends in fertility for about fifteen years preceding a survey can be assessed using the data obtained in the birth history. Table 4.3 shows total fertility rates for women 15-34 for four-year periods prior to the survey. Rates are cumulated only up to age 34 in order to avoid truncation bias. It should be noted, however, that limiting the rates to women 15-34 will tend to underestimate the extent of overall fertility decline because it excludes the older age groups in which fertility has generally decreased the most.

In the majority of the countries in Latin America and the Caribbean, fertility up to age 34 has declined steadily over the last fifteen years. Comparing the total fertility rate for the period 12-15 years before the survey to the rate for the most recent four-year period, the countries fall into two groups. There were relatively small reductions of 13-15 percent in Bolivia, Guatemala and Trinidad and Tobago. The rest of the countries experienced a decrease of 24-34 percent between the two periods. The pace of decline seems to have been relatively steady in the Dominican Republic, Ecuador, and Mexico. Larger declines in the recent past compared with the more distant past appear in Brazil, Colombia, and Peru.

Table 4.3 Total fertility rates for women 15-34 for the periods 0-3, 4-7, 8-11 and 12-15 years prior to the survey, Demographic and Health Surveys, 1986-1989

	Years Prior to the Survey			
Country	0-3	4-7	8-11	12-15
SUB-SAHARAN AFRICA				
Botswana	3.64	4.22	4.67	4.86
Burundi	4.65	5.22	4.92	5.01
Ghana	4.55	4.65	4.88	5.11
Kenya	5.05	5.42	5.84	6.19
Liberia	4.89	5.06	4.90	4.70
Mali	5.28	5.85	5.69	5.35
Senegal	4.87	5.59	5.43	5.56
Togo	4.59	5.19	5.14	5.51
Uganda	5.54	5.57	5.91	6.07
Zimbabwe	4.09	4.96	5.00	5.30
NORTH AFRICA				
Egypt	3.78	4.08	4.41	4.90
Morocco	3.31	4.16	4.67	5.11
Tunisia	3.29	3.78	4.11	4.32
ASIA				
Indonesia	2.70	3.55	3.93	4.42
Sri Lanka	2.27	2.73	2.95	3.14
Thailand	1.91	2.39	2.86	3.56
LATIN AMERICA/CARIBBEAN				
Bolivia	3.84	4.22	4.68	4.43
Brazil	2.96	3.44	3.55	3.90
Colombia	2.67	3.24	3.40	3.85
Dominican Rep.	3.15	3.60	4.11	4.77
Ecuador	3.26	4.01	4.19	4.81
Guatemala	4.37	5.10	5.03	5.05
Mexico	3.31	3.63	4.21	4.83
Peru	3.22	3.98	4.43	4.77
Trinidad & Tobago	2.68	2.98	2.86	3.16

In the three Asian countries, large fertility declines are evident during the last fifteen years. In Thailand, the total fertility rate for the most recent period is 46 percent lower than the rate for the period 12-15 years prior to the survey.

In Sri Lanka and Indonesia, the TFRs declined over the same period by 28 and 39 percent, respectively. The largest declines in fertility in Indonesia and Sri Lanka have occurred within the last eight years whereas, in Thailand, declines of 16-20 percent have occurred in each of the four-year periods.

The long-term trend in the three North African countries–Egypt, Morocco and Tunisia–is a clear and steady decline in fertility. In sub-Saharan Africa, however, the picture is mixed and rendered difficult to interpret by evidence of the displacement of births. In 5 of the 10 sub-Saharan countries, the TFR for the period 4-7 years prior to the survey is higher than the TFR for both the preceding and the succeeding periods. Thus, it appears that there was a temporary increase in fertility around that time followed by a decrease. This pattern is one that is often found in birth history data from developing countries and is thought to result from the forward displacement in time of births among older women in combination with accurate reporting among younger women. While it is possible that a temporary increase in fertility actually occurred, as a result of decreases in breastfeeding or secondary sterility, for example, it is more likely that birth displacement is the principal factor. Hence, some caution should be used in evaluating these data.

There are three countries in sub-Saharan Africa–Botswana, Kenya, and Zimbabwe–in which long-term declines in fertility up to age 34 appear to have taken place. In Botswana and Zimbabwe, the decline over the period is 25 and 23 percent, respectively. In both countries, this amounts to a decrease in the total fertility rate of about 1.2 (for women 15-34). In Kenya, the decline is more modest, amounting to 18 percent in a period of about 12 years.

Among the remaining sub-Saharan countries, small but consistent declines appear in Ghana and Uganda. In Burundi, Mali, Liberia, Senegal, and Togo the patterns over time are more irregular and the apparent extent of birth displacement is greater. In every country except Liberia and Mali, however, there is evidence that fertility up to age 34 is somewhat lower now than in the past.

4.4 FERTILITY TRENDS IN DHS AND OTHER DATA

In Figure 4.1, the TFRs for women 15-34 are shown along with comparable data from a previous survey or census, where possible.[6] The figure is intended to examine the trend in fertility for a longer period than is possible with DHS data alone.

The six countries of sub-Saharan Africa for which previous estimates of fertility are available show that little or no fertility decline occurred prior to 1980. Fertility in Botswana, Kenya, Zimbabwe, and possibly Senegal, has decreased since the late 1970s and early 1980s, while it has remained high and fairly stable in Mali and Ghana since the early to mid-1960s. The picture is quite different in the three North African countries, however. By combining data from the WFS and the DHS, a series of fertility rates can be estimated covering more than twenty years. In all three countries, the TFR for women 15-34 was around 5.5 in the mid-1960s. It declined to slightly over 3.0 in the mid- to late 1980s in Morocco and Tunisia and 3.8 in Egypt.

Fertility has been declining steadily in the three Asian countries for about the last twenty years. The trend in Thailand has been particularly dramatic; the TFR in 1966 indicated that women would have an average of 4.8 children by the age of 35, while in 1985 this number was only 1.9. Thus, fertility up to age 35 in Thailand has declined by more than half in the last twenty years. Indonesia (Java-Bali) and Sri Lanka have also experienced rapid declines, with fertility dropping by about half over the same period.

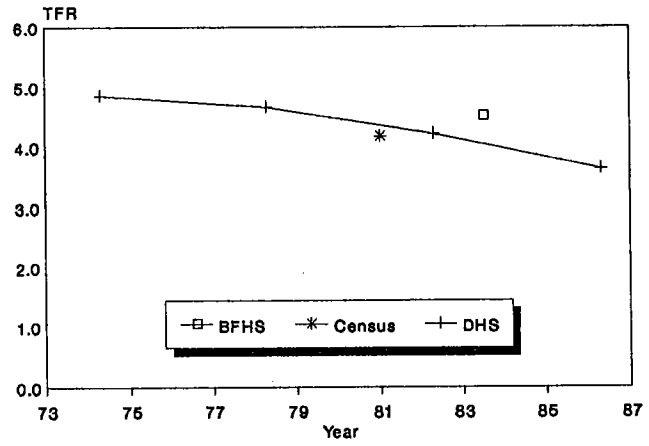
Among the countries in Latin America and the Caribbean, all except Guatemala exhibit a declining trend in fertility from the mid- to late 1960s onward. In Guatemala, fertility appears to have been stable until the early 1980s when it began to decline.

[6] See Arnold (1990) for a discussion of the consistency of fertility estimates as derived from DHS and other sources.

Figure 4.1 Trends in the total fertility rate (TFR) for women 15-34, selected DHS and other surveys

SUB-SAHARAN AFRICA

Botswana



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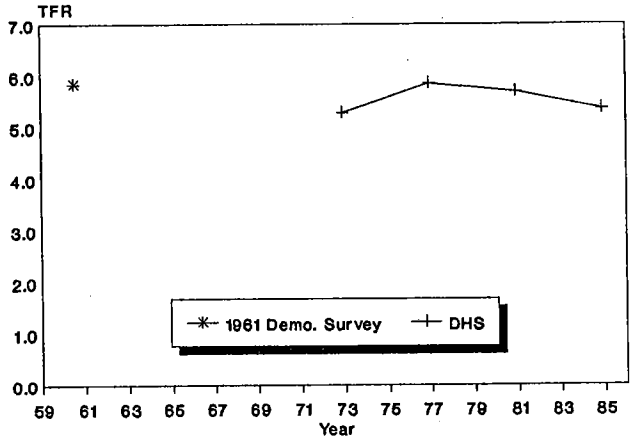

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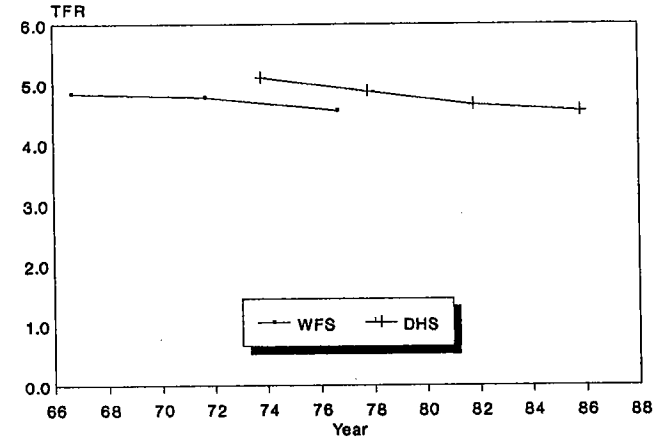

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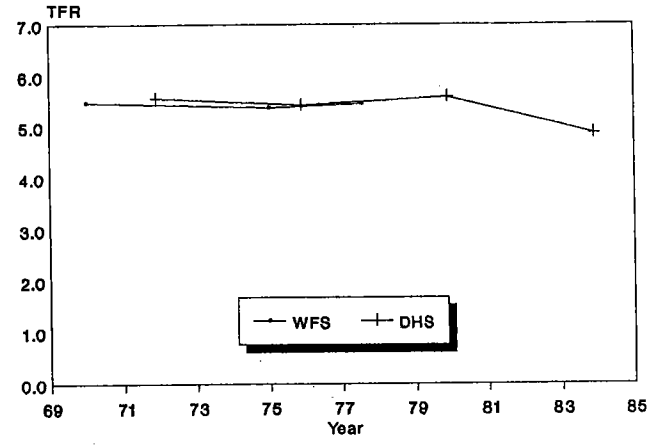

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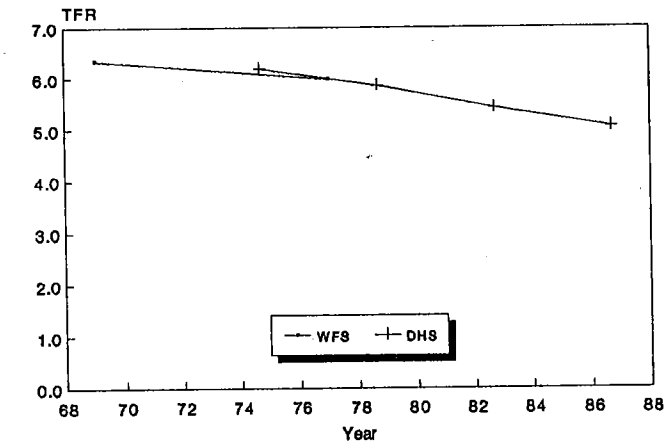

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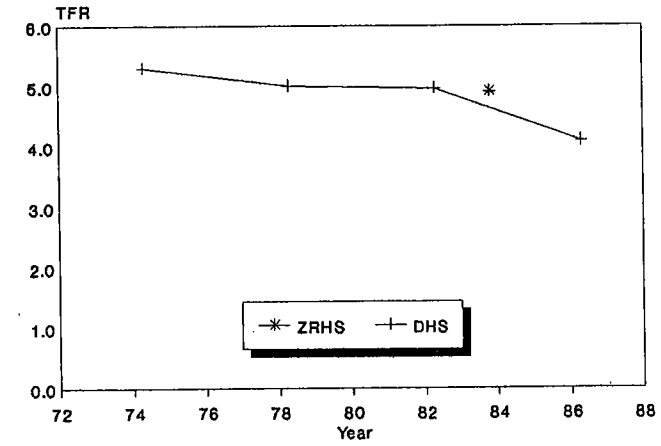
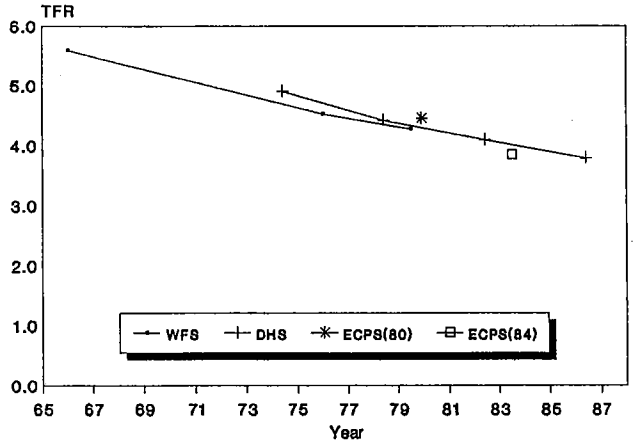


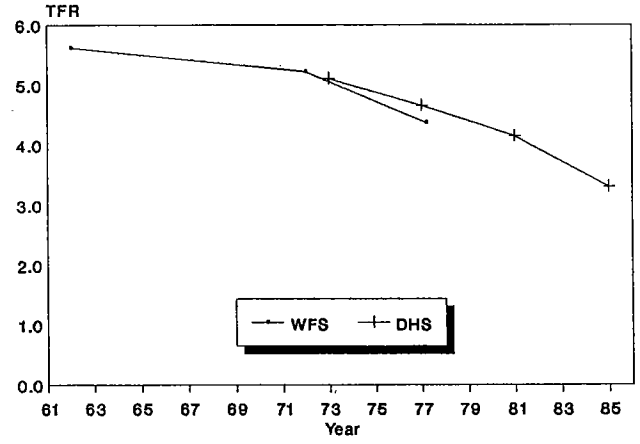
Figure 4.1—*Continued*

NORTH AFRICA

Egypt



Morocco



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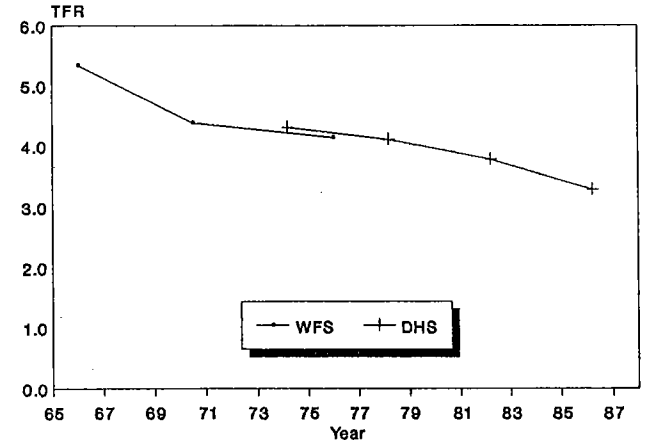
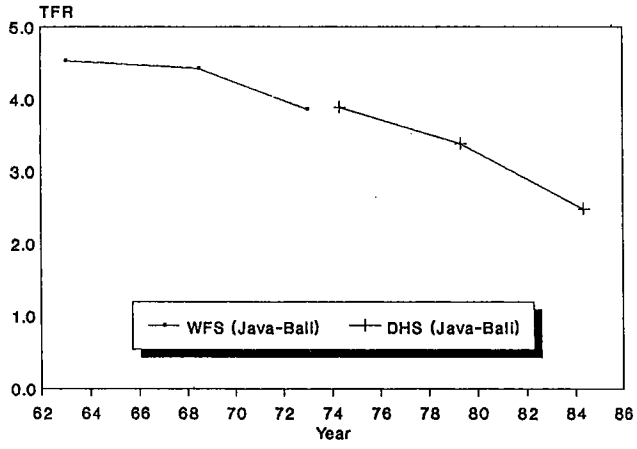


ASIA

Indonesia



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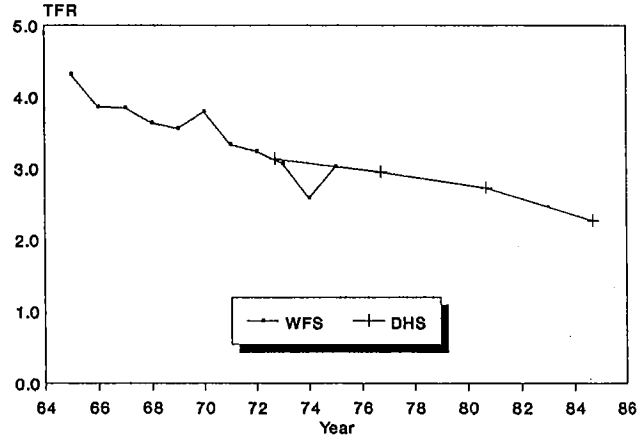

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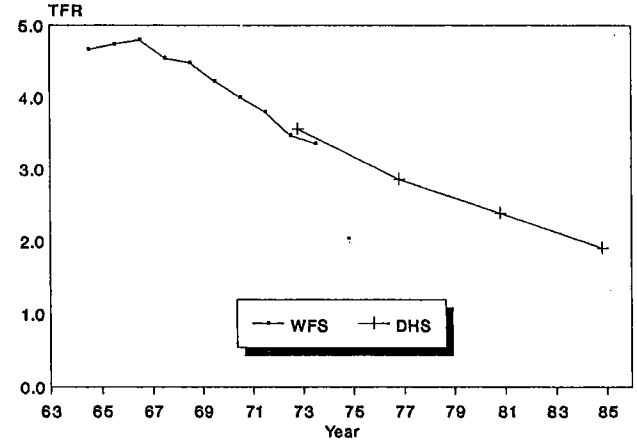

Figure 4.1—*Continued*

LATIN AMERICA AND THE CARIBBEAN

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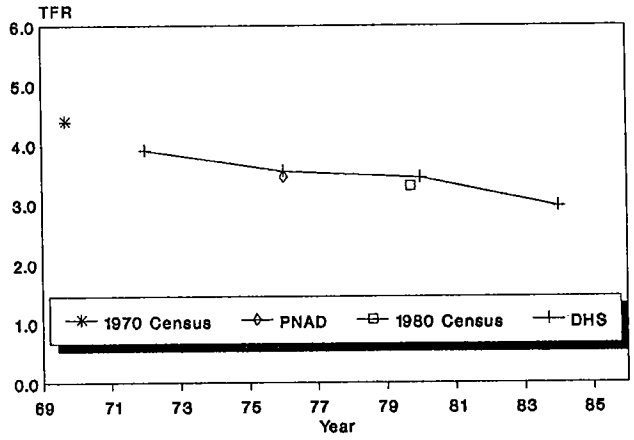

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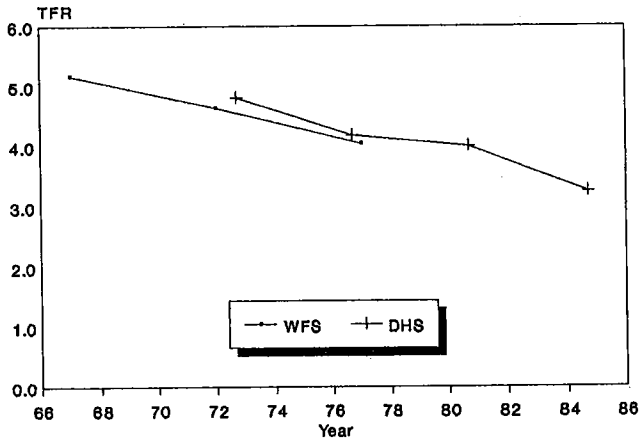

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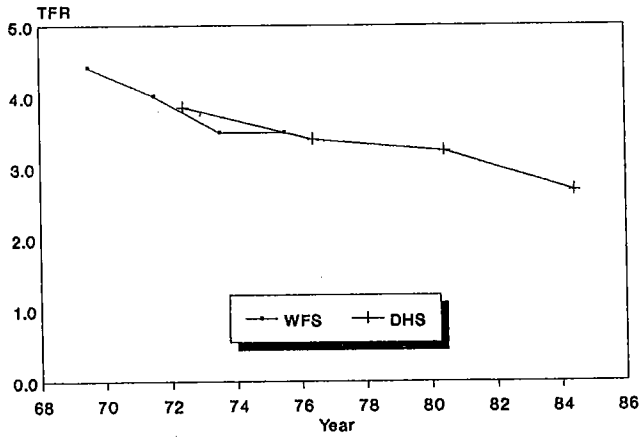

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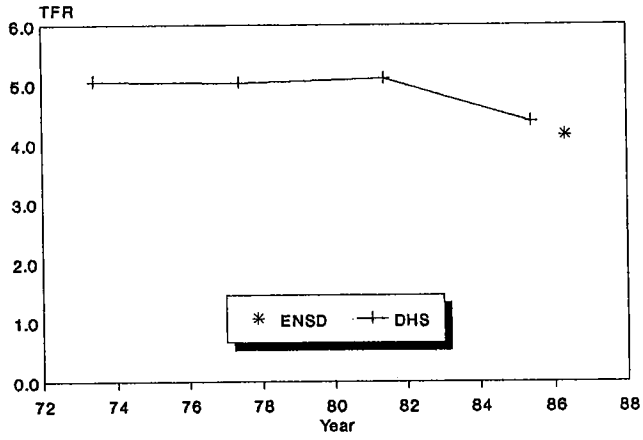

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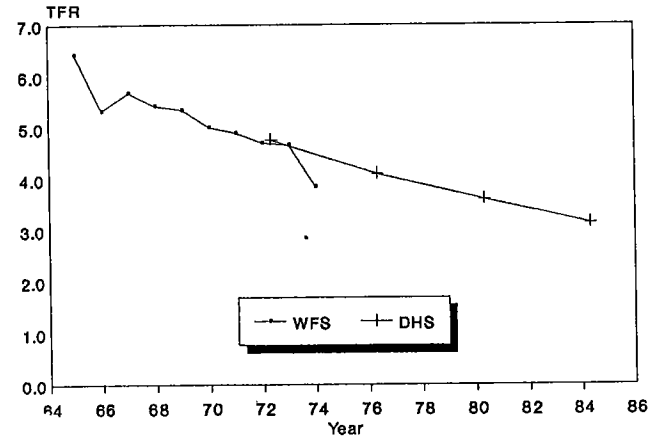

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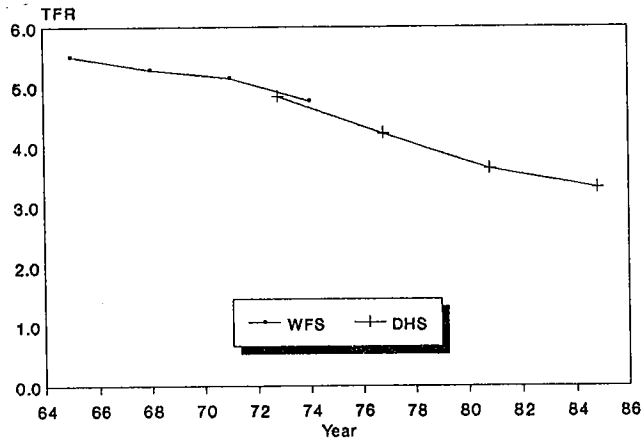
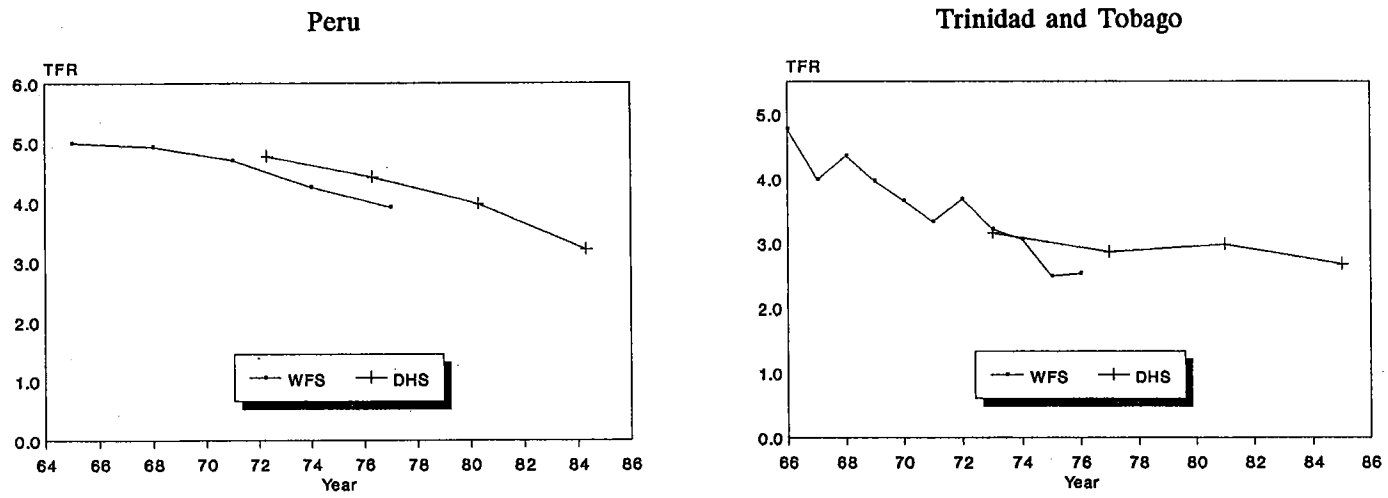


Figure 4.1—*Continued*



Sources for Figure 4.1:

Botswana: Manyeneng et al. (1985)
Brazil: Merrick and Berquo (1983)
Colombia: Departamento Administrativo Nacional de Estadística (1977)
Dominican Republic: Consejo Nacional de Población y Familia (1976)
Ecuador: Instituto Nacional de Estadística (1984)
Egypt: Khalifa et al. (1982), Sayed et al. (1989), and United Nations (1987)
Ghana: Central Bureau of Statistics (1983)
Guatemala: Instituto Nacional de Estadística (1987)
Indonesia: Central Bureau of Statistics (1978) and United Nations (1987)
Kenya: United Nations (1987)
Mali: Traoré et al. (1989)
Mexico: Dirección General de Estadística (1977)
Morocco: Farid (1984) and United Nations (1987)
Peru: Oficina Nacional de Estadística (1979)
Senegal: Direction de la Statistique et Enquête Mondiale sur la Fécondité (1981) and Gueye (1984).
Sri Lanka: Retherford and Alam (1985)
Thailand: Piampiti and Knodel (1978)
Trinidad and Tobago: Central Statistical Office (1981)
Tunisia: United Nations (1987)
Zimbabwe: Zimbabwe National Family Planning Council and Westinghouse Public Applied Systems (1985)

5 Age at First Birth

5.1 INTRODUCTION

The age at which a woman bears her first child has implications for her health and the health of her child, as well as for her educational and economic opportunities in life. In the aggregate, the age at first birth is an important determinant of average family size and the rate of population growth. The generally adverse impact of early childbearing on family well-being is well documented and has provided the rationale for programs designed to increase the average age at which women become mothers. At the International Population Conference in Mexico City in 1984 programs to delay the timing of first births were recommended for inclusion in the World Population Plan of Action.

Bearing children at an early age entails substantial health risks for both the mother and the child. Complications of pregnancy at an early age include first and third trimester bleeding, severe anemia, preeclampsia and toxemia, prolonged or obstructed labor, cephalopelvic disproportion, prematurity, low birth weight, stillbirth, high perinatal and infant mortality, and high maternal mortality (Casterline and Trussell, 1980; Cherlin and Riley, 1986; Gyepi-Garbrah, 1985c, 1988; Lowe, 1977).

Although early motherhood may be considered desirable in some traditional cultures, it tends to impede the pursuit of other life options that might compete with childbearing, particularly in developed countries (Bumpass et al., 1978). In both developing and developed countries, early childbearing is usually incompatible with educational achievement (Card, 1981; Gyepi-Garbrah, 1985a, 1985b; Mott and Marsiglio, 1985). Partly because of the hindrance to the mother's educational attainment, early childbearing often results in reduced economic opportunity for the mother and for the household as a whole (Hofferth, 1984; Moore, 1978, Rao and Balakrishnan, 1988; Trussell, 1976). Early motherhood may also have adverse effects on marital stability (Card and Wise, 1978).

Finally, the timing of the first birth has important demographic implications. Both the timing of subsequent births and completed family size are related to the age at first birth. Under a natural fertility regime, the early onset of childbearing tends to boost the number of children a woman will have. Even when family planning is widespread, however, the timing of first births can affect completed family size. Several studies have found evidence of faster subsequent childbearing and an increased chance of unwanted births when the first child is born at an early age (Casterline and Trussell, 1980; Finnas and Hoem, 1980; St. John, 1982). Delaying the first birth tends to reduce completed family size (Ford, 1984; Rao and Balakrishnan, 1988). Even if the average completed family size is constant, however, a younger age at childbearing will result in faster population growth (Coale and Tye, 1961).

The later age at which women are having their first birth has been a factor in the reduced levels of population growth that have been observed in many countries (Pebley, 1981). The impact of the timing of first births, however, appears to have declined substantially in some developed countries (Balakrishnan et al., 1988; Teachman, 1985). Moreover, differences in the age of entry into motherhood under age 20 have relatively little effect on completed fertility. A postponement of childbearing until at least age 20 is necessary before substantial effects on fertility can be observed (Hobcraft and Casterline, 1983).

A number of factors are associated with the age at which a woman first gives birth, including age at menarche, age at marriage, fecundability at different ages, frequency of intercourse, and the use of contraception to delay the birth of the first child. In countries in which marriage is considered to be a prerequisite for childbearing, the age at first birth depends on both the age at marriage and the timing of the first birth within marriage. Although age at first birth and age at marriage move broadly in parallel in many countries, these variables cannot be used as easy substitutes for one another in demographic analyses (Hobcraft, 1985). As the average age at first marriage increases, two forces tend to decrease the time between marriage and the first birth. First, when marriages occur soon after menarche, fecundability at the time of marriage is relatively low, on the average (Rindfuss and Morgan, 1983). As the average age at marriage increases into the early twenties, women enter into marriage during their most fecund period. Second, in many countries an increasing age at marriage takes place in conjunction with a shift from arranged marriages to romantic marriages. For example, Rindfuss and Morgan (1983) found a remarkable increase in the proportion of early marital conceptions in several Asian countries, which they attribute to the increased frequency of intercourse in the first few months of marriage. The increase in coital frequency, they believe, is related to a decline in the traditional pattern of arranged marriages.

5.2 DHS RESULTS

In DHS surveys, the mother's age at the birth of her first child is calculated from information on the month and year of her birth and the month and year of the first child's birth. In demographic surveys, information on first births is generally subject to two types of errors: (1) omission of the first birth, particularly when the first child has died and (2) errors in reporting the timing of the first birth. Older women are particularly prone to omit first births or to report them as occurring closer to the survey date than was actually the case. These errors will tend to bias upward the estimates of age at first birth for older cohorts. In the World Fertility Survey, errors of this type were found in most countries, although the date of first birth was reported more reliably than the date of first union (Casterline and Trussell, 1980; Hobcraft, 1985; O'Muircheartaigh and Marckwardt, 1981). Problems with the quality of reported age at first birth data are also evident in the Demographic and Health Surveys, but they are almost entirely limited to surveys in Africa (Arnold, 1990; Blanc and Rutenberg, 1990).

The median age at first birth is shown in Table 5.1 by five-year age groups for women 25-49 in all countries and for women 20-24 in countries where at least half the women in this age group have given birth. The median cannot be calculated for the 20-24 age group for countries in which half of the women in this age group have not had a first birth by age 20.

The median age at first birth for women 40-44 is lower than the median for those 45-49 in more than half the countries.[7] While there may have been a real decline in the age at first birth about 25 years ago in some countries (e.g., Sri Lanka), it is likely that in most cases the decline is due to reporting error. Thus, in examining trends over time, it is preferable to use the age group 40-44 as the starting point of the trend line. The median age at first birth for women 40-44 ranges from 18.3 in Uganda to 23.1 in Sri Lanka. In general, the median age at first birth is about two years younger in sub-Saharan Africa than in the other three regions. Half of the sub-Saharan countries have medians of 19.0 years or less, whereas all but two countries in other regions have medians of 20 years or more.

Trends over time in the age at first birth can be seen by examining the differences in the median age at first birth between the cohort of women 40-44 and the cohort 25-29 (or 20-24 where available). In the ten sub-Saharan countries, little change occurred over the period represented by the two cohorts. There was an increase of about one year in the median age at first birth in Ghana, but over the last 20 years no other country has experienced a substantial change in the age at which childbearing begins. The relatively early age at first birth in sub-Saharan Africa is consistent with the results of previous studies which have reported unusually high levels of adolescent fertility in that region (Gyepi-Garbrah, 1988).

Table 5.1 Median age at first birth by age of woman at the time of the survey, Demographic and Health Surveys, 1986-1989

	Age of Woman at the Time of Survey					
Country	20-24	25-29	30-34	35-39	40-44	45-49
SUB-SAHARAN AFRICA						
Botswana	19.7	19.2	19.3	19.6	20.0	20.9
Burundi	a	20.9	21.1	21.1	21.2	21.1
Ghana	19.9	20.0	19.2	19.5	18.8	19.3
Kenya	19.3	18.6	18.3	18.7	18.6	19.7
Liberia	18.5	19.0	19.4	19.8	18.6	21.0
Mali	18.4	19.0	18.6	19.1	18.7	20.3
Senegal	19.0	19.0	19.0	18.7	18.7	19.2
Togo	19.5	19.2	18.8	19.5	19.2	20.0
Uganda	18.6	18.3	18.0	18.0	18.3	18.6
Zimbabwe	a	19.5	19.4	19.8	19.2	19.7
NORTH AFRICA						
Egypt	a	21.7	21.6	20.5	20.0	20.0
Morocco	a	22.4	21.3	21.0	20.1	20.0
Tunisia	a	24.5	23.2	22.5	21.5	22.4
ASIA						
Indonesia	19.6	19.7	19.7	19.4	19.2	19.8
Sri Lanka	a	24.7	24.1	24.8	23.1	21.9
Thailand	a	23.4	22.9	22.5	22.3	21.7
LATIN AMERICA/CARIBBEAN						
Bolivia	a	20.6	20.8	21.4	21.5	21.7
Brazil	a	22.4	22.8	22.4	22.2	NA
Colombia	a	21.6	21.9	21.6	20.8	21.0
Dominican Rep.	a	21.2	20.5	19.9	19.9	19.7
Ecuador	a	20.7	21.0	21.2	21.1	21.6
Guatemala	20.0	19.7	19.7	20.1	20.2	NA
Mexico	a	21.1	20.6	21.5	21.0	20.7
Peru	a	21.4	21.4	21.2	20.8	20.5
Trinidad & Tob.	a	22.2	21.9	21.6	21.1	20.5

NA = Not available

[a] Fewer than half of the women in the age group have given birth.

[7] In the World Fertility Survey, nearly 80 percent of the countries exhibited the same pattern: a lower median age at first birth for women 40-44 than for those 45-49 (Casterline and Trussell, 1980).

Most of the Latin American countries have undergone little change in the age at first birth, although the median age has increased by at least 0.5 years in four countries (Colombia, the Dominican Republic, Peru, and Trinidad and Tobago). The most rapid transition has taken place in North Africa. Over a period of just 15 years, Tunisia experienced a three-year increase in the median age at first birth; in Morocco the median increased by more than two years; and in Egypt the increase was 1.7 years. In the three Asian countries, the increase in the median age at first birth ranged from half a year in Indonesia to 1.6 years in Sri Lanka.

The median age at first birth is considerably higher in Sri Lanka and Tunisia than in other countries. In both countries, more than two-thirds of women 20-24 and more than one-third of women 25-29 have not had any children. The beginning of motherhood is particularly late in the capital cities of Colombo and Tunis where the median age at first birth for women 25-29 is 26.9 years and 25.1 years, respectively. The rapid increase in the age at first birth in Sri Lanka and Tunisia has been an important factor in reducing the rate of population growth in both countries.

The distribution of survey countries by the medians for age at first birth in 25 DHS countries is shown graphically in Figure 5.1. In most countries, the median for women 40-44 is between 18 and 21 years. While the distribution is fairly concentrated, the findings are not consistent with the "remarkable homogeneity of behavior in the onset of motherhood across a wide range of societies" that characterized the World Fertility Survey 10-15 years earlier (Hobcraft, 1985). The distribution for the 25-29 age group shows a slight upward movement. Nearly one-third of the countries have medians of 19 years, but the remaining are widely scattered. The number of countries in the upper age range (22 years and above) doubled between the older cohort and the younger cohort.

Another perspective on the initiation of childbearing can be gained by examining the DHS data on the percentage of women who had their first birth by age 20 (Table 5.2). One advantage of this measure is that it can be calculated for women 20-24 in all countries. Focusing on the youngest age group provides a contemporary view of differential patterns of early childbearing. Once again, the intra-regional similarities are most prominent. In sub-Saharan Africa, approximately one-half to two-thirds of the women in every country except Burundi have had a child before reaching age 20. In Latin America and the Caribbean, on the other hand, only one-third of the women in all countries except Guatemala had a child that early. Egypt exhibited a similar pattern. The onset of childbearing is considerably later in Morocco, Sri Lanka, Thailand, and Tunisia. While Thailand has shown only a slight decline in adolescent fertility, the other three countries have experienced dramatic declines. In Sri Lanka and Tunisia, fewer than one in six women in the youngest age group had a child before reaching age twenty. In contrast, in Mali and Uganda, two out of every three women 20-24 had their first child in their teenage years.

Figure 5.1 Distribution of survey countries by median age at first birth for age groups 25-29 and 40-44, Demographic and Health Surveys, 1986-1989

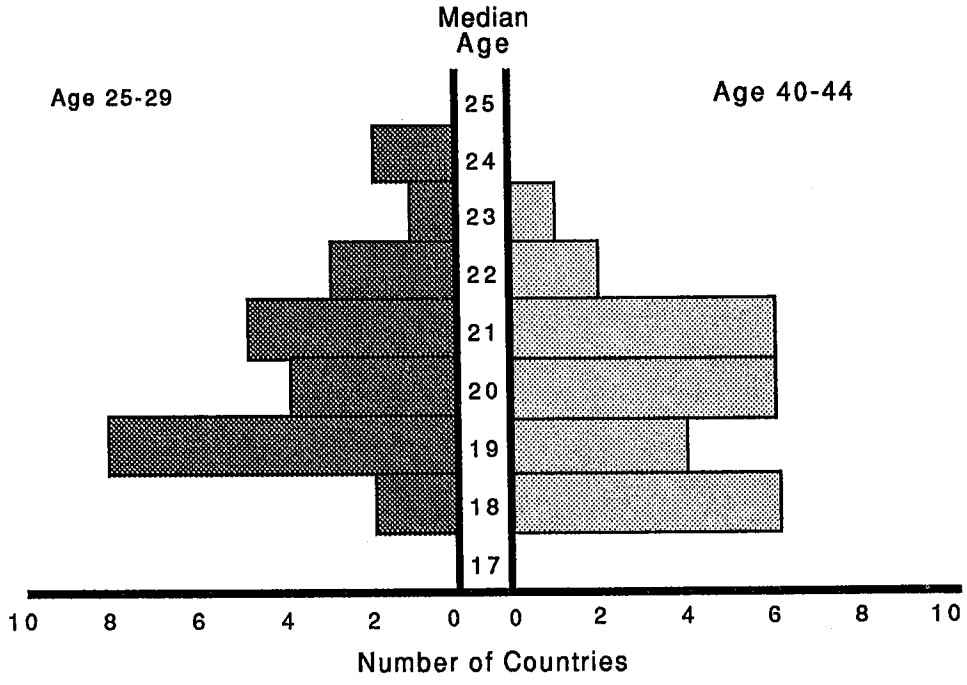


Table 5.2 Percentage of all women who had their first birth by exact age 20 by age at the time of the survey, Demographic and Health Surveys, 1986-1989

Country	Age of Woman at Time of Survey						
	20-24	25-29	30-34	35-39	40-44	45-49	20-49
SUB-SAHARAN AFRICA							
Botswana	54.8	61.2	60.3	56.5	49.8	38.6	56.1
Burundi	27.1	36.7	36.2	37.6	38.5	36.5	34.6
Ghana	50.6	49.7	57.8	55.7	62.6	57.4	54.3
Kenya	58.3	58.3	67.5	69.6	67.4	64.8	64.3
Liberia	64.1	61.9	55.4	52.0	58.9	43.6	58.0
Mali	66.9	61.3	64.2	58.5	61.9	47.7	61.2
Senegal	59.4	61.1	59.6	61.2	61.3	56.8	60.1
Togo	56.1	57.7	64.1	55.1	58.6	49.8	57.5
Uganda	67.5	67.9	71.5	72.5	68.7	64.5	68.8
Zimbabwe	48.9	58.3	59.3	52.8	56.9	53.8	54.6
NORTH AFRICA							
Egypt	30.6	38.0	39.6	45.9	49.8	50.0	40.5
Morocco	22.8	31.3	38.0	40.8	49.2	50.0	35.2
Tunisia	13.1	14.4	19.5	26.5	35.9	26.5	20.0
ASIA							
Indonesia	38.0	48.5	51.1	53.7	56.6	51.6	48.4
Sri Lanka	16.5	19.0	16.9	20.5	30.4	35.5	21.2
Thailand	25.0	25.1	28.1	29.7	28.3	32.0	27.2
LATIN AMERICA/CARIBBEAN							
Bolivia	37.0	44.5	41.4	37.5	33.6	37.7	39.2
Brazil	31.2	28.1	26.9	26.8	30.8	NA	28.8[a]
Colombia	32.0	35.4	32.6	36.2	38.4	41.9	35.0
Dominican Republic	37.5	40.7	45.9	50.9	50.5	54.7	44.2
Ecuador	35.3	43.5	39.8	40.4	39.1	35.7	39.2
Guatemala	50.4	54.0	54.0	48.8	47.7	NA	51.4[a]
Mexico	34.8	40.6	45.1	37.1	40.6	43.0	39.8
Peru	30.3	39.6	37.5	39.0	43.6	45.2	38.0
Trinidad and Tobago	29.8	31.1	34.8	35.6	40.0	45.5	34.4

NA = Not available
[a] Based on women 20-44 years

6 Infertility

6.1 INTRODUCTION

The incidence of infertility in a population has important demographic and health implications. Since high infertility has a dampening effect on overall fertility and the rate of population growth, improvements in the ability to bear children may impede efforts to lower fertility rates. For example, it has been estimated that a reduction in infertility in sub-Saharan Africa to "normal" levels would increase fertility in that region by 15 percent (Frank, 1983). Similarly, Bongaarts et al. (1984) found that infertility accounts for 60 percent of the variation in total fertility in 18 sub-Saharan countries and that fertility decreases by one birth for each increase of 9 percentage points in the proportion of women age 45-49 who have no children. In Cameroon, a country with an unusually high level of infertility, the current total fertility rate of 5.5 children might rise to 7.3 children in the absence of sterility (Larsen and Menken, 1989).

Estimates of infecundity are also crucial for measuring the KAP-gap (i.e., the inconsistency between childbearing preferences and childbearing practices) and the unmet need for family planning (Westoff, 1988). Finally, a knowledge of the incidence of infecundity is important for estimating the effect of contraceptive use on fertility (Nortman, 1982).

6.2 DEFINITIONS AND MEASUREMENT PROBLEMS

The terms *infertility, sterility,* and *infecundity* are often used loosely, without regard to precise definition. Moreover, demographic and medical definitions of these terms may differ substantially. In demographic terminology, primary infertility (or primary sterility) is usually defined as the inability to bear any children. According to this definition, primary infertility may arise because of the inability to conceive or the inability to carry a pregnancy to full term. In clinical studies, however, infertility is usually defined as the inability to become pregnant or to achieve fertilization. Secondary infertility, which has been shown to be highly correlated with primary infertility (Mammo and Morgan, 1986), is the inability to bear a child after having an earlier birth. Some analysts prefer the term infecundity to infertility because infertility suggests simply a lack of demonstrated fertility rather than the physiological inability to reproduce. The terms infecundity and infertility are used interchangeably in this report.

In practice, infecundity is usually defined as the inability to conceive or to bear a child after being exposed to the risk of conception for a fixed length of time. The epidemiological definition recommended by the World Health Organization depends on a two-year period of exposure while clinical studies often use a one-year period and demographic measures generally cover a five-year period. No matter what definition is used, measurement problems are likely to occur. First, it is difficult to measure continuous exposure to conception over a period of years. A comprehensive measure of exposure would require data on marital status, abstinence, coital frequency, contraceptive use, and the partner's presence or absence for all women for the entire period under consideration. If the measure is based on currently married women, then it may underestimate infecundity if couples without children are more likely to dissolve their marriages than couples with children (Mtimavalye and Belsey, 1987; Sherris and Fox, 1983). This problem, however, will not have an appreciable effect in countries which have high rates of remarriage (Vaessen, 1984).

The exclusion of couples who have used contraception during the measurement period (or the common assumption that such couples are all fecund) will bias the infertility estimates since there is probably some degree of infertility among them, but lower than for couples who have not used contraception. Other biases arise because women who have borne a child during the period may have subsequently become infecund or because women who have not borne a child during the period may have had a miscarriage or abortion, been temporarily separated from their partner, been ill, failed to report contraceptive use, or stopped having intercourse (Vaessen, 1984). The existence of voluntary childlessness in a society can also confound the standard measures of infertility. Although voluntary childlessness is rare in developing countries (Poston et al., 1983), there are exceptions such as Brazil, where childlessness tends to be more voluntary than involuntary, particularly for younger women in the more modernized regions of the country (Poston and Rogers, 1988).

One of the more serious problems with infertility measures that are based on the fertility of couples at the end of the childbearing period is that these measures do not reflect recent trends in infertility. Moreover, most sample surveys include a relatively small number of women over age 40 and, therefore, sampling errors result in imprecise estimates.

Two further problems with some of the infecundity measures that have been used in the World Fertility Survey and elsewhere have been identified by Larsen and Menken (1989)—namely, the ages the measures refer to are not specified and no test is made of the sensitivity of the estimator to different age patterns of sterility. They propose a new measure of subsequent infertility that can be calculated from incomplete birth histories and that yields information on recent infecundity. Their measure, however, cannot be used in analyzing DHS data because it is only appropriate for countries with negligible contraceptive prevalence and because it requires a complete marriage history.

6.3 PREVIOUS FINDINGS ON INFERTILITY

Despite the inevitable problems encountered in measuring infertility, several studies have attempted to estimate infertility at the country or regional level. Farley and Besley (1988) estimate that primary infertility rates for individual countries range from 3 to 30 percent and secondary infertility rates are generally twice as high. An examination of 28 countries included in the World Fertility Survey showed that, proportionally, fewer women had never had a live birth and were not pregnant at the time of the survey (Vaessen, 1984). Less than 2 percent of women age 40-44 fell in that category in 7 countries, 2-4 percent in 14 countries, 4-6 percent in 6 countries, and more than 6 percent in only one country (Guyana).

Most studies show an unusually high incidence of infertility in sub-Saharan Africa, particularly in central Africa, and relatively low infertility in Latin America (Bongaarts et al., 1984; Caldwell and Caldwell, 1983; Frank, 1983). Farley and Besley (1988) cited estimates of primary infertility of 10.1 percent for Africa, 6.5 percent for the Caribbean, 5.4 percent for Europe, 4.8 percent for Asia and Oceania, 3.1 percent for Latin America, and 3.0 percent for the Middle East (based on selected countries in each region). Bongaarts et al. (1984) reported particularly high levels of infertility in most of central Africa (20+ percent of women childless at age 45-49), high levels in East Africa and parts of central Africa (12-20 percent childless), and higher than expected levels in West Africa (3-12 percent childless). Frank (1983) noted that the prevalence of infertility in sub-Saharan Africa is "remarkably widespread." Yet, although infertility has been found to be high in Africa, that region also has the greatest variability in levels of infertility. Moreover, there is evidence that infertility has been declining over time in some areas (Mammo and Morgan, 1986).

It was previously thought that there was a core rate of infertility of about 10 percent due to genetic, anatomical, and endocrinological causes (Veevers, 1972). Several more recent studies have concluded that there is a minimum primary infertility rate of about three percent in the absence of pathological infertility (Farley and Besley, 1988; Frank, 1983). According to Bongaarts et al. (1984), the age at which natural infertility is at its lowest level (3 percent among women in their early twenties) "provides us with the lowest proportion of women we would expect to be childless for life in a society where virtually all women are exposed to conception in those years. This standard level of childlessness is confirmed by the lowest proportion of ever-married women ending their reproductive years childless (3 percent) in a number of populations."

Infertility may be due to the normal aging process or to the consequences of a variety of diseases or malfunctions of the reproductive process (Vaessen, 1984). Although the causes of infertility are diverse, it is generally agreed that sexually transmitted diseases (STD) are the major preventable cause of infertility (Farley and Besley, 1988). In particular, STDs have been implicated as the single major cause of the high level of primary and secondary sterility in sub-Saharan Africa (Caldwell and Caldwell, 1983; Frank, 1983). Pockets of childlessness among certain tribal groups in central Africa have also been attributed to the spread of STDs in these groups (Romaniuk, 1968; Retel-Laurentin, 1974). In sub-Saharan Africa as a whole, Farley and Besley (1988) found that 46 percent of clinically investigated infertile males and 9 percent of such females reported a history of STDs. The reported history of sexually transmitted diseases among women is probably low because STDs are often asymptomatic in women. Much lower levels of reported STDs among infertile couples have been found in Latin America (29 percent among men and 1 percent among women) and in Asia (13 percent among men and 1 percent among women). STDs may result in tubal obstruction, a problem which may also be caused by infections related to pregnancy and abortion (Cates et al., 1985). Infection is particularly likely when unhygienic obstetric or abortion practices are followed.

6.4 DHS RESULTS

Two basic measures of infertility are used in this comparative report. The first measure is the proportion of women with no live births. The second measure is the proportion of women who neither had a live birth nor were pregnant at the time of the survey—that is, the proportion of women who have never had a "fertile pregnancy" (Vaessen, 1984).

The latter measure considers women who are currently pregnant to be fertile on the assumption that most of those pregnancies will result in a live birth (especially since pregnancies are usually not reported until they are of relatively long duration).[8]

In Tables 6.1 and 6.2, the above measures are based on successively refined denominators, starting with ever-married women (in Table 6.1) and then adding in turn the conditions that the respondent was currently married, had first gotten married at least five years ago, and was in her first union. The period of five years was chosen because few women have a first birth more than five years after their marriage except in countries with very low ages at first marriage (Hobcraft and McDonald, 1984). Since a complete marriage history is not available, it is not possible to identify women who have been continuously exposed to conception for a period of five years unless they are still in their first marriage. Moreover, measures based on currently married women may slightly underestimate infertility if couples without any children are more likely to get divorced or separated. For that reason, ever-married women are included in the table based on the number of children ever born, although these women were not necessarily continuously exposed to conception for at least five years. All of these measures give a slightly different picture of the extent of infertility, although none of the measures strictly fits either the standard demographic definition or the standard medical definition of infertility.

Because the number of women in the older five-year age groups is sometimes small (as low as 265 women aged 45-49 in Mali), sampling errors tend to be large. Two steps have been taken to counteract this problem. First, the measures are presented for each of the three oldest five-year age groups. Second, a summary measure is presented for all women aged 25-49. The latter measure has smaller sampling errors, although it may overestimate infertility since it includes some women with short durations of marriage.

The proportion of women who had never had a live birth is shown in Table 6.1. Among ever-married women, no more than 5.3 percent of women 45-49 in any country had not had a live birth at the time of the survey. At the other end of the spectrum, only 1.3 percent of women 45-49 in three countries (Burundi, Colombia and Peru) reported no live births. The estimates for women 25-49 are generally higher because they include some women who had not been married very long. Overall, the level of infertility is highest in North Africa and Asia and lowest in sub-Saharan Africa and Latin America. At most ages, Trinidad and Tobago has a particularly high level of childlessness. This result is consistent with the findings of the World Fertility Survey conducted in that country ten years earlier (Central Statistical Office, 1981). The high infertility rate in Trinidad and Tobago can be partially explained by the popularity of informal marriages, which are less likely to produce offspring. When the results are confined to only currently married women in formal marriages, only 6.1 percent of women aged 25-49 have not had any live births. This is still higher than all other countries, but it is considerably lower than the overall estimate for Trinidad and Tobago shown in Table 6.1. The comparable figure is only slightly higher (6.5 percent) for women in common-law unions but is extremely high (25.2 percent) for women in visiting unions (i.e., couples who do not live together but who have a regular sexual relationship). Even among women who entered into a visiting relationship at least five years before the survey date, one in five had never had a live birth.

The relatively low level of infertility in sub-Saharan Africa does not agree with several studies which have found a uniquely high level of infertility in that region. The DHS results may indicate that there have been substantial reductions in infertility in sub-Saharan Africa in recent years. Another possibility is that both the Demographic and Health Surveys and the World Fertility Survey have done a better job of completely enumerating live births (particularly those that subsequently died) than the sources used for previous estimates of infertility.[9] This would imply that infertility in sub-Saharan Africa has never really been as high as reported. Finally, the selection of DHS countries may partially explain the different results since the DHS data presented in this report do not include countries such as Cameroon, Gabon, Zaire and the Central African Republic, where infertility has been found to be unusually high (Caldwell et al., 1989). Nevertheless, the generally low levels of infertility found in the ten DHS countries in sub-Saharan Africa demonstrate that high levels of primary infertility are not a general characteristic of that region. Perhaps infertility is still high in parts of central Africa, but there are many parts of sub-Saharan Africa that exhibit very modest levels of infertility (levels comparable to or even lower than those found in developing countries in other regions of the world).

[8] Since the DHS surveys do not include a complete pregnancy history, it is not possible to obtain a measure of the proportion of women with no pregnancies throughout their lives (which would be necessary to estimate primary infertility according to the medical definition).

[9] We cannot, however, dismiss the possibility that some childless women are the recipients of foster children whom they report as their own live births in the birth history.

Table 6.1 Percentage of women who have not had a live birth, by age of woman, Demographic and Health Surveys, 1986-1989

Country	Ever-Married Women				Currently Married Women				Currently Married Women Who First Married 5+ Years Ago				Currently Married Women in First Union Who First Married 5+ Years Ago			
	35-39	40-44	45-49	25-49	35-39	40-44	45-49	25-49	35-39	40-44	45-49	25-49	35-39	40-44	45-49	25-49
SUB-SAHARAN AFRICA																
Botswana	1.1	2.7	3.5	3.2	0.6	1.9	3.1	2.9	0.4	1.1	3.2	1.8	0.5	1.2	3.7	1.7
Burundi	1.7	0.9	1.3	2.7	1.9	1.0	1.6	2.5	1.6	1.0	1.6	1.6	1.3	0.0	0.1	0.9
Ghana	1.3	1.7	1.6	2.7	0.8	1.0	1.8	2.6	0.8	0.6	1.8	1.6	0.7	1.3	1.5	1.5
Kenya	1.5	2.4	2.4	2.4	1.3	2.1	2.6	2.2	1.2	1.9	2.6	1.7	1.0	1.1	1.1	1.2
Liberia	3.2	3.5	2.6	4.1	3.2	3.7	2.1	4.1	2.9	3.7	2.1	3.5	1.6	3.3	2.0	2.8
Mali	2.3	3.5	3.1	3.9	2.4	3.8	3.0	3.7	2.4	3.8	3.0	3.5	NA	NA	NA	NA
Senegal	3.3	4.0	5.2	4.5	2.7	2.6	4.4	4.0	2.7	2.6	4.4	3.4	1.3	0.6	0.7	2.4
Togo	2.7	0.4	2.9	3.0	2.6	0.4	1.9	2.8	2.7	0.4	1.9	1.8	1.7	0.7	0.0	1.4
Uganda	1.6	5.1	5.3	4.1	1.7	5.1	4.2	3.5	1.7	5.1	4.2	3.1	0.9	2.7	2.9	2.1
Zimbabwe	2.0	2.5	2.8	3.0	1.2	1.6	2.2	2.3	1.3	1.2	2.2	1.5	1.2	0.5	1.7	1.0
NORTH AFRICA																
Egypt	2.8	2.8	2.7	4.8	2.5	2.3	2.6	4.4	2.1	1.9	2.2	2.7	1.8	1.4	1.9	2.3
Morocco	5.3	3.4	4.9	6.2	4.8	3.4	3.8	5.2	4.5	3.4	3.7	3.7	2.9	2.2	2.8	2.8
Tunisia	4.9	3.9	2.3	5.2	4.0	3.2	2.2	4.6	3.5	2.3	2.2	2.9	3.5	1.7	2.1	2.7
ASIA																
Indonesia	4.3	4.0	4.7	4.8	3.8	4.0	4.5	4.4	3.5	3.6	4.5	3.5	2.6	2.5	3.3	2.4
Sri Lanka	4.5	2.8	3.3	5.3	4.2	2.7	2.6	5.3	2.3	2.0	2.3	1.8	2.2	1.9	2.2	1.7
Thailand	3.0	2.6	2.3	5.0	2.9	2.7	1.2	5.0	2.7	2.5	1.2	2.7	2.4	2.4	1.4	2.6
LATIN AMERICA/CARIBBEAN																
Bolivia	1.9	1.9	3.0	2.5	1.8	2.0	3.6	2.5	1.9	1.9	3.2	1.6	2.0	2.0	3.0	1.6
Brazil	3.9	4.9	NA	5.1[a]	3.5	4.5	NA	4.9[a]	2.7	3.7	NA	2.8[a]	2.5	3.8	NA	2.7[a]
Colombia	2.1	1.9	1.3	3.3	2.3	2.1	0.9	3.3	2.0	1.5	0.4	1.7	2.3	1.7	0.4	1.8
Dominican Rep.	4.1	3.9	2.2	5.3	4.1	4.6	1.7	5.3	4.2	4.1	1.7	3.4	4.0	2.8	2.0	3.0
Ecuador	2.3	1.3	3.2	3.0	1.3	0.6	3.0	2.5	0.9	0.6	3.0	1.5	1.0	0.7	2.7	1.5
Guatemala	1.0	2.3	NA	2.2[a]	0.8	2.7	NA	2.2[a]	0.9	2.7	NA	1.3[a]	0.8	2.9	NA	1.3[a]
Mexico	2.2	2.4	4.5	4.0	2.1	2.5	3.9	3.9	1.4	0.9	3.9	1.7	1.4	1.0	4.3	1.7
Peru	0.7	1.3	1.3	2.2	0.8	1.5	1.2	2.3	0.4	1.5	1.2	0.9	0.4	1.7	1.5	1.0
Trinidad and Tobago	8.0	6.4	2.9	10.3	6.9	5.1	2.1	9.2	6.0	4.8	2.1	6.5	NA	NA	NA	NA

NA = Not available
[a] Based on women 25-44 years

Table 6.2 Percentage of currently married women who have not had a fertile pregnancy by age of woman, Demographic and Health Surveys, 1986-1989

Country	Currently Married Women				Currently Married Women Who First Married 5+ Years Ago				Currently Married Women in First Union Who First Married 5+ Years Ago			
	35-39	40-44	45-49	25-49	35-39	40-44	45-49	25-49	35-39	40-44	45-49	25-49
SUB-SAHARAN AFRICA												
Botswana	0.6	1.9	3.1	2.7	0.4	1.1	3.2	1.8	0.5	1.2	3.7	1.7
Burundi	1.9	1.0	1.6	2.3	1.6	1.0	1.6	1.6	1.3	0.0	0.1	0.9
Ghana	0.8	1.0	1.8	2.1	0.8	0.6	1.8	1.6	0.7	1.3	1.5	1.5
Kenya	1.0	2.1	2.6	2.0	1.1	1.9	2.6	1.6	1.0	1.1	1.1	1.1
Liberia	2.9	3.2	2.1	3.6	2.9	3.2	2.1	3.2	1.6	2.2	2.0	2.2
Mali	2.3	3.8	3.0	3.5	2.3	3.8	3.0	3.3	NA	NA	NA	NA
Senegal	2.7	2.6	4.4	3.7	2.7	2.6	4.4	3.3	1.3	0.6	0.7	2.3
Togo	2.4	0.4	1.9	2.4	2.4	0.4	1.9	1.7	1.7	0.7	0.0	1.4
Uganda	1.7	5.1	4.2	3.4	1.7	5.1	4.2	3.0	0.9	2.7	2.9	2.1
Zimbabwe	1.2	1.6	2.2	1.9	1.3	1.2	2.2	1.4	1.2	0.5	1.7	1.0
NORTH AFRICA												
Egypt	2.4	2.3	2.6	3.6	2.1	1.9	2.2	2.6	1.8	1.4	1.9	2.2
Morocco	4.6	3.4	3.8	4.8	4.4	3.4	3.7	3.6	2.9	2.2	2.8	2.8
Tunisia	3.9	3.0	2.2	3.9	3.4	2.3	2.2	2.9	3.4	1.7	2.1	2.7
ASIA												
Indonesia	3.7	4.0	4.5	4.0	3.5	3.6	4.5	3.4	2.6	2.5	3.3	2.4
Sri Lanka	3.8	2.7	2.6	3.9	2.3	2.0	2.3	1.7	2.2	1.9	2.2	1.7
Thailand	2.9	2.7	1.2	4.3	2.7	2.5	1.2	2.7	2.4	2.4	1.4	2.5
LATIN AMERICA/CARIBBEAN												
Bolivia	1.5	2.0	3.6	2.0	1.5	1.9	3.2	1.5	1.6	2.0	3.0	1.6
Brazil	3.3	4.5	NA	4.3	2.7	3.7	NA	2.6[a]	2.5	3.8	NA	2.5[a]
Colombia	2.1	2.1	0.9	2.6	2.0	1.5	0.4	1.6	2.3	1.7	0.4	1.8
Dominican Rep.	4.0	4.6	1.7	3.9	4.1	4.1	1.7	3.1	4.0	2.8	2.0	2.8
Ecuador	1.3	0.6	3.0	2.1	0.9	0.6	3.0	1.4	1.0	0.7	2.7	1.5
Guatemala	0.8	2.7	NA	1.8[a]	0.9	2.7	NA	1.3[a]	0.8	2.9	NA	1.3[a]
Mexico	1.6	2.4	3.9	3.2	1.0	0.9	3.9	1.6	1.0	1.0	4.3	1.5
Peru	0.8	1.5	1.2	1.9	0.4	1.5	1.2	0.8	0.4	1.7	1.5	0.9
Trinidad and Tobago	6.9	5.1	2.1	8.5	6.0	4.8	2.1	6.1	NA	NA	NA	NA

NA = Not available
[a] Based on women 25-44 years

Similar regional patterns are evident for currently married women and for the more restricted groups shown in Table 6.1. The magnitude of infertility overall is much lower among currently married women and particularly among currently married women who first got married at least five years before the survey (the group that most closely approximates women continuously exposed to conception for at least a five-year period). In the latter group, less than two percent of women 25-49 were childless in 13 of the 25 countries. This suggests that the previous estimate of 3 percent as a minimum core primary infertility rate is too high. Substantially lower infertility has now been achieved in many developing countries in Africa, Asia, and Latin America. Moreover, if only currently married women who first married at least ten years ago are considered, infertility drops by another 0.5 percentage points, on the average.

The lowest level of childlessness in almost every country is exhibited by currently married women in their first marriage who have been married for at least five years. At age 25-49, the proportion of women in this group who are childless is 3 percent or less in every country and the average level of childlessness is less than 2 percent. As mentioned earlier, this measure will underestimate infertility whenever women without children are more likely to get divorced than women who have children.

Another way of measuring infertility is to count as fertile those childless women who were pregnant at the time of the survey. Since women who have been pregnant for longer durations are more likely to report themselves as pregnant, it is reasonable to assume that most of these pregnancies will result in live births. Table 6.2 shows the percentage of currently married women who have not had a fertile pregnancy (i.e., no live birth and no current pregnancy). At age 25-49, 0.5 percent fewer currently married women have not had a fertile pregnancy than are childless. Adding current pregnancy to the measure of infertility makes the greatest difference in Sri Lanka and the Dominican Republic where infertility among currently married women drops from 5.3 percent to 3.9 percent. For women who were first married at least five years ago, the percentage who have not had a fertile pregnancy is only slightly lower than the percentage who are childless. The closeness of these two figures suggests that extending the period under consideration beyond five years is not likely to result in a further decrease in the estimates of infertility.

Changes in infertility over time can be examined for countries included in both the DHS and WFS projects. Two different measures of infertility are shown in Table 6.3 for the 15 countries for which comparisons can be made. In the majority of countries, infertility decreased between the two surveys. Infertility fell in each of the comparison groups in eight countries and these decreases were often quite substantial. Most of the remaining countries showed increases in some of the groups and decreases in others. Only Thailand and Tunisia exhibited a tendency toward increased infertility between the two surveys, and these increases were generally small.

Table 6.3 Measures of infertility in DHS and WFS surveys by age of woman

	Percentage of Currently Married Women (Married at Least 5 Years[a]) Who Have Not Had a Fertile Pregnancy				Percentage of Ever-Married Women Who Have Not Had a Live Birth			
	Age 40-44		Age 25-49		Age 40-44		Age 25-49	
Country	DHS	WFS	DHS	WFS	DHS	WFS	DHS	WFS
SUB-SAHARAN AFRICA								
Ghana	0.6	NA	1.6	NA	1.7	2.6	2.7	3.5
Kenya	1.9	NA	1.6	NA	1.9	3.5	2.5	3.1
Senegal	2.6	3.2	3.3	3.1	4.0	3.5	4.5	3.8
NORTH AFRICA								
Egypt	1.9	NA	2.6	NA	2.8	4.1	4.8	5.0
Morocco	3.4	NA	3.6	NA	3.4	7.7	6.2	8.2
Tunisia	2.3	NA	2.9	NA	3.9	3.6	5.2	4.6
ASIA								
Indonesia	3.6	4.6	3.4	5.1	4.0	4.8	4.8	6.7
Sri Lanka	2.0	3.4	1.7	2.5	2.8	4.2	5.3	5.5
Thailand	2.5	1.8	2.7	1.9	2.6	2.5	5.0	3.5
LATIN AMERICA/CARIBBEAN								
Colombia	1.5	3.2	1.6	2.3	1.9	3.2	3.3	4.1
Dominican Republic	4.1	5.2	3.1	3.7	3.9	6.0	5.3	4.5
Ecuador	0.6	NA	1.4	NA	1.3	2.0	3.0	2.8
Mexico	0.9	2.6	1.6	2.3	2.4	3.1	4.0	3.9
Peru	1.5	1.7	0.8	1.4	1.3	1.8	2.2	2.6
Trinidad and Tobago	4.8	4.6	6.1	6.4	6.4	5.8	10.3	10.4

[a] For DHS, this category includes all currently married women whose date of first marriage was at least five years before the date of interview. For WFS, this category includes women married for at least five years in total, with marriage periods cumulated throughout their lives.

Source: Tables 9 and 10, Vaessen (1984), and WFS country reports.

It may be argued that although primary infertility is low in many areas, secondary infertility may be considerably more widespread. Secondary infertility has been found to be particularly common in parts of Africa, where a majority of couples visiting infertility clinics had already had one or more live births (Cates et al., 1985). The data requirements for accurately measuring secondary infertility are particularly demanding and the DHS surveys do not include some of the necessary input data. Nevertheless, it is possible to obtain some information about the incidence of secondary infertility by examining subsequent births after the first live birth. Table 6.4 shows the subsequent fertility behavior of currently married women whose first child was born at least five years before the time of the survey. With the exception of Trinidad and Tobago, which as before shows a divergent pattern, only 1.2 to 5.5 percent of such women have not gone on to have a second birth. For women in their first union, the proportion is even lower, ranging from 0.8 percent in Burundi to 5.0 percent in Thailand. As with the other measures of infertility discussed above, sub-Saharan Africa is generally low, again suggesting that this region as a whole is not subject to high levels of infertility.

It is likely that some of the couples who did not have a second child were experiencing problems of secondary infertility. Others may have made a conscious decision not to have any more children. In every country, some women with one living child state that they do not want to have any more children (data not shown). The proportion who do not want another child is relatively low in sub-Saharan Africa (averaging 3 percent), somewhat higher in North Africa (7 to 9 percent) and higher still in Asia (16 percent) and Latin America (well over 20 percent). Although some women may profess not to want another child because they think that they and their husbands are physically unable to have any more, it is clear that the voluntary curtailment of childbearing after the first child is substantial in many countries. Therefore, the secondary infertility estimates shown in Table 6.4 should be regarded as maximum values, with the actual prevalence being considerably lower.

In summary, the level of infertility is surprisingly low in most of the 25 DHS countries examined in this report. In more than half of these countries, fewer than two percent of currently married women age 25-49, whose first marriage took place at least five years before the interview date reported not having any children born alive. This suggests that the previously accepted minimum core value of three percent of women childless in the absence of pathological infertility may be too high. Even a minimum value of two percent infertile seems questionable in light of the DHS findings.

Another widely accepted finding from previous studies–that sub-Saharan Africa suffers from unusually high rates of infertility–is also not supported by the DHS data. Primary infertility in the ten sub-Saharan countries examined is no higher than it is in Latin America and the Caribbean and somewhat lower than primary infertility in the small number of Asian and North African countries included in the study. Moreover, secondary infertility also appears to be relatively low in sub-Saharan Africa. Although pockets of high infertility may still exist in parts of sub-Saharan Africa, it is no longer appropriate to characterize that region as a whole as a high infertility area.

Infertility appears to have declined over time in a number of developing countries. This decline is probably due in part to general improvements in women's health and nutrition and to the availability of antibiotics to treat diseases that affect the ability to bear children.

Table 6.4 Among currently married women age 25-49 whose first child was born five or more years ago, the percentage who have not had a second child, Demographic and Health Surveys, 1986-1989

Country	All Women	Women in Their First Union
SUB-SAHARAN AFRICA		
Botswana	3.7	3.7
Burundi	1.9	0.8
Ghana	2.5	1.6
Kenya	1.7	1.3
Liberia	5.1	3.6
Mali	3.7	NA
Senegal	3.2	2.2
Togo	1.8	1.0
Uganda	3.2	1.8
Zimbabwe	2.7	2.1
NORTH AFRICA		
Egypt	1.5	1.2
Morocco	2.2	1.7
Tunisia	1.2	0.9
ASIA		
Indonesia	5.5	4.2
Sri Lanka	4.4	4.3
Thailand	5.3	5.0
LATIN AMERICA/CARIBBEAN		
Bolivia	2.8	2.5
Brazil[a]	5.0	4.2
Colombia	3.8	3.5
Dominican Republic	4.1	2.9
Ecuador	2.5	2.5
Guatemala[a]	1.9	1.7
Mexico	2.5	2.1
Peru	1.9	1.8
Trinidad and Tobago	7.4	NA

NA = Not available
[a] Based on women 25-44 years

7 Summary and Conclusions

Results from the Demographic and Health Surveys, when examined in conjunction with previous censuses and surveys, provide up-to-date information on fertility levels and recent trends in developing countries. There is great variation in fertility among the 25 DHS surveys included in this report: from Thailand, which has nearly achieved replacement level fertility, to Uganda where—if current fertility rates prevail in the future—the average woman will have more than seven children by the end of her childbearing years. Sub-Saharan Africa stands out as a region of particularly high fertility, with total fertility rates exceeding six children per woman in most countries. The region is also characterized by childbearing which begins in the teenage years and continues into the later childbearing years. Substantial deviations from traditional fertility patterns have recently begun to emerge in several countries in sub-Saharan Africa, primarily in Botswana, Kenya, and Zimbabwe. The total fertility rate in Botswana dropped by 14 percent, from 5.6 in the period 4-7 years before the survey to 4.8 in the most recent four-year period. During the same time period, the TFR fell by 19 percent in Zimbabwe. Although Kenya continues to have among the highest total fertility rates in the world (6.5 in the most recent four-year period), this still represents a substantial decline of nearly 20 percent over the last 12 years.

Outside of sub-Saharan Africa, Guatemala is the only DHS country examined in which the total fertility rate exceeds five children per woman. Aside from Guatemala and Bolivia, all of the DHS countries in the Latin America/Caribbean region have moderate levels of fertility, with TFRs between 3.0 and 4.1. The current level of fertility in these countries represents a sharp drop from the levels that prevailed in earlier years. In seven of the nine DHS countries in that region, women at the end of their childbearing years had borne between 6 and 7 children. If current fertility rates continue into the future, women who are currently beginning their childbearing career will have only about half as many children by the end of their childbearing years.

In recent years, the three North African countries included in this analysis (Egypt, Morocco and Tunisia) have had TFRs of 4.1 to 4.5. This is slightly higher than the level of fertility in the Latin American/Caribbean region and 30 percent lower than fertility in DHS countries south of the Sahara. Childbearing typically begins much later in these North African countries than in sub-Saharan Africa. The median age at first birth is 22 in Egypt and Morocco and over 24 in Tunisia, compared with 19 or less in most sub-Saharan countries. Only 14 percent of Tunisian women in their twenties had their first child before reaching age twenty, whereas one-half to two-thirds of women in almost all of the sub-Saharan African countries had their first child during their teenage years.

Indonesia, Sri Lanka, and Thailand do not represent the total demographic situation in the Asian region, but they do demonstrate how rapidly fertility can fall even in countries with limited economic resources. The GNP per capita in 1987 was $840 in Thailand, and only $400 in Sri Lanka and $450 in Indonesia (World Bank, 1988). Yet all of these countries had undergone a remarkable fertility transition by that time. The total fertility rates ranged from 2.3 in Thailand to 2.7 in Sri Lanka to 3.2 in Indonesia in the four years before the DHS surveys were conducted. Although fertility decline began at least fifteen years ago in each of these countries, the pace of the decline has not slackened in recent years. Between the two most recent four-year periods, fertility declined by 18 to 26 percent in the Asian DHS countries, slightly accelerating the pace of the decline experienced earlier. Indonesia achieved its fertility decline without a major change in the age of initiation into childbearing, but an increasing age at first birth was an important factor in the fertility decline in Sri Lanka and Thailand. The postponement of childbearing is particularly remarkable in Sri Lanka where the median age at first birth was close to 25 for the whole country and nearly 27 in the capital city of Colombo.

The trend in fertility over the last 15 years can be examined using data from the DHS birth history; long-term trends can be identified by comparing DHS data with fertility estimates from the World Fertility Survey and other sources. Over the course of the last fifteen years, fertility up to age 34 declined to some extent in all of the DHS countries analyzed except Liberia and Mali. The largest declines in fertility occurred in Asia, Latin America, and North Africa, but declines of 10 percent or more also took place in more than half of the sub-Saharan African countries. During this same period, fertility declined by more than 30 percent in Colombia, the Dominican Republic, Ecuador, Indonesia, Mexico, Morocco, Peru, and Thailand. Thailand experienced the most dramatic change, a fertility decline of 46 percent in a little more than a decade.

Reliable fertility estimates are available for a period of approximately 20 years in 11 DHS countries. In almost every country in which fertility estimates can be compared with estimates from other sources for overlapping periods, the estimates are in general agreement. The DHS estimates are close to, or slightly higher than, estimates from alternative data sources. This suggests that the DHS birth history data are relatively complete even for periods 10-15

years before the time of the survey. Over the course of the last two decades, these estimates suggest that fertility fell by an average of 40 percent–a remarkable change in such a short period of time.

With respect to infertility, the DHS results indicate that it occurs less frequently than was previously believed. Infertility has been declining over time in a number of DHS countries and has dropped to unexpectedly low levels in most of the 25 countries included in this report. Previous estimates of a minimum level of primary infertility in most countries of about three percent appear to be untenable. In the majority of countries examined, fewer than two percent of women 25-49 who had been married for at least five years had not had any live births. Moreover, contrary to the results of previous studies, sub-Saharan Africa cannot be characterized as a region of high primary or secondary infertility, although pockets of high infertility may still exist.

Fertility data from the 25 DHS countries analyzed in this report provide an up-to-date profile of fertility levels and trends in a wide variety of societies and answer some important questions about fertility change in the developing world. Some crucial questions remain, however. These include whether the incipient fertility decline in some sub-Saharan African countries will continue and be duplicated in other parts of the region; whether the fertility transition is beginning in earnest in countries such as Nigeria and Pakistan where family planning programs have met with only limited success in the past; and whether countries that have experienced moderate fertility declines will be able to sustain the momentum or whether fertility plateaus will make the goal of lower fertility unattainable. The results of future DHS surveys and other studies should help to resolve these issues.

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Appendix A

Standard errors, relative errors and confidence intervals for total fertility rates (TFR) for the periods 0-3 and 4-7 years prior to the survey, Demographic and Health Surveys, 1986-1989

Country	Standard Error TFR (Women 15-44)		Relative Error[a]		Confidence Intervals					
					0-3 Years Prior to Survey			4-7 Years Prior to Survey		
	0-3 Years Prior to Survey	4-7 Years Prior to Survey	0-3 Years Prior to Survey	4-7 Years Prior to Survey	- 2 SE	TFR	+ 2 SE	- 2 SE	TFR	+ 2 SE
SUB-SAHARAN AFRICA										
Botswana	.140	.168	2.9	3.0	4.50	4.78	5.06	5.23	5.56	5.90
Burundi	.105	.125	1.6	1.7	6.29	6.50	6.71	7.17	7.42	7.67
Ghana	.102	.114	1.7	1.8	5.85	6.06	6.26	6.21	6.43	6.66
Kenya	.085	.107	1.3	1.5	6.29	6.46	6.63	6.87	7.09	7.30
Liberia	.111	.135	1.7	2.0	6.17	6.39	6.61	6.52	6.79	7.06
Mali	.131	.163	1.9	2.1	6.58	6.84	7.10	7.37	7.70	8.02
Senegal	.107	.132	1.7	1.7	6.15	6.37	6.58	7.29	7.55	7.82
Togo	.121	.152	1.9	2.1	5.98	6.22	6.46	6.87	7.17	7.48
Uganda	.109	.126	1.5	1.8	6.96	7.18	7.40	6.86	7.11	7.37
Zimbabwe	.113	.118	2.1	1.8	5.09	5.31	5.54	6.32	6.55	6.79
NORTH AFRICA										
Egypt	.051	.061	1.1	1.2	4.48	4.58	4.68	4.82	4.94	5.07
Morocco	.069	.086	1.5	1.5	4.44	4.58	4.71	5.46	5.63	5.81
Tunisia	.074	.095	1.7	1.9	4.11	4.26	4.41	4.88	5.07	5.26
ASIA										
Indonesia	.049	.060	1.5	1.4	3.11	3.21	3.31	4.20	4.32	4.44
Sri Lanka	.045	.060	1.7	1.8	2.63	2.72	2.81	3.19	3.31	3.43
Thailand	.047	.064	2.1	2.2	2.16	2.25	2.34	2.81	2.94	3.07
LATIN AMERICA/CARIBBEAN										
Bolivia	.081	.094	1.6	1.7	4.76	4.92	5.08	5.33	5.52	5.70
Brazil	.084	.272	2.3	6.0	3.47	3.63	3.80	3.96	4.50	5.05
Colombia	.100	.127	3.1	3.1	2.99	3.20	3.40	3.78	4.04	4.29
Dominican Rep.	.079	.098	2.1	2.2	3.53	3.69	3.85	4.36	4.55	4.75
Ecuador	.098	.125	2.4	2.4	3.88	4.08	4.27	4.91	5.16	5.41
Guatemala	.107	.324	1.9	5.0	5.33	5.55	5.76	5.88	6.53	7.18
Mexico	.079	.089	2.0	2.0	3.85	4.01	4.17	4.34	4.52	4.70
Peru	.086	.121	2.0	2.3	4.03	4.20	4.37	5.04	5.28	5.52
Trinidad and Tobago	.086	.093	2.8	2.7	2.95	3.12	3.29	3.21	3.39	3.58

[a] Relative Error = 100 (Standard Error/TFR)

Appendix B

Summary of DHS-I surveys, 1985-1990

Region and Country	Date of Fieldwork	Implementing Organization	Respondents	Sample Size	Supplemental Studies, Modules, and Additional Questions
AFRICA					
Botswana	Aug-Dec 1988	Central Statistics Office	All women 15-49	4,368	AIDS, PC, adolescent fertility
Burundi	Apr-Jul 1987	Département de la Population Ministère de l'Intérieur	All women 15-49	3,970	AM, SAI, adult mortality
Burundi (Husband Survey)	Apr-Jul 1987	Département de la Population Ministère de l'Intérieur	Husbands	542	KAP study
Ghana*	Feb-May 1988	Ghana Statistical Service	All women 15-49	4,488	AM, SM, WE
Kenya**	Dec-May 1988/9	National Council for Population and Development	All women 15-49	7,150	H
Liberia	Feb-Jul 1986	Bureau of Statistics Ministry of Planning and Economic Affairs	All women 15-49	5,239	H, TBH, employment status
Mali	Mar-Aug 1987	Institut du Sahel USED/CERPOD	All women 15-49	3,200	AM, VC, childhood physical handicaps
Mali (Male Survey)	Mar-Aug 1987	Institut du Sahel USED/CERPOD	Men 20-55	970	KAP study
Ondo State, Nigeria	Sep-Jan 1986/7	Ministry of Health, Ondo State	All women 15-49	4,213	AM, H, TBH
Senegal	Apr-Jul 1986	Direction de la Statistique Ministère de l'Economie et des Finances	All women 15-49	4,415	AM, CD
Sudan	Nov-May 1989/90	Department of Statistics Ministry of Economic and National Planning	EMW 15-49	5,860	H, M, MM, female circumcision, family planning services
Togo	Jun-Nov 1988	Unité de Recherche Démographique Université du Benin	All women 15-49	3,360	AM, H, SAI, marriage history
Uganda	Sep-Feb 1988/9	Ministry of Health	All women 15-49	4,730	AM, H, SAI
Zimbabwe	Sep-Jan 1988/9	Central Statistical Office	All women 15-49	4,201	AIDS, AM, H, PC, SAI, WE
ASIA/NEAR EAST/NORTH AFRICA					
Egypt	Oct-Jan 1988/9	National Population Council	EMW 15-49	8,911	AM, CD, H, MM, PC, SAI, WE, women's status
Indonesia	Sep-Dec 1987	Central Bureau of Statistics National Family Planning Coordinating Board	EMW 15-49	11,844	PC, SM
Morocco	May-Jul 1987	Ministère de la Santé Publique	EMW 15-49	5,982	AM, CD, H, S
Nepal (In-depth)	Feb-Apr 1987	New Era	CMW 15-49	1,623	KAP-gap survey

Region and Country	Date of Fieldwork	Implementing Organization	Respondents	Sample Size	Modules, and Additional Questions
Sri Lanka	Jan-Mar 1987	Dept. of Census and Statistics Ministry of Plan Implementation	EMW 15-49	5,865	AM, H, NFP
Thailand	Mar-Jun 1987	Institute of Population Studies Chulalongkorn University	EMW 15-49	6,775	AM, S, SAI
Tunisia	Jun-Oct 1988	Office National de la Famille et de la Population	EMW 15-49	4,184	AM, CD, H, S, SAI
LATIN AMERICA & CARIBBEAN					
Bolivia	Mar-Jun 1989	Instituto Nacional de Estadística	All women 15-49	7,923	AM, CD, H, MM, PC, S, WE
Bolivia (In-depth)	Mar-Jun 1989	Instituto Nacional de Estadística	All women 15-49	7,923	Health
Brazil	May-Aug 1986	Sociedade Civil Bem-Estar Familiar no Brasil	All women 15-44	5,892	AM, H, PC, SM, abortion, young adult use of contraception
Colombia	Oct-Dec 1986	Corporación Centro Regional de Población Ministerio de Salud	All women 15-49	5,329	AM, PC, SAI, SM
Dominican Republic	Sep-Dec 1986	Consejo Nacional de Población y Familia	All women 15-49	7,649	NFP, S, SAI, SM, family planning communication
Dominican Republic (Experimental)	Sep-Dec 1986	Consejo Nacional de Población y Familia	All women 15-49	3,885	
Ecuador	Jan-Mar 1987	Centro de Estudios de Población y Paternidad Responsable	All women 15-49	4,713	SAI, CD, H, employment
El Salvador	May-Jun 1985	Asociación Demográfica Salvadoreña	All women 15-49	5,207	S, TBH
Guatemala	Oct-Dec 1987	Instituto de Nutrición de Centro América y Panamá	All women 15-44	5,160	H, S, SAI
Mexico	Feb-May 1987	Dirección General de Planificación Familiar Secretaría de Salud	All women 15-49	9,310	H, NFP, S, employment
Peru	Sep-Dec 1986	Instituto Nacional de Estadística	All women 15-49	4,999	H, NFP, employment, cost of family planning
Peru (Experimental)	Sep-Dec 1986	Instituto Nacional de Estadística	All women 15-49	2,534	
Trinidad and Tobago	May-Aug 1987	Family Planning Association Trinidad and Tobago	All women 15-49	3,806	AM, NFP, breastfeeding

EMW = ever-married women
CMW = currently married women

AIDS = acquired immune deficiency syndrome
AM = anthropometric measurements
CD = causes of death (verbal reports of symptoms)
H = additional health questions
M = migration
MM = maternal mortality
NFP = natural family planning
PC = pill compliance
S = sterilization
SAI = service availability information
SM = social marketing
TBH = truncated birth history
VC = value of children
WE = women's employment

*Data available for 943 husbands interviewed with a husband's questionnaire
**Data available for 1,133 husbands interviewed with a husband's questionnaire