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JOHN Y. OWUSU

Evaluation of the Ghana Fertility Survey 1979–80

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

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

The World Fertility Survey is an international research programme whose purpose is to assess the current state of human fertility throughout the world. This is being done principally through promoting and supporting nationally representative, internationally comparable, and scientifically designed and conducted sample surveys of fertility behaviour in as many countries as possible.
The WFS is being undertaken, with the collaboration of the United Nations, by the International Statistical Institute in cooperation with the International Union for the Scientific Study of Population. Financial support is provided principally by the United Nations Fund for Population Activities and the United States Agency for International Development.
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JOHN Y. OWUSU
Central Bureau of Statistics
Accra, Ghana

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Preface

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

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

The fifth such workshop, involving three countries – Ghana, Egypt and Portugal – was held between September and December 1982. The present document reports on the results of the evaluation of the data of the Ghana Fertility Survey of 1979–80 and was prepared by John Y. Owusu, who participated on behalf of Ghana. Bothaina El Deeb and Custodio Conim, the other participants, contributed to the present evaluation through their ideas and discussions.

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

HALVOR GILLE
Project Director

Acknowledgements

I would like to express my gratitude to the WFS central staff for the invaluable help they gave me in this study. I am particularly grateful to Dr Shea Rutstein, co-ordinator of the fifth WFS evaluation workshop, who gave lectures on the methodology and evaluation techniques employed in this study and provided most of the tabulations used in the study, Dr Susheela Singh for her tremendous help in reviewing the drafts of the report and for making helpful corrections, additions and amendments, and Mr Ishmael Kalule-Sabiti for his useful critical comments and contributions in providing supplementary tables for the study. My thanks are also due to the late Dr V.C. Chidambaram, Deputy Project Director of WFS, for his assistance and encouragement which made possible the early completion of the study.

1 Introduction

1.1 OBJECTIVES AND CONTENT OF GHANA FERTILITY SURVEY (GFS)

The Ghana Fertility Survey (GFS) was conducted in 1979–80 as a country project of the World Fertility Survey (WFS) programme. Its main objective was to assess the current state of fertility in Ghana. It was carried out by the Central Bureau of Statistics in collaboration with the Ghana National Family Planning Secretariat and with technical assistance from the WFS headquarters.

The questionnaire for the survey consisted of two major parts: a household schedule which was used for listing household members together with basic demographic data about members including sex and age, and an individual questionnaire used for detailed interview of females aged 15–49 years who had been identified in the household schedule. The individual questionnaire contained sections on the following topics:

— respondent's demographic and social background
— maternity history
— marriage history
— contraceptive knowledge and use
— birth intervals and fertility preferences
— work history
— current (or last) husband's background

The survey, which covered all the nine regions of the country, used a two-stage self-weighting sample design involving the selection of 300 primary sampling units (PSUs) with the object of yielding a sample of 7500 households and an equal number of respondents for the individual interview. While the census enumeration areas were used as a sampling frame, selection of the sample entailed a field mapping and household listing operation. Regardless of marital status all women aged 15–49 who slept in selected households on the previous night were eligible for the individual survey.

1.2 THE COUNTRY AND ITS SOURCES OF DEMOGRAPHIC DATA

The Republic of Ghana lies along the coast of west Africa and has a land area of 238 537 square kilometres and a coastline of 560 kilometres. The last census in 1970 returned a population of 8.5 million, and with an estimated growth rate of about 3 per cent per annum the population in mid-1983 was estimated to be 13 million. Ethnically and linguistically, the Ghanaian population is heterogeneous, comprising no fewer than 17 major ethnic groups based on major language groups.

Estimates of population are largely based on the 1960 and 1970 censuses, the post-enumeration surveys which followed them, and a National Demographic Sample Survey conducted in 1968–9. The vital registration system covers only about 40 per cent of births and 25 per cent of deaths in the country. To date, however, the GFS constitutes the most comprehensive statistical enquiry into the fertility levels, patterns and conditions of Ghanaian women. Its results will therefore have a significant impact on the evaluation of population policies and programmes in Ghana.

1.3 OBJECTIVES OF THE EVALUATION STUDY

The usefulness and reliability of demographic parameters derived from the survey, however, depend on the quality of the data collected. Inherent errors and biases must be identified, and their magnitude and the effect they may have on the estimates must be ascertained and measured. In this study, therefore, we examine in the following chapters the characteristics of the data to identify the types and sources of errors and biases – if any – that may affect the reliability of the survey findings.

2 Errors and Biases which May Affect the Information in Fertility Surveys

2.1 SELECTION PROCEDURES[1]

The definition of women eligible to be selected for the individual interview and the procedures for such selection vary in the WFS according to country. In some cases all women of childbearing age registered in the household schedule have been included as eligible, irrespective of their marital status. In others, only those women who were ever in a legal or consensual marriage have been considered eligible to be selected for the individual interview. The first was the procedure followed in the GFS.

2.2 ERRORS IN THE REPORTING OF AGE

Incorrect reporting of ages results from a preference for certain digits and a transference of age. In many surveys greater concentrations of persons are observed in the ages ending in 0, 5, 8 and 2 at the expense of the adjacent digits.

In the shifting of age respondents may declare a higher or lower age than their real one: women over 40, for example, may declare themselves to be younger. This type of error has a very important impact on the estimation of measures in which the age of the woman is involved.

Missing data on age may also distort the age structure. The GFS, therefore, tried to obtain an estimate of the woman's age during the interview if the date of birth or age was not known. However, this estimation may also be an additional source of error, especially when the interviewer derives the estimate by using information on characteristics such as parity or marital status.

Age transference can have important effects on estimated fertility rates. The biases that occur depend not only on the direction of transference (ie to older or younger ages than the real age), but also on the real age of the woman and whether or not transference is selective with respect to fertility. As an example, let us take the case of women whose real ages were 45–49 at the time of the interview, but who reported ages 40–44. If these women were not different in their fertility from women of the same age reporting correctly, this transference would bias upwards the estimate of children ever born to women aged 40–44 because older women in general have higher parity. This result holds true for all age groups.

The result holds for women whose real age groups are 30 and above; the opposite is true for women who are really 20–24 but report ages 15–19; and the situation is indeterminate for women really aged 25–29. Now let us see the effect on period fertility for the cohort of women reporting age 40–44. If the women who transferred to this age group from 45–49 report the dates of their childbearing accurately, the ages at which they gave birth would be too low, inflating the rates for those ages less than 20 and deflating for ages 30 or greater; in other words the entire cohort fertility curve would be shifted to younger ages.

If the transferred women correctly report their ages at birth, then the age-specific rates for that cohort would be correctly reported but births would be transferred to later periods. If women report older ages, the errors introduced would be the opposite of those outlined above.

2.3 ERRORS IN THE RETROSPECTIVE INFORMATION

The accuracy of fertility estimates will depend on the quality of the data involved in both the numerator and the denominator of the rates. We have already described age-reporting errors which may affect the denominator of the rates; therefore we shall examine the factors which could affect the numerator, that is to say the live births.

The basic source of information on births is the maternity history of the respondent, in which all pregnancies, their dates and outcomes are listed in chronological order. In addition, the survival status of all live births at the time of the interview and age at death (if applicable) are also registered.

It must be pointed out that the women interviewed in each age group are the survivors of their respective cohorts, and therefore one must assume generally in using the maternity history for analysis that the fertility of the survivors does not differ from that of the women who have died. The bias from the non-fulfilment of this assumption will be greater for periods more distant from the time of the interview and will also be related to the level of adult mortality. If female mortality is high and differs according to the number of children, the level of past fertility will probably have been underestimated.

The data contained in the maternity history are obtained retrospectively, so that their quality depends on the respondents' capacity for remembering each of the events and the exact date each occurred, as well as on their willingness to report all the events.

Omission

A frequent error in maternity histories is the omission of births. Generally, omission occurs more often among older women and for births that occurred long before the time of the survey. However, more recent births, mostly those that occurred in unstable marriages, may also be omitted. In addition, children are more frequently omitted if they died during their first years of life or were living outside the home at the time of the interview. It has also been observed

[1] The substance of this chapter is taken wholly from chapter 2 of Guzmán (1980).

in countries with son preferences that more female births are omitted than male births.

When the omission concerns periods more distant from the time of the survey, its effect is to underestimate fertility in these periods, with the possible result of showing a false increase in fertility with time.

The level of total fertility for the older women would thus be underestimated, and therefore the mean parity by age would show a decline in the later ages. On the other hand, when children of very young ages (at interview) are omitted, the level of fertility in the latest period is underestimated, which could give the impression of a recent decrease of fertility.

Goldman, Coale and Weinstein have found a high correlation between the poor information about age and the omission of births in a study on the quality of the data obtained in the Nepal Fertility Survey (Goldman *et al* 1979).

Misdating of births

Incorrect reporting of dates of births of children is another important source of distortion of the maternity history. The failure of some women to remember the dates at which their children were born may be important if there is a systematic tendency on the part of the respondents to transfer the birth date of their children nearer to or further from the time of the survey.

Studies of the data from surveys carried out in west New Guinea around 1962 have produced evidence of a shift in fertility to periods further removed from the time of survey, caused by a presumed tendency on the part of the interviewers to assume that the women had begun childbearing at a very young age. The effect of this distortion was to overestimate the fertility in the earlier periods and to show a false decline in the fertility in the younger ages for the later periods.

In an analysis of the data obtained in the Bangladesh Fertility Survey of 1976, Brass (1978) found evidence of other types of displacement. Specifically, it seemed that births which occurred during the last five years had been transferred to the previous period (five to ten years before the survey), and that births which had taken place in periods before this were brought forward, many to this same period. The error, which mainly affects the older cohorts, creates a distortion in the trend of fertility, shown as an exaggerated decline of fertility in recent periods for the older ages.

Potter (1977), starting from certain assumptions on the manner in which the displacements of births in time are produced, developed a simulation model to find out to what extent the fertility levels and trends obtained from the data contained in a maternity history could be distorted. In his model, the following assumptions are made: the more distant the births are from the time of the survey, the less exactly the interviewed women remember the date at which births occurred; and, if the maternity history is obtained through questions about the live births in the order in which they occurred, that is to say starting with the oldest child, then the date a woman gives for any other birth after the first one is influenced by the information she has given about her previous births. In effect, the model assumes that the respondents report their births – at least those furthest removed from the time of the survey – in terms of birth intervals, and that dates of birth are brought forward because of the reporting of a later date for the first birth or the exaggeration of the interval between successive births. Comparing the results of his model with the information obtained in surveys carried out in Bangladesh and El Salvador, Potter found that the distortions affecting the data of these surveys were of the type specified by his model.

3 Age Reporting

3.1 INTRODUCTION

Age, like sex, is one of the basic elements in the structure of any population, and in view of the functional differences between the sexes and among age groups in every society, many demographic phenomena are analysed in terms of the sex and age categories of the population. The demographer's interest in studying the characteristics of age data and the age composition of populations also stems from the fact that most if not all demographic characteristics vary with age. For this reason age was one of the basic items of information collected in the GFS – as in all demographic enquiries carried out in Ghana.

3.2 TYPES AND SOURCES OF DATA ON AGE

In the GFS household schedule the date of birth and age of household members were asked and the information was supplied by the person responding for the household – generally the head of household or by the individual concerned if he/she was around. The specific questions asked were:

Date of birth: During which month was this person born?
During which year was this person born?
Age: How old is he/she?

In the individual interview information on the age of the respondent was obtained before the question on date of birth was asked; the questions were:

Age: How old are you?
Date of birth: Do you know your date of birth?

If the answer to the second question was Yes, the month and year of birth were asked.

In 52.1 per cent of the completed interviews the respondent gave her exact date of birth, and in 27.2 per cent only the year of birth was known. The main sources of information on date of birth were birth and baptismal certificates, child clinic cards and miscellaneous documents and records of dates. Where the date of birth was not known but age was given, the source was usually a guess by the respondent himself/herself or by a member of the family or household. Where neither the date of birth nor age could be given, or where the age given appears improbable, various procedures were followed to obtain an estimate of the respondent's age. The procedures included the use of a historical calendar of national, regional and local events, and demographic facts about the respondent such as number of children ever born. Where these could not help, age was estimated by the physical appearance of the respondent. These sources of information about a person's age of course have varying degrees of accuracy and reliability.

3.3 TYPES OF ERROR IN AGE DATA

Data on age from censuses and sample surveys are subject to several types of error, as discussed in chapter 2, and distortion in the age data of a population may arise from the following sources:

1 Age mis-statement originating from:
  1.1 Digit preference resulting in heaping on certain last digits of age
  1.2 Incorrect age statement resulting in age transfers. The incorrect age statement may originate from the respondent or from the interviewer
2 Omissions of certain groups of population. That is:
  2.1 Undercoverage of certain categories of the population who may be predominant in certain age groups, and
  2.2 Non-response – which may be related to particular population groups with special age characteristics.

In the evaluation of the GFS data, therefore, an attempt is made to evaluate the age data in terms of the above types and sources of age errors.

3.4 DIGIT PREFERENCES IN AGE STATEMENT

Figure 1 gives the age distribution of the household population from the GFS and of the population from the 1970 census by single years of age while figure 2 makes the comparison by sex within the GFS household population. In both sources the pattern of age reporting is similar, with ages concentrated largely at digits ending in 0 and 5. Preference for digits ending in the even numbers 2 and 8 is greater than for digits ending in 4 and 6. However, the degree of heaping is greater in the census than in the GFS and greater among females than males.

Myers' blended index is used to measure the digit preference. It takes values between 0 where there is no digit preference and 180 when only digits ending in 0 and 5 are preferred. Tables 1 and 2 and figures 3 and 4 give Myers' index for the GFS and the 1970 census. Also compared are the indices by sex and type of place of residence. Although the indices for the GFS and the census are both quite high, digit preference was greater in the census (31.0) than in the GFS (22.7). Digit preference was also greater among males than females in both the GFS and the census. In the GFS preference was also greater in rural than in urban areas.

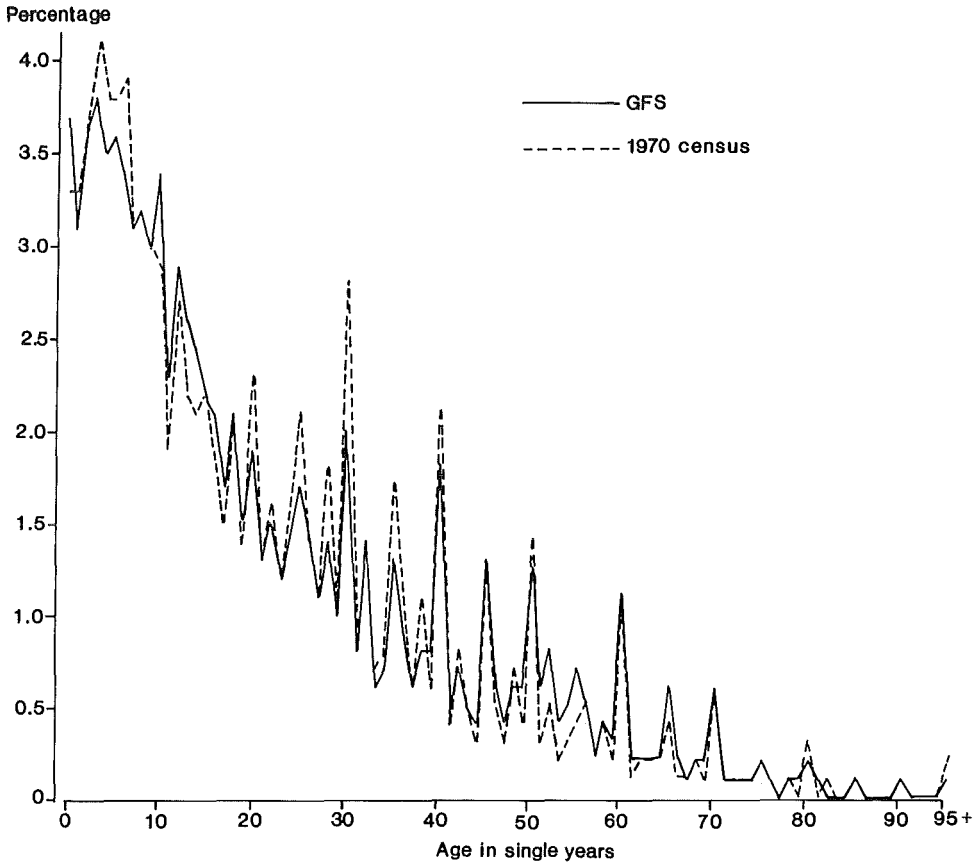


Figure 1 Percentage distribution of population (both sexes) enumerated in GFS and 1970 census, by single years of age

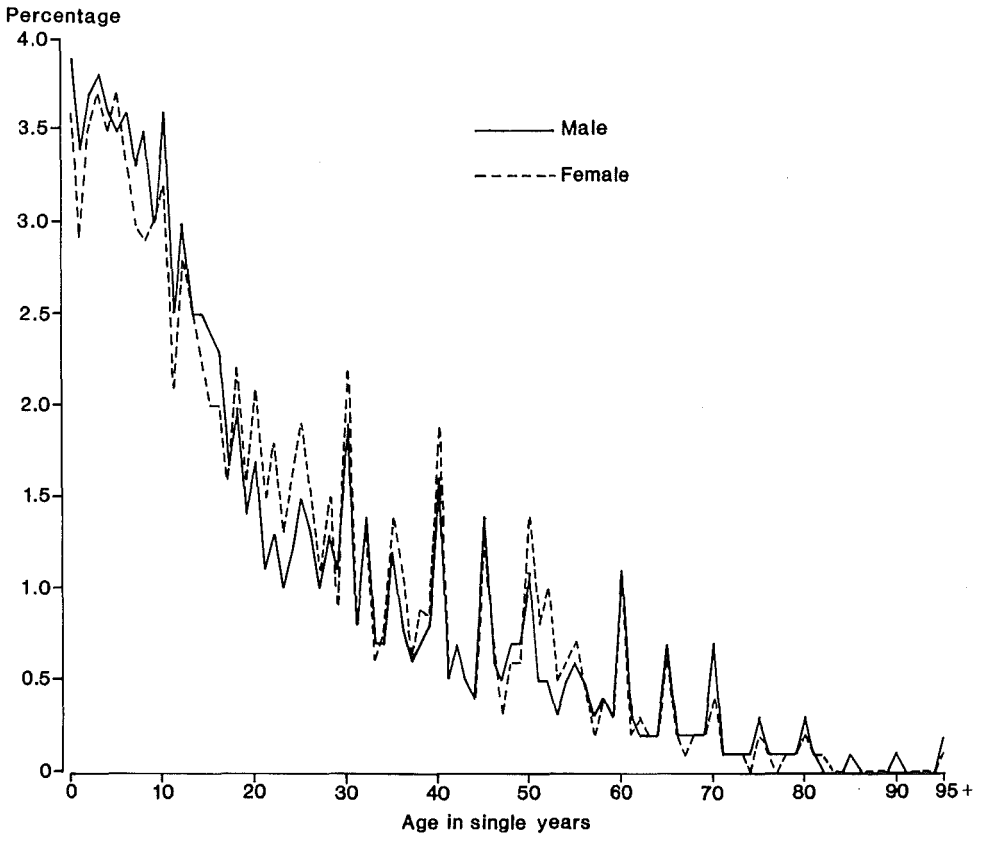


Figure 2 Percentage distribution of population enumerated in GFS, by sex and single years of age

Table 1 Percentage distribution of Myers' blended population according to last age digit by sex: GFS and 1970 census

Digit	Total country		Male		Female	
	GFS	1970 census	GFS	1970 census	GFS	1970 census
0	17.2	19.8	16.9	18.8	17.5	22.1
1	7.7	6.5	7.5	6.7	8.0	6.7
2	10.4	10.1	10.0	10.0	10.8	10.8
3	7.5	7.0	7.3	7.1	7.8	7.2
4	8.3	8.0	8.2	8.0	8.4	8.6
5	13.5	14.3	14.0	14.6	13.1	14.9
6	9.6	9.4	9.7	9.4	9.4	10.0
7	7.1	6.7	7.7	7.2	6.5	6.7
8	10.1	11.3	9.8	11.0	10.4	12.3
9	8.5	6.9	9.0	7.2	8.2	0.7
Myers' index	22.7	31.0	21.7	28.8	23.5	40.2

Sources: Household schedule, GFS 1979–80; 1970 census

Table 2 Percentage distribution of Myers' blended population according to last age digit by rural/urban status: GFS

Digit	Total country	Rural	Urban	Large urban
0	17.2	18.1	15.7	15.0
1	7.7	7.5	8.2	8.5
2	10.4	10.3	10.5	11.1
3	7.5	7.4	7.5	8.1
4	8.3	8.1	9.5	7.9
5	13.5	14.2	12.4	11.6
6	9.6	9.4	9.6	10.2
7	7.1	6.8	7.3	7.9
8	10.1	10.0	10.6	9.9
9	8.5	8.2	8.7	9.7
Myers' index	22.7	25.2	18.4	15.9

Source: Household schedule, GFS 1979–80

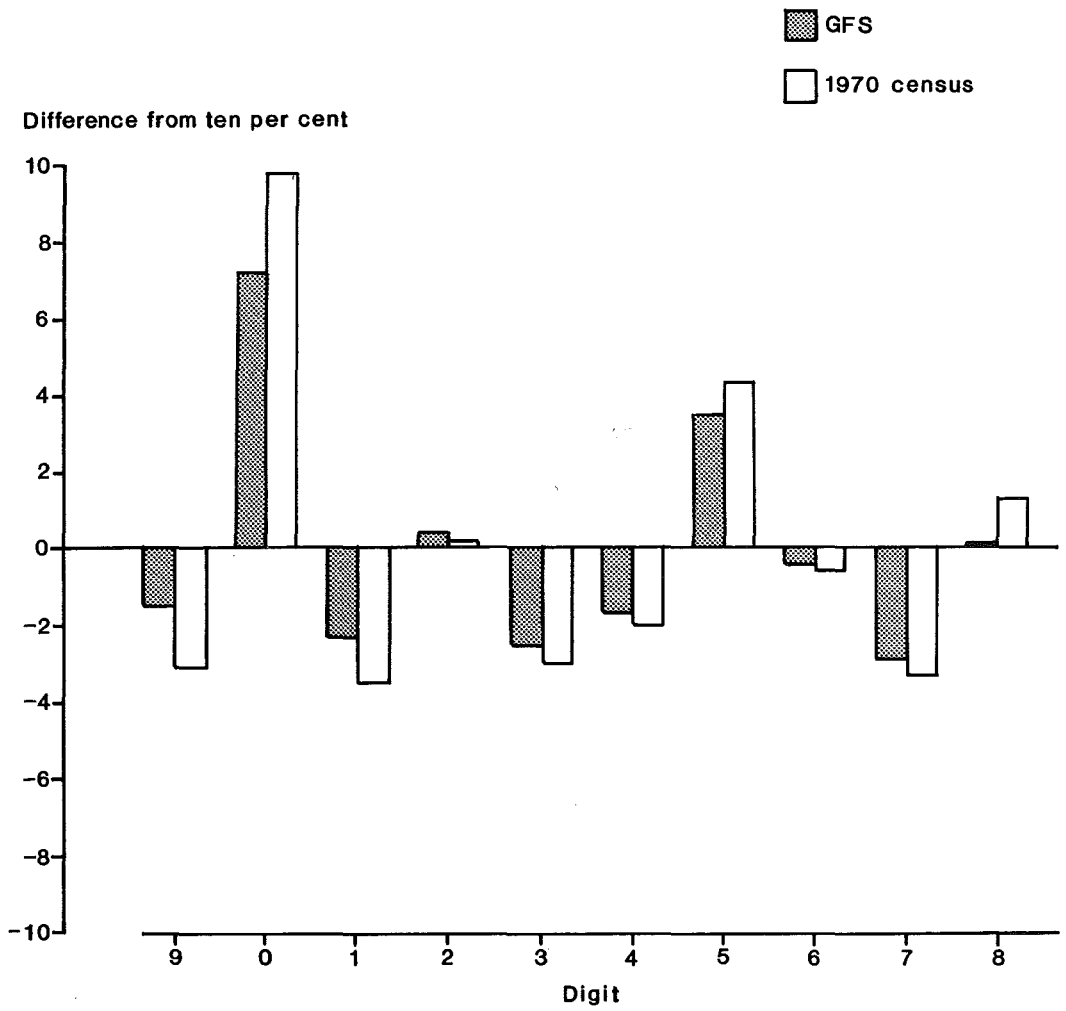


Figure 3 Preference for digits in the reporting of age among the population 10–79 years of age, enumerated in GFS and 1970 census, measured by the difference from 10 per cent obtained in the calculation of Myers' index

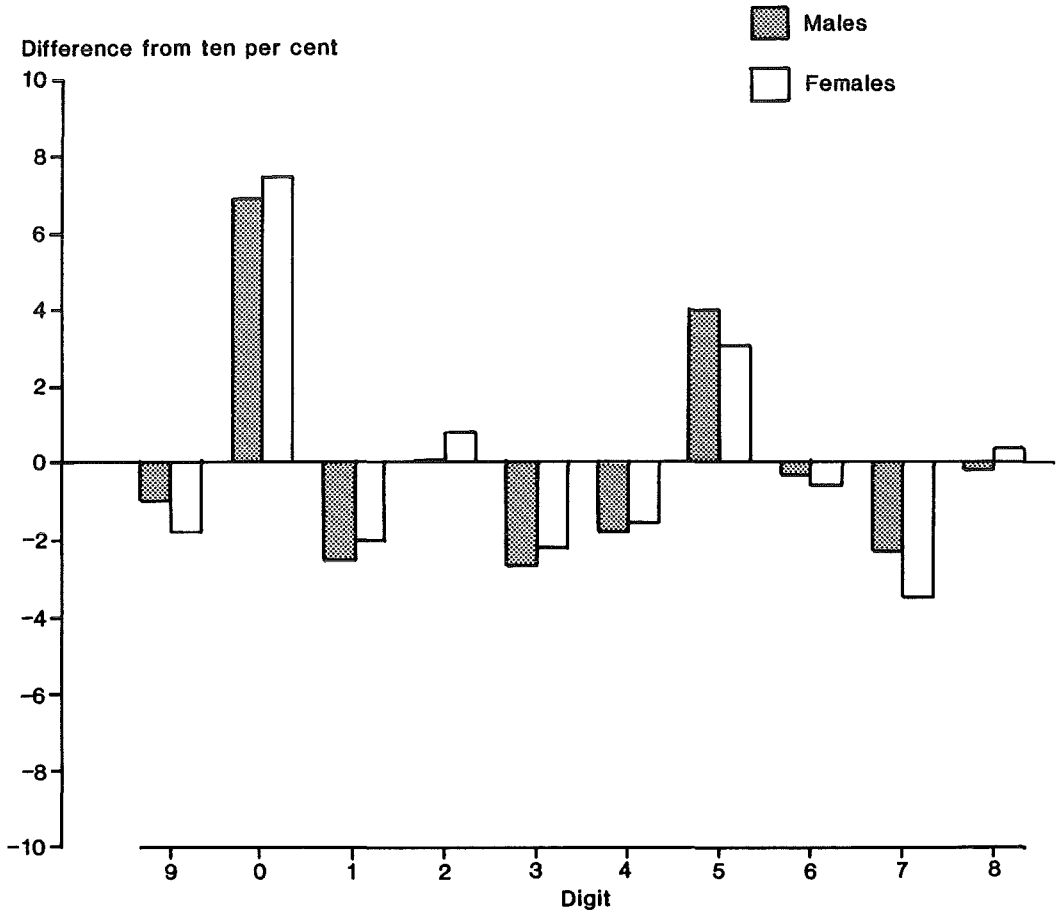


Figure 4 Preference for digits in the reporting of age among the population 10–79 years of age, enumerated in GFS, by sex, measured by the difference from 10 per cent obtained in the calculation of Myers' index

Individual interview

The procedure used in the individual interview to obtain information on the age of the respondent was different from the procedure used in the household survey. While in the household survey the information in respect of all members of the household was obtained in most cases from the head of the household, the respondent in the individual survey herself gave the information about her age – or gave the information used to estimate her age. The procedure in the individual interview also involved much more probing than did the procedure in the household survey. However, since in most cases the individual interview immediately followed the household survey, there were not many differences in the age data for females listed in the household schedule and covered in the individual interview. The matching of the age statements from the two sources in respect of the same woman showed that for 86.6 per cent of the women the age statements were the same in both sources (table 3). For

Table 3 Percentage distribution of respondents according to difference in reported age between the household and the individual survey: GFS

Age difference[a]	Age group							
	<20	20–24	25–29	30–34	35–39	40–44	45+	Total
–3 or more	0.1	0.0	0.1	0.5	0.7	0.7	0.9	0.3
–2	0.1	0.2	0.2	0.1	0.3	0.5	0.0	0.2
–1	0.5	0.7	1.4	0.1	1.0	1.4	1.6	0.8
0	89.9	89.2	85.4	87.0	82.5	81.3	84.3	86.6
+1	9.2	9.6	12.7	12.0	15.2	15.2	13.2	11.8
+2	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.1
+3 or more	0.1	0.2	0.1	0.2	0.3	0.4	0.0	0.1

[a]Plus sign indicates age was higher in the household survey; minus sign indicates age was higher in the individual survey.

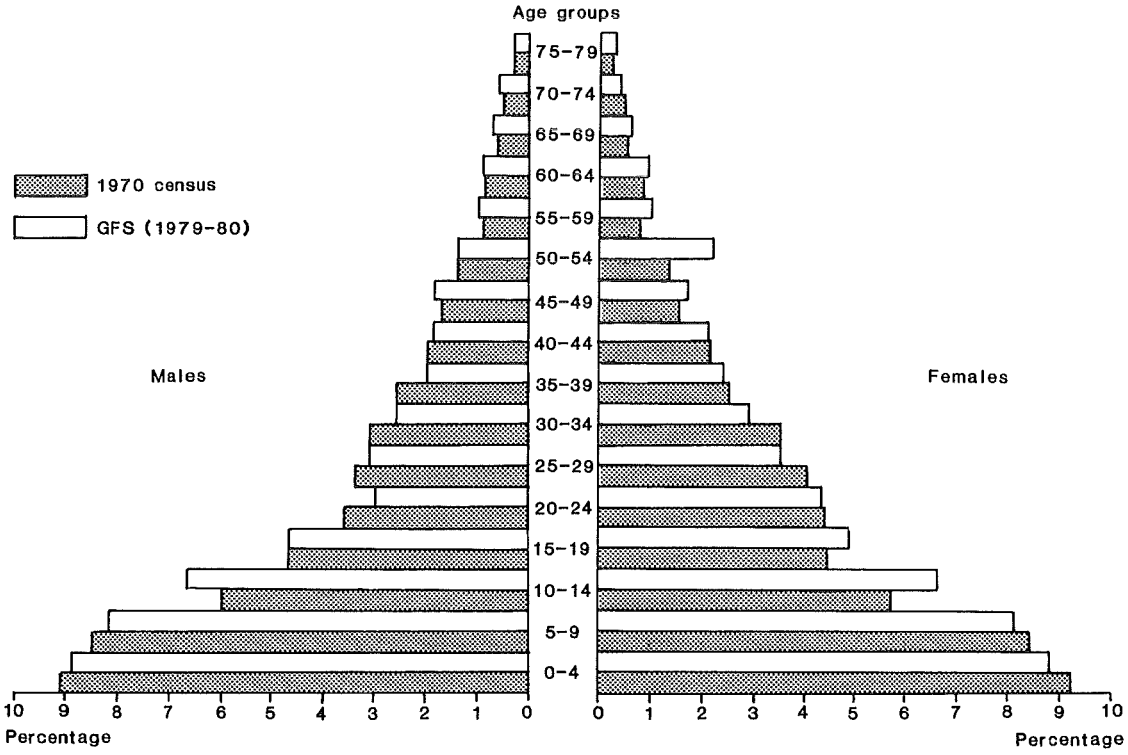


Figure 5 Percentage distribution of population by sex and age: GFS and 1970 census compared

11.8 per cent of the women the age in the household schedule was overstated by one year while for 0.8 per cent of the women the age was understated by one year. Women whose ages were overstated or understated in the household survey by two or more years constituted less than 1 per cent.

3.5 DISTRIBUTION OF POPULATION BY SEX AND FIVE-YEAR AGE GROUPS

When the age distribution is expressed in five-year age groups rather than in single years the degree of misreporting is reduced considerably (table 4 and figure 5). This, however, does not eliminate completely the effects of heaping on last digits as the differential effects by the digits are not equally distributed over all the five-year age groupings. Nonetheless as no better alternative system of grouping has yet been accepted for adoption in demographic analysis we shall continue to use the conventional five-year grouping in this analysis. Figure 5 shows higher proportions of the census population in the age groups 0–9 and 20–44 while the proportions in the age groups 10–19 and 45–79 were very low. The distribution by sex shows possible transference of females to age 20–34 in the census. The age distribution by sex in the GFS, on the other hand, is relatively smooth up to age group 15–19. There was however a significant deficit of males in age group 20–44 – more prominently in the age group 20–24 – and an excessive transfer of females to age 50–54. The big hump at age 50–54 (for females) may be due partly to residual error in digit preference (at age 50) and partly to transfer of women aged 45–49 into the age group 50–54 probably to avoid their inclusion in the individual survey.

Table 4 Percentage distribution of enumerated population by sex and five-year age groups: GFS and 1970 census

Age group	Total		GFS		1970 census	
	GFS	1970 census	Male	Female	Male	Female
0–4	17.8	18.3	18.3	17.2	18.3	18.2
5–9	16.3	16.9	16.9	15.8	17.2	16.8
10–14	13.5	11.7	14.2	12.9	12.1	11.3
15–19	9.6	9.1	9.7	9.6	9.4	8.8
20–24	7.3	7.9	6.2	8.4	7.2	8.7
25–29	6.6	7.4	6.3	6.9	6.8	7.9
30–34	5.5	6.5	5.3	5.7	6.2	6.9
35–39	4.5	5.1	4.1	4.8	5.2	5.0
40–44	4.0	4.1	3.9	4.1	4.1	4.1
45–49	3.6	3.2	3.8	3.3	3.4	3.0
50–54	3.6	2.7	2.9	4.2	2.8	2.6
55–59	2.1	1.7	2.1	2.0	1.8	1.5
60–64	1.9	1.7	2.0	1.9	1.8	1.6
65–69	1.3	1.1	1.4	1.2	1.1	1.1
70–74	1.0	1.0	1.3	0.7	1.0	0.9
75–79	0.6	0.5	0.7	0.5	0.5	0.5
80+	0.9	1.1	0.9	0.7	1.1	1.1
All ages	100.0	100.0	100.0	100.0	100.0	100.0

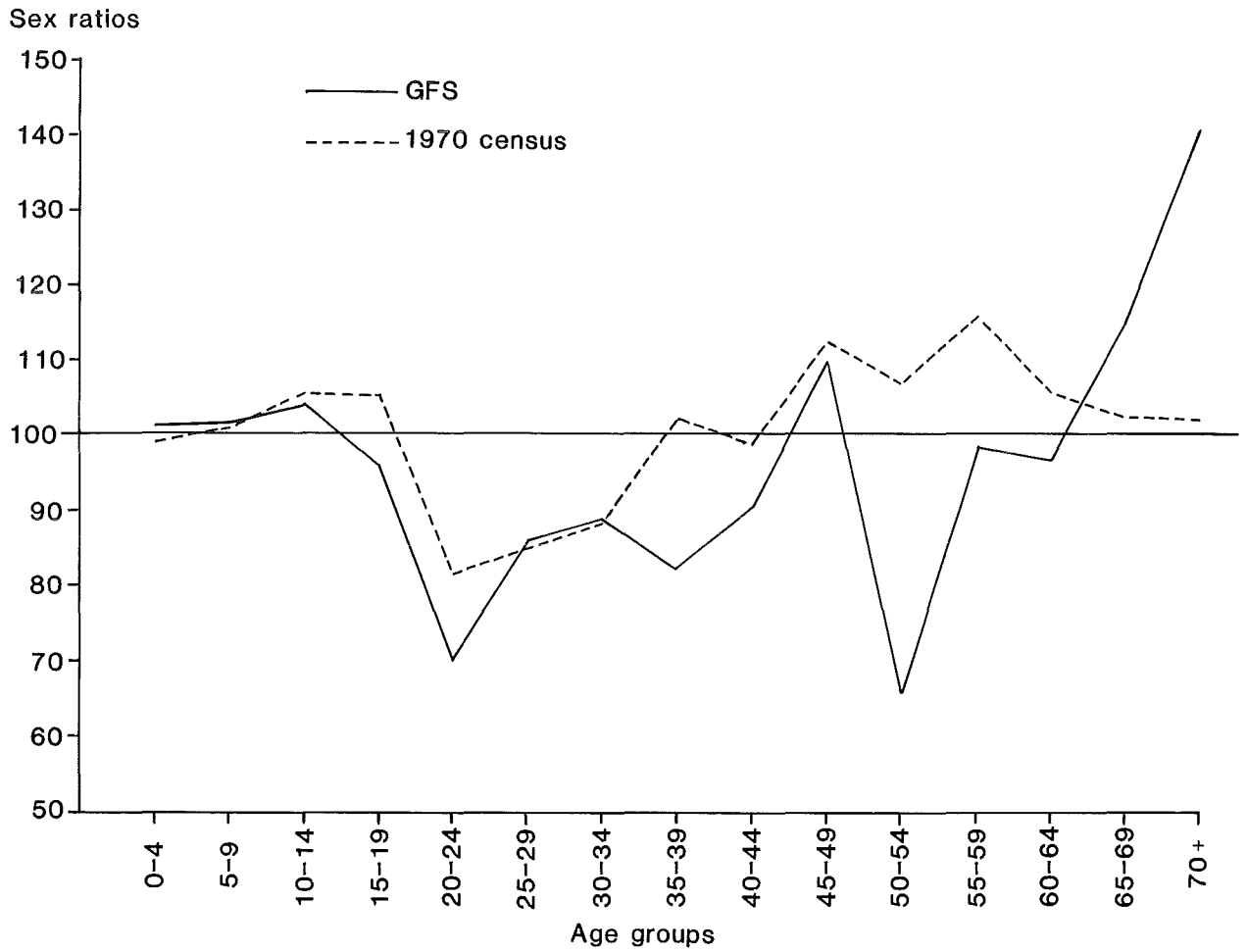


Figure 6 Sex ratios at 1970 census and GFS for five-year age groups

Further evidence of the deficit in the adult male population is given by the sex ratio of the total household population and the proportion of the population under 15 years of age. The sex ratio of the household population enumerated in the GFS was 95.3 males per 100 females, compared with 98.5 males per 100 females enumerated in the 1970 census. The breakdown of the population into broad age groups given in table 5 also shows that while the proportion of females aged less than 15 years was lower in the GFS (46.0 per cent) than in the 1970 census (46.3 per cent), the corresponding proportion of males was significantly higher in the GFS (49.4 per cent) than in the 1970 census (47.6 per cent) indicating deficiency in the adult male population at ages above 15.

The deficiency in the enumerated male population may be due to two factors: underenumeration and migration of young adult males. In the GFS a significant proportion (15 per cent) of households selected for interview could not be contacted (not at home or moved away) and these were more likely to be single-person households which were constituted mostly by young adult males. In recent years there had also been excessive migration of young Ghanaian adults to neighbouring countries. In the early part of 1983 an estimated 1.2 million Ghanaians returned home following an expulsion order issued by the Government of Nigeria against illegal immigrants in that country, and most of the returning Ghanaians were young adults, mostly males.

Table 5 Percentage distribution of enumerated population by age and sex: GFS, 1960 census and 1970 census

Source of data	Age group					
	0–14	15–29	30–44	45–59	60+	Total
Total						
GFS	47.6	23.5	14.0	9.2	5.7	100.0
1970 census	46.9	24.4	15.8	7.5	5.4	100.0
1960 census	44.6	25.5	17.5	7.5	4.8	100.0
Male						
GFS	49.4	22.2	13.3	8.8	6.3	100.0
1970 census	47.6	23.4	15.5	8.0	5.5	100.0
1960 census	44.6	24.2	17.8	8.2	5.2	100.0
Female						
GFS	46.0	24.9	14.6	9.5	5.0	100.0
1970 census	46.3	25.4	16.0	7.1	5.2	100.0
1960 census	44.5	26.9	17.2	6.9	4.5	100.0

The combined effects of the sex and age selective undercoverage and migration have resulted in the erratic sex and age ratios presented in table 6 and figures 6 and 7. The age distribution of the population enumerated in the 1970 census given in table 4 also showed significant divergence in the proportions of males and females in the age range 20–34. But outside this range the distributions for males and females were very close, indicating lesser degrees of distortion in the age-sex distribution of the census population. Consequently, the age and sex ratios for the census population given in figure 6 were comparatively less erratic, with a United Nations (UN) age-accuracy index of 42.8 as against 64.4 for the GFS data.

In summary, although the Myers' index for age digit preference in the GFS was not as high as in the 1970 census the digit preference in the GFS was nonetheless excessive. Digit preference was greater for females than for males and, as expected, was greater for the rural population than for the urban population. The age and sex ratios calculated from grouped data also showed significant deviations from the expected values, partly reflecting residual effects of the age mis-statements and partly the effects of the age-sex selective migration of Ghanaians from the country in recent years.

Table 6 Sex and age ratios calculated for enumerated population: GFS and 1970 census[a]

Age group	Sex ratio		Age ratios			
	GFS	1970 census	GFS		1970 census	
			Male	Female	Male	Female
0–4	101.3	99.1	–	–	–	–
5–9	101.7	100.9	104.0	104.9	112.7	113.4
10–14	104.3	105.4	106.7	102.0	91.3	88.7
15–19	96.3	105.3	95.0	89.7	97.3	87.8
20–24	70.3	81.4	77.6	101.8	88.7	104.2
25–29	86.4	84.9	108.7	98.0	101.9	101.6
30–34	89.0	88.8	102.7	98.0	103.1	106.3
35–39	82.7	102.1	89.8	97.5	101.1	91.8
40–44	90.8	99.3	97.3	100.6	95.5	101.8
45–49	109.9	112.5	112.4	79.8	97.9	89.1
50–54	65.6	107.1	98.4	158.4	108.5	115.2
55–59	98.7	115.8	86.5	66.1	78.4	72.2
60–64	97.2	105.9	110.1	118.8	121.3	126.3
65–69	115.4	102.7	90.0	89.7	81.4	83.4
70+	140.9	102.2	–	–	–	–

[a]Sex ratios are the number of males per 100 females. Age ratios are calculated by dividing each age group by the adjacent, younger age group.

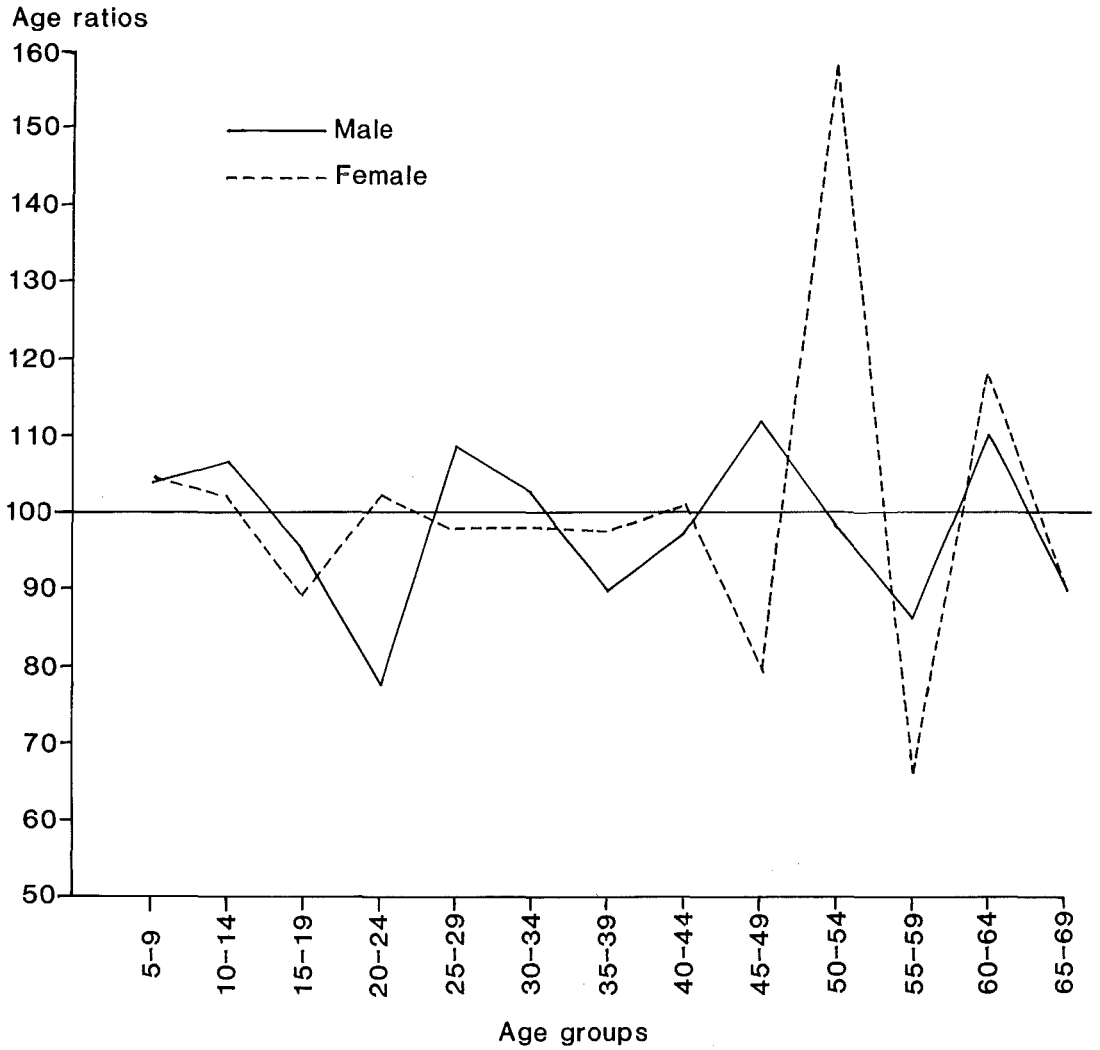


Figure 7 Age ratios at GFS by sex for five-year age groups

4 Nuptiality

Although premarital births do occur in many societies, marriage remains an important social institution within which most childbearing takes place. It is therefore one of the main mechanisms which regulate fertility level in a society. For this reason, the GFS enquired into the marital conditions of the women to gain greater understanding of factors that underlie the fertility levels and differentials in Ghana.

Information on the marital conditions of women covered in the survey was derived mainly from the individual survey. The principal topics enquired into were marital status, age at first marriage, duration of married life, prevalence of polygamous marriage, and stability of marriage. The information was obtained mainly from a marriage history schedule provided for each respondent in which were recorded the dates of start and end of all marriages and the reason for the dissolution of the marriage if it had been dissolved.

As in previous post-census surveys, 'marriage' in the GFS was defined as a more or less stable cohabitation between a man and a woman irrespective of whether or not any validating legal, religious or customary rites or ceremonies had been performed.

In the survey the marital status of the women was asked only in the individual interview, and in this the form of marriage was not asked. These omissions limit the scope of comparisons possible in this evaluation.

4.1 HEAPING IN NUPTIALITY DATA

Analysis of the nuptiality data relating to dates and ages given in figures 8, 9, 10 and 11 showed some amount of heaping on preferred last age or calendar year digits. Preference for digits 0 or 5 and for even numbers 2 and 8 is again evident in figure 8. The percentage distribution of ever-married women by years (expressed in single years) since first marriage given in figure 9 also shows heaping on ages 5, 9, 13, 17, 19 etc which end in most cases with least preferred digits. This is most likely due to the fact that the periods since first marriage were estimated from date or year of first marriage, and the years were

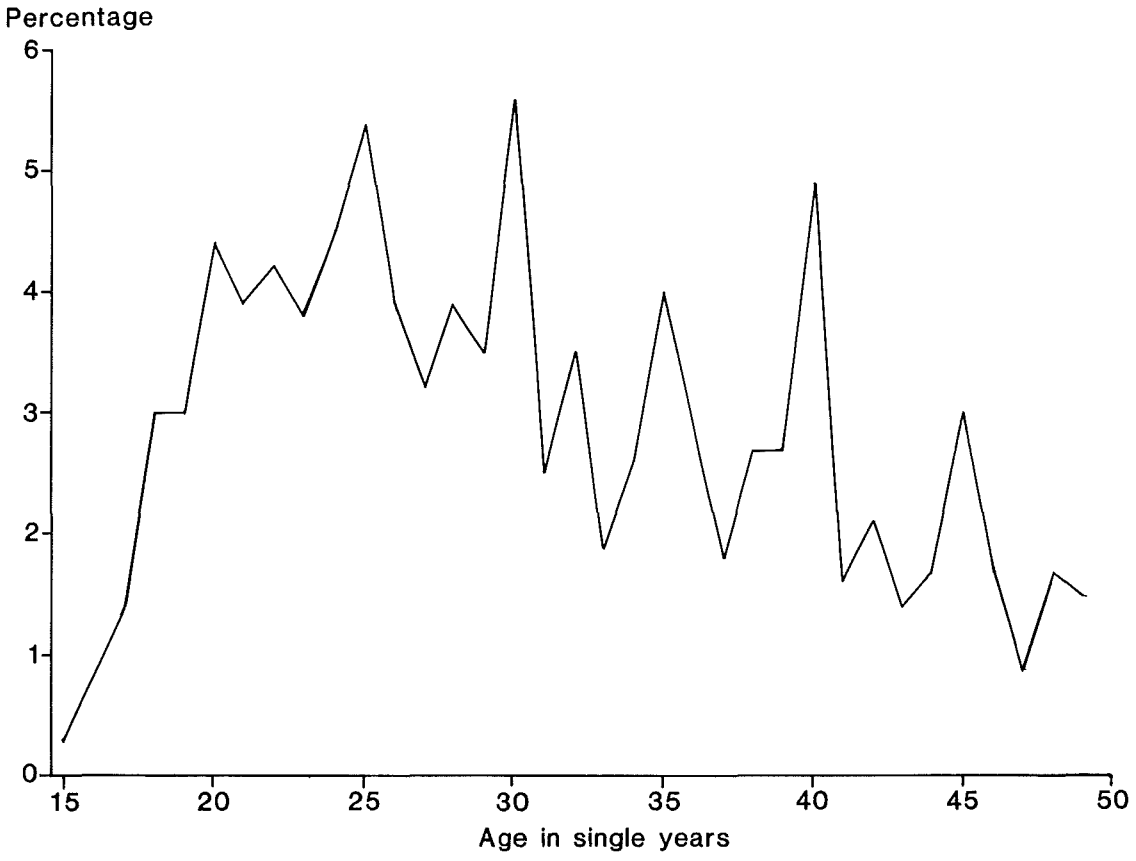
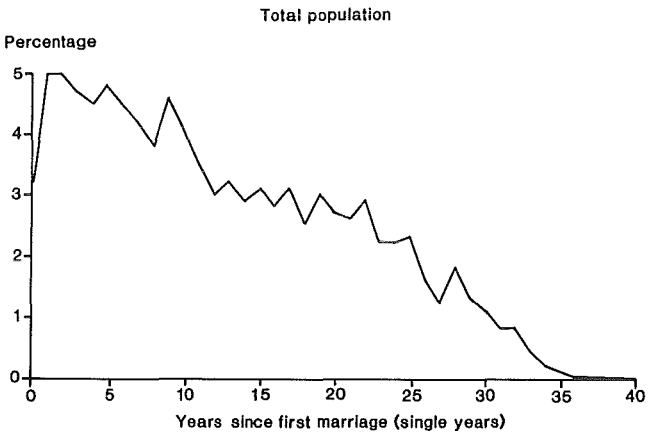


Figure 8 Percentage distribution of ever-married women, by single years of age: individual schedule



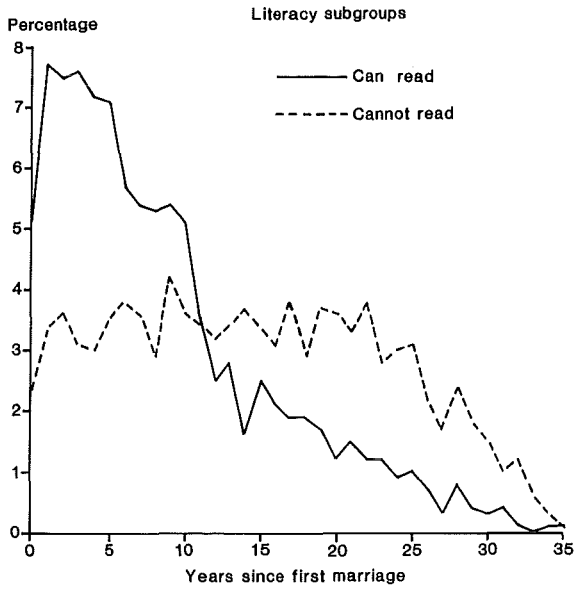


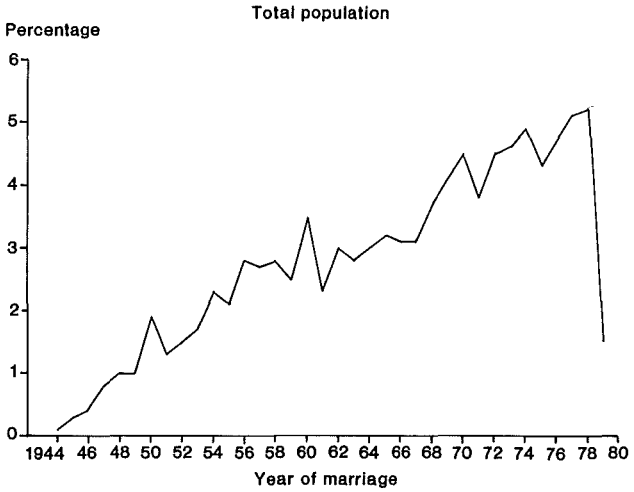
Figure 9 Percentage distribution of ever-married women, by single years since first marriage, total and according to selected characteristics

probably given with the highly preferred last digits (see figure 10). For instance if year of first marriage was given or estimated as 1970 the period to the survey date would be 9 years, and if the year was 1960 the period would be 19 years. A duration of 13 years is estimated from the calendar year 1966 (the year of the first military coup which overthrew the regime of the late Dr Nkrumah in Ghana) while duration of 22 years is estimated from 1957 (the year of Ghana's political independence). These two national historical dates which have been used to estimate ages and dates have contributed to heaping on periods (and ages) in many demographic enquiries in Ghana.

4.2 MARITAL STATUS BY AGE: COMPARISON WITH 1971 SUPPLEMENTARY ENQUIRY (SE)

In the GFS the proportion of females who have ever been married was 80.7 per cent compared with 82.6 per cent in the 1971 Supplementary Enquiry (SE). The proportions by age begin at a lower level of 30.9 per cent in the GFS, compared with 31.8 per cent in the 1971 SE for the age group 15–19. The proportions in the GFS then rise slightly but consistently above the proportions in the 1971 SE for the higher age groups. As table 7 shows, however, the two patterns are very close and there are no marked irregularities in the two distributions of the ever married.

The distributions for the currently married given in table 7 also show a similar pattern. The proportions for the age groups 15–19 and 20–24 in the GFS (26.8 per cent and 75.9 per cent respectively compared with 29.5 per cent and 76.1 per cent in 1971 SE) are lower and these are accounted for by the higher proportions who are divorced/ separated.



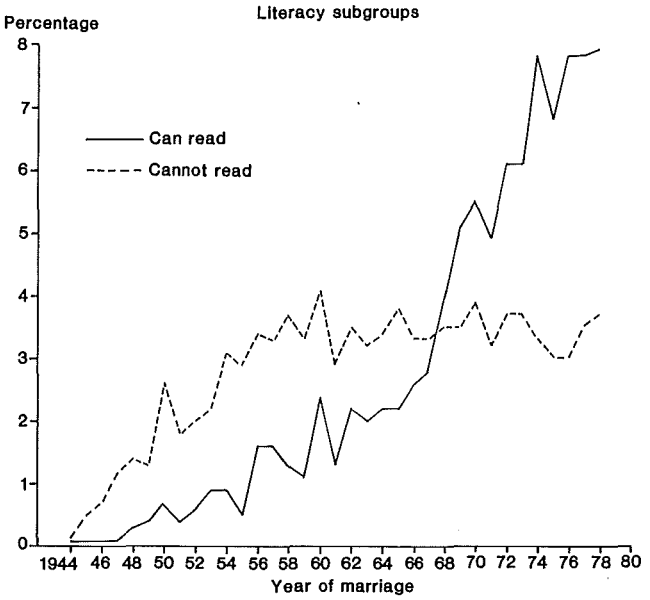


Figure 10 Percentage distribution of ever-married women by year of marriage, total and according to selected characteristics

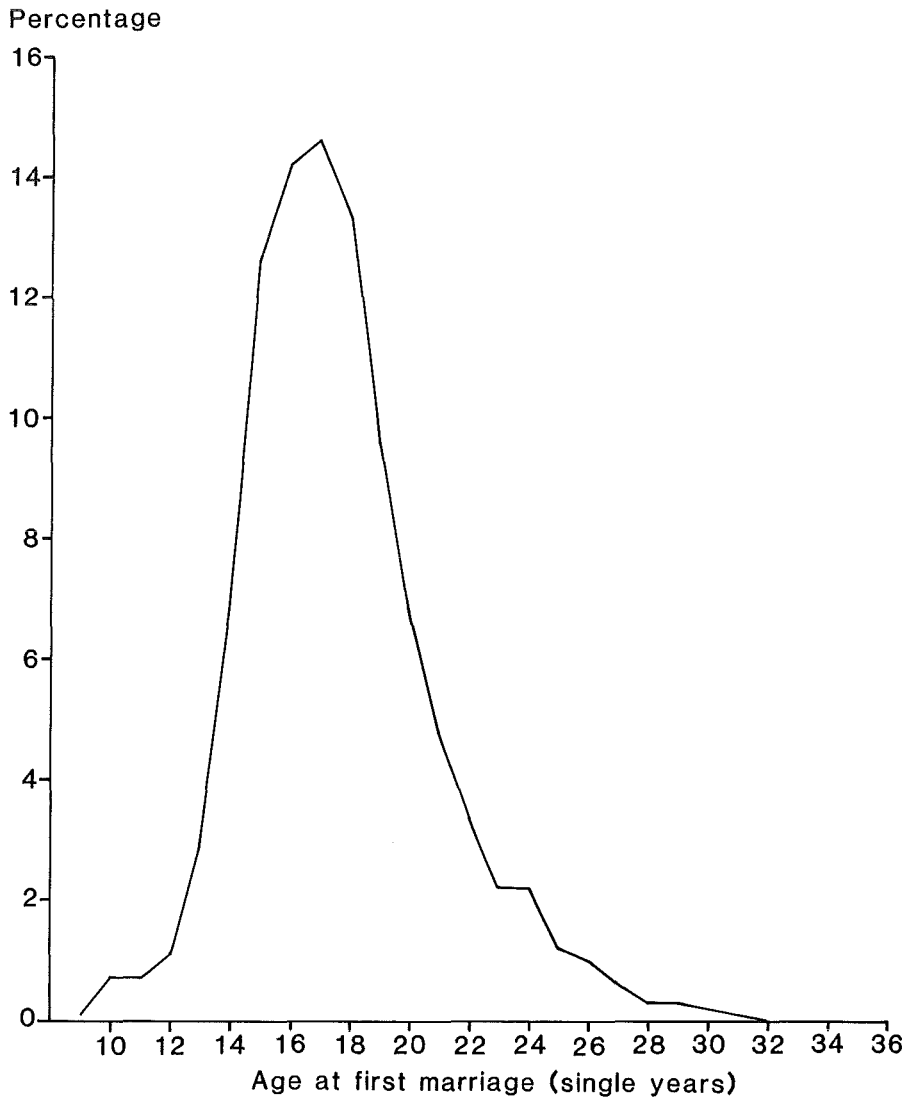


Figure 11 Percentage distribution of ever-married women, by age at first marriage (single years)

4.3 RECONSTRUCTION OF MARITAL STATUS AT EARLIER DATES USING SURVEY DATA

To obtain a direct comparison of the GFS data with data from the 1971 SE, data from the marriage history have been used to classify the women in the GFS according to age and marital status at the time of the 1971 SE. Reconstructed percentages of women in the various categories of marital status and corresponding percentages obtained in the 1971 SE are given in table 8. The reconstructed percentages of the ever-married women start at a significantly higher level in the younger age groups. The reconstructed proportions from the GFS were 37.5 per cent and 85.2 per cent respectively for the age groups 15–19 and 20–24, compared with 31.8 per cent and 84.0 per cent obtained in the 1971 SE. The proportions currently married were also consistently higher in the reconstructed GFS data, counterbalanced by lower proportions of women who were divorced/separated and widowed.

In explaining the very high proportions of the currently married in the reconstructed GFS data (compared with the proportions in the 1971 SE) it must be noted that the females in the GFS were the survivors of the female population in the 1971 SE, and the never married, the divorced/separated, and the widowed might have experienced higher mortality and greater migration during the period between the two surveys. Errors in the data arising from misplacement and misclassification could however also explain the discrepancies between the two sets of data. One possibility is that the GFS achieved better coverage of unions. A second reason may be age misreporting associated with marital status. For example if women gave an incorrect age, but gave the correct duration of marriage, the proportion married at younger ages will be inflated at periods before the survey. This would apply to the discrepancy at age 15–19, in particular.

Table 7 Percentage distribution of women aged 15–49 according to age group and current marital status: GFS and 1971 SE

Age group	Never married		Ever married							
			Total		Married		Divorced/ separated		Widowed	
	GFS	1971 SE	GFS	1971 SE	GFS	1971 SE	GFS	1971 SE	GFS	1971 SE
15–19	69.1	68.2	30.9	31.8	26.8	29.5	4.0	2.2	0.1	0.1
20–24	15.4	16.0	84.6	84.0	75.9	76.1	8.1	7.3	0.6	0.6
25–29	3.0	3.5	97.0	96.5	90.6	87.7	6.0	7.5	0.4	1.3
30–34	0.9	1.4	99.1	98.6	91.5	87.3	6.6	8.9	1.0	2.4
35–39	0.9	0.9	99.2	99.1	89.9	85.9	6.8	9.2	2.4	4.0
40–44	0.5	0.7	99.5	99.3	86.0	79.9	9.0	12.2	4.5	7.2
45–49	0.2	0.5	99.8	99.5	82.5	72.1	10.5	13.9	6.8	13.5

Table 8 Percentage distribution of women aged 15–49 according to age group and marital status at the date of the 1971 SE: GFS and 1971 SE

Age group	Total ever married		Married		Divorced/ separated		Widowed	
	GFS	1971 SE	GFS	1971 SE	GFS	1971 SE	GFS	1971 SE
15–19	37.5	31.8	36.4	29.5	1.0	2.2	0.1	0.1
20–24	85.2	84.0	80.7	76.1	4.3	7.3	0.2	0.6
25–29	96.2	96.5	88.2	87.7	7.1	7.5	0.9	1.3
30–34	98.4	98.6	93.6	87.3	3.6	8.9	1.2	2.4
35–39	99.8	99.1	90.5	85.9	7.0	9.2	2.3	4.0
40–44	99.4	99.3	87.4	79.9	7.7	12.2	4.1	7.2
45+	–	–	–	–	–	–	–	–

4.4 MEAN AGE AT FIRST UNION

Mean age at first union is one of the most important nuptiality variables in demographic analysis. In the GFS the mean age at first union was derived from information on the date of birth and date of entry into first union. In this section we try to analyse information from the individual questionnaire on date of entry into first union for each cohort of women.

Table 9 presents the cumulative proportions ever married by single years of age, for each five-year age cohort. It should be mentioned that entry into first union for each cohort has been truncated at the youngest age (for each cohort) because experience within the cohort would be incomplete.

It is evident from table 9 that although age at first marriage is still low in Ghana, in the past women first married at much younger ages. For instance, among women aged 35–39 about 27 per cent entered the first union at exact age 15, compared to 20 per cent among those in the age group 20–24 and only 13 per cent for the 15–19 age group. At age 20 and above there was less variation across cohorts although there may be some irregularities due to errors in date reporting, particularly among older age groups 40–44 and 45–49 where the first marriage occurred many years in the past.

Table 9 Cumulative percentage of women entering marriage at specified age, by current age

Age	Current age						
	15–19	20–24	25–29	30–34	35–39	40–44	45–49
9	0.0	0.0	0.0	0.5	0.1	0.2	0.0
10	0.1	0.4	0.9	1.1	1.4	0.9	0.2
11	0.4	0.8	1.4	2.2	2.8	1.4	0.4
12	0.8	1.5	2.5	4.4	3.5	2.1	0.9
13	1.8	4.0	4.8	6.6	6.6	5.4	4.1
14	5.7	9.3	10.5	14.0	13.9	10.8	8.7
15	12.8	19.8	22.2	23.7	26.6	21.9	20.1
16		32.7	33.2	35.8	39.7	35.5	34.5
17		47.8	46.2	50.4	51.4	48.1	45.4
18		61.5	59.1	62.1	63.8	58.6	60.7
19		72.4	69.5	71.1	72.2	68.3	71.2
20		78.6	77.1	77.8	79.5	75.9	78.9
21			83.0	83.2	84.2	82.6	82.8
22			87.6	88.3	87.6	84.5	88.3
23			91.8	91.3	89.3	86.9	90.6
24			94.5	94.7	92.6	90.5	92.9
25			95.9	95.9	94.6	93.1	93.8
26				97.1	95.9	95.3	96.1
27				98.1	96.9	96.0	97.2
28				98.5	97.2	96.9	97.7
29				98.9	98.2	97.9	97.9
30				99.0	98.3	98.1	99.5
31					98.6	98.3	99.7
32					98.7	98.5	99.7
33					98.8	98.7	99.7
34					98.8	99.0	99.7
35					99.1	99.0	99.7
36						99.2	99.7
37						99.2	99.7
38						99.4	99.7
Total no of women	1371	1220	1011	802	703	579	439

Table 10 Proportion of women ever married by age group at five-year intervals before the survey

Age at specified period	Year before the survey						
	0	5	10	15	20	25	30
15–19	0.309	0.380	0.350	0.379	0.421	0.314	0.478
20–24	0.846	0.826	0.830	0.844	0.795	0.822	
25–29	0.970	0.978	0.960	0.945	0.957		
30–34	0.991	0.984	0.986	0.995			
35–39	0.992	0.991	0.998				
40–44	0.995	0.998					
45–49	0.998						

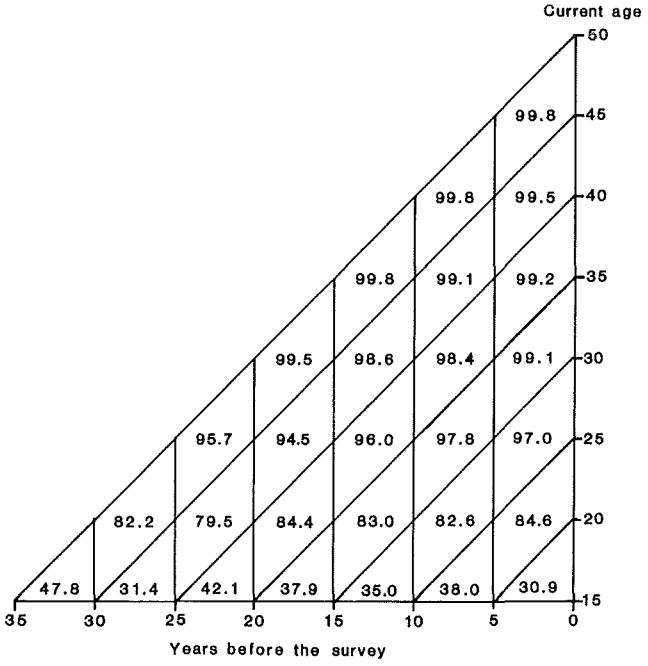


Figure 12 Percentage of women ever in a union by current age for given years before the survey

When the data are analysed by looking at the percentage of a cohort ever in a union by years before the interview (table 10 and figure 12) errors in date reporting become even more apparent, especially at younger ages. For instance at central age 20 in the period 25–29 years before the interview (ie data for 45–49 year olds), the proportion ever married is slightly higher than for the period 20–24 but lower than for the successive periods 15–19, 10–14, 5–9 and 0–4 years before the survey. This probably indicates the presence of shifting of the date of the first union closer to the date of interview or omission of earlier first unions. The proportions of ever-married women for the cohorts 45–49 and 40–44 in the periods 20–24 and 15–19 years before the survey (ie central age 25) are also slightly less than the proportions for more recent cohorts.

4.5 COALE'S NUPTIALITY MODEL FOR ESTIMATION OF AGE AT FIRST UNION

Another way of evaluating nuptiality data is by fitting the Coale nuptiality model to the data and comparing the results with observed or reported information. Errors contained in the data will be detected by the magnitude of the differences between the reported and the model estimates. As well as being used for smoothing the nuptiality data, Coale's model enables estimation of the mean age at entry into first union and projection of proportions ever married in respective age groups.

The results of the application of the model to the GFS are presented in table 11. The irregularities observed in figure 12 reflecting errors due to the reporting of date of first union, possible omission of earlier unions or randomness are again replicated here. Looking at the data on age at first marrriage, there is a possibility that age at entry into first union is increasing due to education and urbanization. There are, however, some irregularities among the older age groups 40–44 and 45–49, both of which have ages at marriage which are higher than or equal to those of the younger age groups 30–34 and 35–39, which is contrary to expectation. This may be accounted for either by differential mortality or misdating of first marriages or omission of first unions (ie some women might have omitted their first marriage and only reported later ones).

Estimates of other indicators derived from the model are also given in table 11. Indicator A_0 refers to the initial age at first marriage, K describes the rate at which marriage occurs with age, and C is the proportion eventually marrying in each cohort. Data on A confirm the change in the age of entry into first union, with the older age groups 40–44 and 45–49 again showing some irregularities (ie age at first marriage being overestimated in these age groups). The generally increasing values of K as the cohort gets younger imply a reduction in the speed of entry into first marriage for younger age groups, with older age groups showing a more rapid entry. The values for K, which are all less than 1.00 and therefore indicate generally a more rapid entry into first marriage, however, do not give a

Table 11 Mean age at first marriage of the women and parameters estimated using the Coale nuptiality model

Cohort (current age group)	Parameters of the model[a]			
	Mean age at 1st marriage	A_0	K	C
20–24	19.75	11.77	0.703	1.126
25–29	19.46	11.33	0.716	1.039
30–34	18.96	10.80	0.718	1.005
35–39	18.78	10.82	0.700	0.996
40–44	19.21	11.30	0.696	0.997
45–49	18.96	12.21	0.594	0.998

[a] A_0 represents the age at beginning of marriage; K the rate at which the proportion of ever-married women increases with age relative to the model; and C the final proportion of ever-married women at the end of the childbearing period (Coale 1971).

plausible picture. This is confirmed by the illogical values for C, the proportion that would eventually marry, which for the three youngest age groups are greater than 1.00. The Coale model therefore tends to overstate the tempo of the marriage rates in Ghana, and does not give a plausible fit to the data.

In conclusion we note that the data on nuptiality are affected by the usual preference for digits ending in 0 and 5 and for even numbers, mainly 2 and 8. The data are also affected by misdating and possible omission of first marriages, as well as a possible interaction with age misreporting. The Coale nuptiality model does not seem to fit the data closely. Despite these biases, however, the overall quality of the nuptiality data is reliable and the differentials generally look realistic.

5 Fertility

The main objective of the GFS was to assess the levels and trends of the fertility of women in Ghana. The principal sources of data for the estimation of fertility in Ghana have been decennial censuses and demographic sample surveys, and the main fertility data obtained from these sources have been number of children ever born, number living and dead, and births during the past year. The use of the birth history approach in the GFS was therefore a significant departure from the methodology of past demographic enquiries. This approach produced data that permit much more direct measures of fertility and the examination of fertility trends in the past 20 years or so.

For each respondent in the individual interview details of all the pregnancies she has had were recorded in chronological order including the date of termination, whether the outcome was a live birth, still birth or abortion; the sex and current survival status of the child, and, if dead, date of death or age at death. Each woman was also asked about the number of children living with her and the number living away. From such information fertility rates by age of woman (birth cohort) or duration of marriage (marriage cohort) can be obtained to estimate both current fertility and fertility for periods in the distant past.

However, as is generally known, information based on birth histories or retrospective enquiries are subject to errors which can affect the estimates of fertility. These errors may arise from misreporting of the age of mother, incorrect reporting of a child's birth date or omission of births. In this exercise we attempt to identify such errors and try to assess the quality of the estimates obtained from the birth history data. This will be done through a process of internal consistency checks and comparisons with external sources, mainly the 1971 SE.

5.1 MEAN NUMBER OF CHILDREN EVER BORN

Beginning with the simplest measure of fertility we present in table 12 the mean number of children ever born by age of woman (in single years) at the time of the survey. Generally, there are no pronounced fluctuations in the data except at older ages and these may be due to sample variations. Comparing the data from the GFS with data from the 1971 SE, by five-year age groups, in table 13, we find that the mean parities in the GFS were lower than the mean parities in the 1971 SE for all the age groups, except the 45–49 age group for whom the mean in the GFS was higher (6.79 compared with 6.42 in the 1971 SE). Corresponding data for the currently married women in both sources showed similar differentials in achieved parity between the two sources. These results may be interpreted as supporting the occurrence of a small fertility decline in the 1970s, since it is unlikely that the SE achieved more complete coverage of live births than the more detailed GFS questionnaire.

Table 12 Mean number of children ever born to all women aged 15–49 from the individual survey

Age in completed years	Children ever born	Number of women
All	3.00	6125
15	0.01	303
16	0.08	277
17	0.18	249
18	0.37	302
19	0.61	240
20	0.84	303
21	1.15	232
22	1.40	245
23	1.64	204
24	1.99	236
25	2.19	276
26	2.38	199
27	2.65	164
28	3.16	197
29	3.32	175
30	3.68	281
31	3.87	125
32	4.32	171
33	4.09	93
34	4.59	132
35	5.06	200
36	5.04	143
37	5.61	90
38	5.68	134
39	5.68	136
40	5.97	245
41	6.25	77
42	6.45	105
43	6.46	67
44	5.74	85
45	6.43	149
46	7.08	85
47	6.55	44
48	6.78	87
49	6.86	74

Table 13 Mean number of children ever born to all women and to the currently married at specified ages: GFS and 1971 SE

Age group	All women		Currently married	
	GFS	1971 SE	GFS	1971 SE
15–19	0.24	0.26	0.68	0.69
20–24	1.37	1.54	1.59	1.77
25–29	2.69	3.06	2.77	3.18
30–34	4.04	4.61	4.11	4.74
35–39	5.36	5.61	5.47	5.77
40–44	6.12	6.28	6.13	6.55
45–49	6.79	6.42	6.90	6.79

Source: GFS 1979–80; 1971 SE

5.2 AGE-SPECIFIC FERTILITY RATES BY CALENDAR YEARS

We present in table 14 the age-specific fertility rates obtained from the GFS average for the period 1976–8 and the 1971 SE. The information in the 1971 SE was obtained by asking for births during the last 12 months, while the information in the GFS was derived from a schedule of birth histories. Looking at columns one and three of table 14 we note that the age-specific fertility rates are higher in the GFS than in the 1971 SE for the youngest age group 15–19 and for the last two oldest age groups 40–44 and 45–49. The rates for the age groups in the 20–39 age range were practically the same in the two sources. These, however, give the impression of an increase in the fertility levels between the two periods as evidenced by a total fertility rate (TFR) of 5.93 obtained from the 1971 SE data compared with a TFR of 6.31 from the GFS. A reconstruction of the GFS data to the date of the 1971 SE suggests that the 1971 data grossly underestimated the current level of fertility. The estimated TFR from the GFS for the period 1969–71 is 6.99 against 5.93 from the 1971 SE. The percentage shortfall in births covered in the 1971 SE based on the estimates from the GFS is given in column four of table 14. It must however be pointed out here that the reconstructed data from the GFS relate to women who at the time of the GFS were survivors of the 1971 SE population. The women in the GFS may therefore be different in some relevant respects or characteristics, and this may partly explain the differences in the two sets of data relating to the same period. However, the use of a one-year reference period for the 1971 SE also probably contributed to this discrepancy.

Columns two and three of the table also show that there had been some decline in the levels of fertility of all the age groups between the periods 1969–71 and 1976–8, yielding a fall in the TFR from 6.99 to 6.31. Column five shows that the decline increases systematically from 2.3 per cent for the age group 15–19 to 18.1 per cent for the 35–39 age group, with a dip in the rate of decline (9.5 per cent) for the 40–44 age group.

Table 15 shows age-specific fertility rates by single calendar years for the period 1954–78 and the estimated total fertility rates for the period 1963–78. The rates for

Table 14 Age-specific fertility rates (per 1000 women) and the percentage decline in the rates: 1969–71, 1976–8 and 1971 SE

Age group	Fertility rates			Percentage shortfall (1)–(2)/(2) (4)	Percentage decline (3)–(2)/(2) (5)
	1971 SE (1)	GFS 1969–71 (2)	GFS 1976–8 (3)		
15–19	110	133	130	17.3	2.3
20–24	259	269	256	3.7	4.8
25–29	266	285	266	8.0	8.0
30–34	236	272	236	13.2	13.2
35–39	176	215	176	18.1	18.1
40–44	97	147	133	34.0	9.5
45–49	41	72	64	43.1	11.1
TFR	5.93	6.99	6.31	15.2	9.7

Sources: GFS 1979–80; 1971 SE

older age groups in the past are more truncated. Therefore in calculating the TFR the missing rates have been calculated as the averages of the rates for the last two calendar years for which information is available on the assumption that fertility for those years has remained constant. However, if the fertility of older age groups had been declining this procedure would underestimate the total fertility rates in the early periods.

Due to random fluctuations characteristic of single-year data the rates presented in table 15 do not show any reliable trends. There is evidence of some concentration of births in the 5th, 10th and 15th years before the survey (1974, 1969 and 1964), and the sharp change in the TFR in a one-year period (1976–7) is probably due to the misreporting of dates of recent births or of the ages of young children.

The presentation of the same rates, grouped for five-year calendar periods (1964–8, 1969–73, and 1974–8) in table 16, however, shows some evidence of a declining trend in fertility particularly after the early 1970s. The level of fertility showed small increases in all but the 15–19 and 35–39 age groups in the periods 1964–8 and 1969–73 (see column four) but then fell in all age groups between the periods 1969–73 and 1974–8 (see column five). The decline is greatest in the oldest age group 45–49, followed by 30–34 and 35–39 with age group 15–19 having the lowest decline. The TFR declined by about half a child from 6.97 to 6.52 children per woman, over the last 10 years. This is not a very large decline (6.5 per cent), and the more detailed analysis in the rest of this chapter (eg for socio-economic subgroups) must be used to evaluate the possibility of the decline being wholly the result of misreporting – the 'Potter' effect of concentration of births from early and very recent periods into an intermediate period – or partly a real change, and partly misreporting. The special circumstances of Ghana in regard to large scale emigration must also have some bearing on the fertility trend in the recent period, and could account for the decline, since young adult males form a large proportion of emigrants.

Table 15 Age-specific fertility rates (per 1000 women) per calendar years

Year	Age							Total fertility rate[a]
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	
1954	131.0	282.4						
1955	121.0	229.1						
1956	127.2	220.5						
1957	153.7	238.5	258.0					
1958	174.2	255.5	322.3					
1959	172.8	267.4	263.6					
1960	144.9	268.7	338.2					
1961	152.3	254.4	254.5					
1962	132.3	265.3	288.3	286.6				
1963	135.8	266.8	273.7	302.0				
1964	172.0	293.2	276.2	287.1				7.49
1965	138.9	236.2	312.7	271.4				7.15
1966	128.3	283.7	293.9	256.8				7.18
1967	145.8	253.6	282.7	244.7	248.4			6.96
1968	114.7	255.2	269.5	273.7	213.7			6.73
1969	130.9	294.6	297.5	279.8	230.6			7.24
1970	135.5	259.0	301.4	278.1	244.7			7.19
1971	131.1	254.4	267.2	257.3	168.2			6.49
1972	143.5	264.4	278.4	263.8	221.9	133.8		6.88
1973	141.4	280.3	290.9	270.8	192.6	159.5		7.06
1974	150.2	273.5	292.1	256.4	232.0	153.0		7.13
1975	139.0	250.4	274.3	259.4	196.4	122.4		6.53
1976	140.8	268.6	283.3	238.9	198.9	138.6		6.83
1977	120.7	227.0	262.3	245.3	179.8	139.0	47.8	6.11
1978	129.4	272.9	252.4	223.7	149.7	121.7	47.5	5.99

[a] For the years with incomplete information the TFR has been obtained by completing the missing information with estimated rates, assuming that the fertility of the two last calendar years for which information is available has remained constant.
Source: GFS 1979–80

Table 16 Age-specific fertility rates (per 1000 women) and percentage decline[a] in the rates 1964–8, 1969–73, 1974–8

Age group	Fertility rates			Percentage decline	
	1964–8 (1)	1969–73 (2)	1974–8 (3)	(2)–(1)/(1) (4)	(3)–(2)/(2) (5)
15–19	139.9	136.5	136.0	−2.43	−0.37
20–24	264.4	270.5	258.5	+2.31	−4.44
25–29	287.0	287.1	272.9	+0.03	−4.95
30–34	266.7	270.0	244.7	+1.24	−9.37
35–39	244.6	211.6	191.4	−13.49	−9.55
40–44	145.8	146.6	134.9	+0.55	−7.98
45–49	71.9	72.4	64.9	+0.70	−10.36
TFR	7.10	6.97	6.52	−1.83	−6.46

[a] Plus sign indicates increase in fertility; minus sign indicates decrease.
Source: GFS 1979–80

Table 17 Cohort–period fertility rates, cumulative rates for real (P) and synthetic (F) cohorts and P/F ratios

Age at survey	Number of women	Years before survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Cohort–period fertility rates								
15–19	1371	0.047	0.001					
20–24	1220	0.213	0.060	0.001				
25–29	1011	0.266	0.214	0.054	0.003			
30–34	802	0.263	0.271	0.210	0.062	0.004		
35–39	703	0.213	0.282	0.280	0.219	0.074	0.004	
40–44	579	0.166	0.244	0.294	0.272	0.201	0.046	0.000
45–49	439	0.093	0.189	0.251	0.282	0.272	0.195	0.058
B Cumulative fertility rates of real cohorts (P)								
15–19		0.241	0.004					
20–24		1.366	0.301	0.003				
25–29		2.686	1.357	0.288	0.017			
30–34		4.044	2.729	1.377	0.328	0.019		
35–39		5.364	4.302	2.890	1.489	0.393	0.021	
40–44		6.116	5.285	4.064	2.596	1.238	0.233	0.002
45–49		6.711	6.244	5.298	4.046	2.638	1.278	0.301
C Cumulative fertility rates of synthetic cohorts (F)								
15–19		0.241	0.004					
20–24		1.306	0.301	0.003				
25–29		2.636	1.370	0.274	0.017			
30–34		3.950	2.723	1.323	0.326	0.019		
35–39		5.012	4.134	2.724	1.423	0.390	0.021	
40–44		5.843	5.355	4.192	2.700	1.395	0.253	0.002
45–49		6.310	6.301	5.445	4.188	2.755	1.230	0.293
D P/F ratios								
20–24		1.046						
25–29		1.019	0.990					
30–34		1.024	1.002	1.041				
35–39		1.070	1.040	1.061	1.047			
40–44		1.047	0.987	0.969	0.934	0.888		
45–49		1.063	0.991	0.973	0.966	0.957	1.039	

Table 18 P/F ratios by selected characteristics for the periods 0–4 and 5–9 years before the survey

Current age group	Period	Total sample	Area of residence		Education		Date of birth	
			Urban	Rural	Some schooling	No schooling	Exact date	Years ago
A 0–4 years								
20–24		1.046	1.066	1.039	1.038	1.032	1.022	1.037
25–29		1.019	1.064	1.002	0.960	1.034	1.001	1.028
30–34		1.024	1.082	0.991	0.997	0.981	1.022	0.994
35–39		1.070	1.181	1.017	1.037	1.022	1.106	1.016
40–44		1.047	1.086	1.019	1.121	0.979	1.083	0.965
45–49		1.063	1.102	1.030	1.077	1.005	1.080	1.034
B 0–4 and 5–9 years								
25–29	0–4	1.019	1.064	1.002	0.960	1.034	1.001	1.028
	5–9	0.990	0.978	0.998	0.954	0.989	0.997	0.979
30–34	0–4	1.024	1.082	0.991	0.997	0.981	1.022	0.994
	5–9	1.002	1.018	0.991	0.983	0.953	1.033	0.947
35–39	0–4	1.070	1.181	1.017	1.037	1.022	1.106	1.016
	5–9	1.040	1.128	0.998	1.068	0.981	1.114	0.937
40–44	0–4	1.047	1.086	1.019	1.121	0.979	1.083	0.965
	5–9	0.987	0.994	0.976	1.082	0.922	1.048	0.877
45–49	0–4	1.063	1.102	1.030	1.077	1.005	1.080	1.034
	5–9	0.991	1.025	0.969	1.015	0.942	1.033	0.935

5.3 COHORT AND PERIOD FERTILITY RATES

The discussions in the preceding sections of this chapter show that coverage of births in the GFS was more complete than in the 1971 SE. Fertility is also shown to have declined since the early 1970s. These findings have been reached by examining the mean number of children born per woman and the age-specific fertility rates by calendar years. These measures have certain disadvantages, however. In the age-specific rates, for instance, the births used for the estimates are classified according to the year in which they occurred and to the age of the woman at the time of the birth, thus mixing information reported by two different cohorts. In this section therefore we examine the fertility experience of cohorts – defined according to their age at the time of the survey – during their whole childbearing period to determine whether the measures obtained in the preceding sections exaggerate the decline in fertility, or conceal errors in the data, or reflect a real trend. Each age cohort in this analysis is defined by the five-year age group to which the women belonged at the time of the survey, and the time periods are the five-year intervals before the date of the survey.

National level results

In table 17 and figure 13 we present the cohort–period rates for the total sample. The data in panel A of the the table (diagonally downwards from left to right), giving the rates for different cohorts at the same central ages, do not show systematic trends in the level of fertility as some out-of-range rates can be detected in the data. The cohort aged 35–39, in particular, shows very high rates, particularly in their early childbearing ages, compared to rates for the other cohorts. The rates for this cohort were highest (0.074, 0.219 and 0.280) respectively at central ages 15, 20 and 25 compared with the rates for other cohorts at the same central ages. It is difficult to find clear evidence either from the age distribution or from another source to account for the high fertility rates of the cohort aged 35–39. It is however possible that high-fertility women had been transferred from the younger age group 30–34 into this age group. One other noticeable distortion is in the rate for the cohort aged 40–44 (0.294) at central age 30, which is also relatively very high. However, if these apparent distortions are disregarded then the following pattern appears to emerge. Besides the universal picture of a decline in fertility in the last five years portrayed by all the cohorts, the rates at central age 15 show fluctuating levels over the periods with no discernible trend. At age 20 however the levels appear to have been rising – from 0.195 in the period 25–29 years to 0.214 in the 5–9 years before the survey. The levels at ages 25 and 30 have been unchanging, remaining steady around 0.272, while at higher ages the trend has been that of declining fertility.

The analysis in the preceding paragraphs relates to the fertility experience of different cohorts at the same age. We now examine the P/F ratios given in table 17 which compare the cumulative fertility experience of real cohorts with the cumulative fertility rates of synthetic cohorts. As described earlier, a P/F ratio greater than 1.0 shows that the P value (for real cohort) is higher than the F value (for synthetic cohort), indicating a decline in fertility. A P/F ratio less than 1.0 normally also indicates a rise in fertility while a P/F ratio equal to 1.0 indicates that fertility has been constant.

For the total sample the P/F ratios for the most recent period (0–4 years before the survey) were moderately greater than 1.0 for all the cohorts, with the values generally increasing slightly with age of cohort. As in the case of current fertility estimates, therefore, these cohort–period data indicate that fertility has declined slightly from the 5–9 to the 0–4 years period. On the other hand, the low P/F ratios at earlier periods, especially 15–19 and 20–24 years before, suggest that some displacement of births towards the date of interview, rather than a real increase in fertility, may have occurred. The persistence of a fertility decline for the 35–39 year old cohort, even when it was aged 15–19, to the present, is unlikely to be a real occurrence.

Population subgroups

To verify whether the general picture of decreasing fertility in the most recent period is real or is an artifact of data deficiencies, particularly in the case of the cohorts which showed rising fertility in earlier periods before the survey, we present in table 18 the cohort–period fertility rates and the P/F ratios for selected population subgroups. Analysis of these data could assist in identifying problems of data quality, since higher social status groups (urban, some schooling, knows exact date of birth) are expected to have better reporting than the converse subgroups.

As shown in tables A1–A6, the urban subgroup, as expected, recorded lower levels of fertility than did their rural counterparts. The successive cohorts in the rural subgroup, however, appear to have experienced over the periods increasing levels of fertility at ages 20 and 25 and decreasing fertility at higher ages, with levels at central age 15 fluctuating. The urban subgroup, on the other hand, does not exhibit any discernible pattern of fertility change in the early periods, particularly in the period 25–34 years before the survey, but show declining levels for most cohorts in the more recent periods.

Again as expected, levels of fertility for the educated and for the subgroup who knew the exact date of their birth were lower than those of the subgroups who had never attended school and the subgroup who did not know the exact date or year of their birth, respectively. However, the profiles and patterns of fertility levels shown by the urban subgroup, the educated and the subgroup who knew the exact date of their birth were dissimilar, as were the patterns shown by the rural, the never attended school and the subgroup who did not know the exact date or year of their birth. This indicates that those factors which affect the levels and patterns of fertility or the quality of the data – that have been operating within each subgroup – are dissimilar. We may however emphasize that we are dealing here with changes in the fertility experience of different cohorts at different ages over different periods in the past, and in conditions of rapid social change and persisting economic and political crises we may expect such differences in the responses of different segments of the population to the changing socio-economic conditions.

In table 19 we show the percentage decline in cohort fertility for more recent periods. Table 19 shows substan-

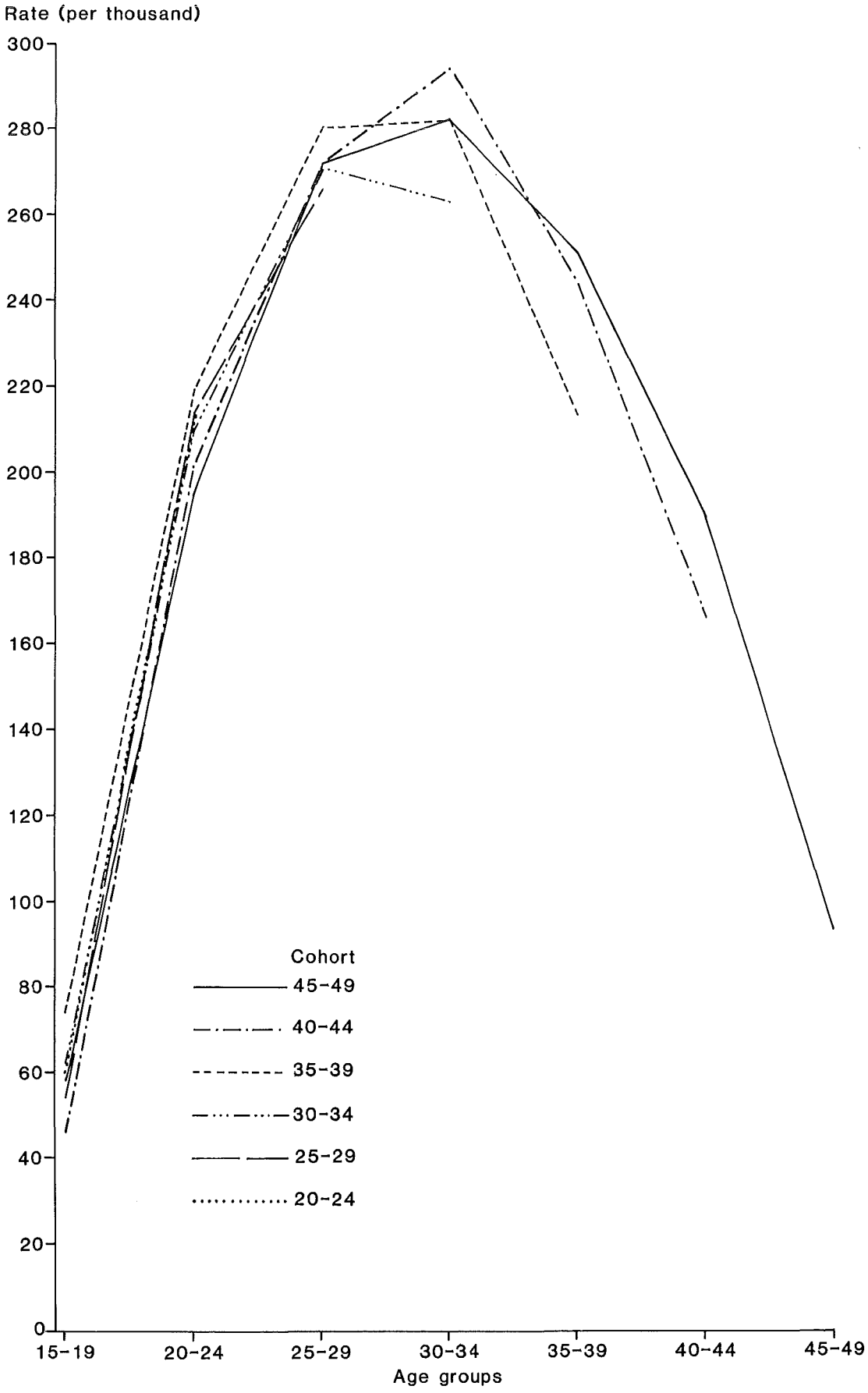


Figure 13 Age-specific fertility rates for five-year cohorts

Table 19 Percentage decline[a] in cohort fertility for more recent periods, by selected characteristics

Age at end of each period	Periods	Total population	Residence		Education		Date of birth	
			Urban	Rural	Some schooling	No schooling	Exact date	Years ago
15–19	5–9 to 0–4	−21.7	−26.0	−18.5	−21.3	−10.7	−14.0	−13.5
	10–14 to 5–9	+11.1	+16.3	+6.6	+30.6	+12.0	+4.9	+21.3
20–24	5–9 to 0–4	−0.5	−10.4	+4.4	+9.7	−6.1	+2.5	−5.6
	10–14 to 5–9	+1.9	+2.0	+4.6	+1.7	+10.3	0.0	+9.4
25–29	5–9 to 0–4	−1.9	−6.0	+1.4	−5.7	+4.0	+0.4	−1.5
	10–14 to 5–9	−3.2	−14.4	+2.2	−0.8	−3.5	−7.6	+5.0
30–34	5–9 to 0–4	−6.7	−5.6	−7.3	+9.6	+9.7	−4.8	−15.4
	10–14 to 5–9	−4.1	−6.0	−2.7	−17.9	+0.3	−6.9	+4.6
35–39	5–9 to 0–4	−12.7	−14.3	−11.9	−26.4	−9.1	−13.9	−9.8
	10–14 to 5–9	−2.8	+4.2	−3.1	+11.1	+4.3	+2.7	−5.0
40–44	5–9 to 0–4	−12.2	+5.4	−15.8	−12.0	−11.5	−6.3	−16.7
	10–14 to 5–9	–	–	–	–	–	–	–

[a]Plus sign indicates increase in fertility; minus sign indicates decrease.
Source: GFS 1979–80

tial fertility decline at age 15–19 during the interval period 5–9 to 0–4 (21.7 per cent) and a high rate of increase at that age in the interval period 10–14 to 5–9 years (11.1 per cent). This obtains in all the subgroups and is most likely due to increasing age at marriage in recent periods although some heaping of births in the 5–9 years period may also be a contributory factor. At other ages in both the total sample and the urban subgroup practically all the cohorts registered moderate fertility declines during both of the interval periods, namely 5–9 to 0–4 and 10–14 to 5–9 years. However, the rates for the other subgroups do not exhibit any consistent pattern of fertility change across cohorts in the two interval periods, with the observed fluctuation in fertility being small.

The P/F ratios which take into account the entire childbearing experience of individual cohorts are shown in table 18 for the selected population subgroups. The urban group and the subgroup who knew the exact date of their birth showed P/F ratios greater than 1.0 for almost all the cohorts in both the 0–4 and 5–9 years periods, indicating generally a decline in fertility in these periods.

The subgroup who had attended school (the educated) on the other hand showed ratios which were slightly less than 1.0 in both interval periods for the cohorts aged 25–29 and 30–34. The ratios for the older cohorts, however, were greater than 1.0, indicating decline in fertility above age 35. The small increase in fertility indicated for the cohorts 25–29 and 30–34 might be a reflection of the increase in the proportion of females who had postponed having early births because of schooling.

The rural, no schooling and does not know date of birth subgroups showed very small fertility decline (P/F ratios slightly greater than 1.0) in the 0–4 years period for some of the cohorts. However, these subgroups consistently showed P/F ratios which were less than 1.0 or lower than that for the 0–4 year period in the 5–9 years period. This phenomenon may be interpreted readily as the 'Potter effect' (heaping of births at 5–9 years period) which is often observed in birth history data, or it may be partly due to underenumeration of infants, often encountered in demographic enquiries.

In conclusion, while the effects of data deficiencies cannot be completely ruled out, the observed trend of fertility decline in the last ten years for the three higher social status subgroups (urban, some schooling, knows exact date of birth) can be accepted as at least partly true. The lower social-status subgroups, in contrast, showed much smaller, if any, fertility declines, and showed stronger evidence of misreporting errors. The results for the total population reflect the mixture of these two different conditions; however, the finding that the subgroups which are expected to report higher quality data show stronger indications of fertility decline means that the rational pattern of a small decline in fertility over the last two five-year calendar periods is more acceptable.

5.4 OTHER TESTS FOR DETECTING OMISSIONS

In fertility surveys there is an assumption that certain types of live births are more likely to be omitted than others. Children who have died, particularly those who died long ago or in infancy, tend to be omitted; and in societies which have greater preference for children of a particular sex children of the less preferred sex are more likely to be omitted in surveys. As a further check on the quality of the survey data therefore we examine in this section the extent to which the survey data are affected by these types of omission.

Sex ratio at birth

A study of the sex ratios of births in many countries has shown in that normal conditions male births tend to exceed female births in the general population. The sex ratio at birth is generally above 100 and usually lies between 104 and 107. Differences in sex ratios at birth may, however, be expected among different population groups – with

population groups likely to experience low rates of prenatal deaths showing higher sex ratios at birth. The variation in these ratios is quite large, however, especially as the number of cases declines and only large deviations from the expected values should be taken seriously.

The overall sex ratio at birth in the GFS was 104.4; this falls within the expected ratio in a normal population. The sex ratios for the five-year periods before the survey given in table 20 fluctuated randomly between 100 and 113, showing no definite pattern over time. The ratios for total births by selected variables, namely, age of mother, rural/urban residence, and literacy, given in table 20, however, show the inverse of the expected relative levels. The ratio at birth for rural was 106 compared with 103 for urban, and 106 for children of illiterate mothers compared with 101 for those of literate mothers. The reason for the relatively lower sex ratios of births of the higher socio-economic population groups may be due to the experience of higher rates of prenatal deaths (induced or spontaneous abortions) by these groups. The sex ratios of births by age of mother, which ranged between 102 and 110, also showed a ∪-shaped profile while the expectation is ∩-shaped since higher prenatal deaths are expected at the youngest and oldest ages of mother and consequently lower sex ratios at these ages. It is possible that the biological theories given here as underlying the expectations do not apply to the Ghanaian population, or that they operate inversely in the Ghanaian situation. Nonetheless the range of the ratios and the divergences are not great enough or so far from the expected values as to indicate omissions of births resulting from preferences for children of a particular sex. As established in the First Country Report (pages 61–2) Ghanaian women generally do not have preference for children of particular sex. Any such preference would depend upon the number of living children they had and the extent of imbalance in their sex composition, but there is no dominant sex preference, and therefore no strong reason for omitting children of either sex.

Table 20 Sex ratios of births by selected variables[a]

Variables	Sex ratios
A Years before the survey	
0–4	107.0 (2832/2646)
5–9	99.7 (2313/2319)
10–14	101.1 (1752/1733)
15–19	112.0 (1281/1144)
20–24	100.6 (718/713)
25+	113.3 (367/324)
B Area of residence	
Urban	102.9 (2948/2783)
Rural	105.8 (5624/5386)
C Mother's age	
15–24	103.2 (1013/982)
25–34	102.3 (3013/2944)
35–44	104.5 (3736/3575)
45–49	109.5 (1540/1405)
D Literacy	
Literate	100.9 (2414/2319)
Illiterate	105.7 (6888/6515)

[a]The number of cases are given in brackets as (boys/girls).
Source: GFS 1979–80

Table 21 Proportion dead of children ever born, by sex and current age of mother

Current age group	Proportion of children dead					
	All deaths			Aged 0–4		
	Total	Male	Female	Total	Male	Female
15–19	0.103	0.137	0.061	0.103	0.137	0.061
20–24	0.119	0.132	0.107	0.116	0.129	0.103
25–29	0.117	0.115	0.120	0.107	0.103	0.111
30–34	0.132	0.150	0.114	0.124	0.143	0.105
35–39	0.138	0.150	0.125	0.117	0.127	0.107
40–44	0.167	0.171	0.162	0.138	0.145	0.131
45–49	0.200	0.210	0.189	0.163	0.173	0.151

Source: GFS 1979–80

Proportion of children who died

Table 21 presents the proportions of male and female children who had died according to current age of mother. For both male and female children dead, the proportions increase generally, as expected, with increasing age of mother. The data presented do not therefore give any strong evidence of selective omission of children who had died. A fuller evaluation of the infant and child mortality data is undertaken in chapter 6.

In summary, analyses undertaken in this chapter show that the GFS data are not free from the deficiencies which characterize retrospective demographic data from statistically underdeveloped countries, and the resultant irregularities in the fertility profiles and patterns as detected in the cohort and period rates make it difficult for any unqualified statement to be made about the fertility levels and trends. Nonetheless the data have shown that the GFS achieved a higher coverage of births than did the 1971 SE. Some indications of fertility decline have also been noted, with the urban and the educated subgroups recording a more significant decline than the rural and less educated groups in the ten years before the survey.

6 Infant and Child Mortality

In the maternity history schedule information was obtained on the survival status of each live birth, and if the child had died the age at death was obtained. These data, in conjunction with the information on the dates of births, enable us to estimate infant and child mortality directly. Like the fertility data, however, the data on infant and child mortality can also be affected by reporting errors, including general or selective omissions of dead children, and misreporting of the dates of birth of the children and of their ages at death. In this chapter therefore we examine the GFS data for evidence of these errors and attempt to assess the plausibility of the levels and trends of infant and child mortality obtained from the GFS data.

Infant and child mortality estimates are affected by various types of errors, in the same way as estimates derived from nuptiality and fertility data. Such errors may be a result of omission of both the birth and death of infants or misplacements of their birth or death dates. The errors may also be due to sampling variations and mis-statements of age of the mother. Because of the retrospective nature of the data, children who died a long time ago and those who died shortly after birth are more likely to be affected seriously by these errors. Children who died in their first year of life (infant mortality) are more subject to errors than those who died at an older age (child mortality). Also deaths that occurred to older women are more likely to be omitted, or their birth and death dates misplaced, than those that occurred to younger women.

In table 22 we present the total births, deaths of children by age at death, and probabilities of death in the first year of life ($_1q_0$), between the first and fifth years ($_4q_1$), and in the first five years as a whole ($_5q_0$), calculated from the births and deaths for single calendar years for the 1954–78 period. We present also in figure 14 the probabilities of death using three-year moving averages of the data for the single calendar years in order to reduce random fluctuations in the annual rates.

Table 22 Probabilities of infant and child death by calendar years 1954–78

Year	Births	Deaths by age of child at death			Probabilities of death[a]		
		< 1 year	1–4 years	0–4 years	$_1q_0$	$_4q_1$	$_5q_0$
1954	213	24	16	40	0.113	0.085	0.188
1955	204	29	19	48	0.142	0.109	0.235
1956	237	16	13	29	0.068	0.058	0.122
1957	290	33	17	50	0.114	0.066	0.172
1958	365	31	27	58	0.085	0.081	0.156
1959	399	38	22	60	0.095	0.061	0.150
1960	458	40	29	69	0.087	0.069	0.151
1961	432	38	27	65	0.088	0.069	0.150
1962	491	38	38	76	0.077	0.084	0.155
1963	536	28	37	65	0.052	0.073	0.121
1964	636	55	44	99	0.086	0.076	0.156
1965	632	52	53	105	0.082	0.091	0.166
1966	675	49	45	94	0.073	0.072	0.139
1967	701	55	55	110	0.078	0.085	0.157
1968	702	50	36	86	0.071	0.055	0.123
1969	840	57	45	102	0.068	0.057	0.121
1970	885	55	35	90	0.062	0.042	0.102
1971	846	61	37	98	0.072	0.047	0.116
1972	948	63	50	113	0.066	0.056	0.119
1973	1007	65	56	121	0.065	0.059	0.120
1974	1074	76	58	134	0.071	0.058	0.125
1975	1038	60	49	109	0.058	–	–
1976	1115	74	46	120	0.066	–	–
1977	1052	85	23	108	0.081	–	–
1978	1106	79	10	89	0.071	–	–

[a] $_1q_0$ is the probability of death between birth and first year of life; $_4q_1$ is the probability of death between first and fifth year of life; and $_5q_0$ is the probability of death before the age of five.
Source: GFS 1979–80

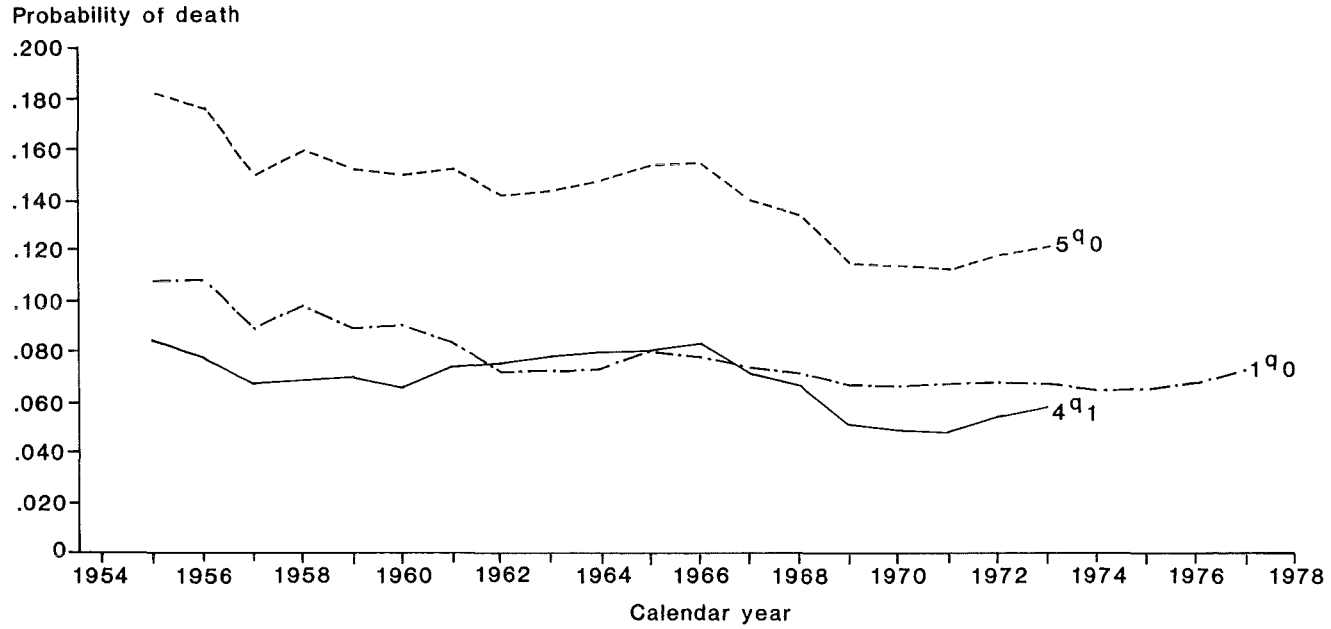


Figure 14 Probabilities of infant and child death by calendar year, 1955–77 (three-year moving averages)

As shown in table 22 the calculated probability of death in the first year of life ($_1q_0$) for specified periods before the survey ranged between 0.142 and 0.058 (0.116 and 0.065 for the three-year moving averages), and the probability of death between the first and the fifth year of life ($_4q_1$) ranged from 0.109 to 0.042 (0.115 to 0.051 for the three-year moving averages). For the first five years of life as a whole the probability of death ($_5q_0$) ranged between 0.235 and 0.102 (0.218 and 0.112 for the three-year moving averages).

Before the GFS, infant and child mortality levels were estimated indirectly, mainly from population census data on total number of children ever born, and the number surviving to women at successive ages. The mortality rates obtained from these data were excessively higher than the rates directly estimated from the GFS. The $_1q_0$ and $_5q_0$ indirectly estimated from the 1971 SE for 1970 were about 0.121 and 0.211 respectively, compared with 0.067 and 0.113 calculated directly from the GFS for the period 1969–71. Given the possible general undercoverage of infant and child deaths in the GFS we examine in the following paragraphs whether there is any evidence of selective omissions or misplacement of events in the time scale.

The data in table 22 and in figure 14 show a rapid decline in the infant mortality rate ($_1q_0$) from a little over 100 infant deaths per 1000 births in the early 1950s to around 80 per 1000 births at the beginning of the 1960s. The level of child mortality ($_4q_1$), however, did not show much change during the 1960s after a drop from 109 in 1955 to 61 in 1959. The child mortality rate in fact rose to 60 in 1960 and stayed at a high level fluctuating between 72 and 91 deaths per 1000 births during the period 1962–7 before declining after 1967.

Infant and child mortality rates for five-year periods before the survey, however, showed a systematic decline in the mortality levels over the periods (table 23). The infant mortality rate ($_1q_0$) showed a systematic decline from 0.115 recorded for the 25–29 years before the survey to 0.068 for the 0–4 year period before the survey. The child mortality rate ($_4q_1$) also showed a general decline from 0.096 recorded for the 25–29 years before the survey to 0.050 recorded for the 5–9 year period before the survey. Deaths in the more distant past are more likely to be forgotten due to memory lapses. However, with the period rates showing the expected declining trend in mortality level, there is not much evidence of such selective omissions of infant and child deaths.

We next evaluate the data in terms of some expected patterns of infant and child mortality, namely, sex differentials in mortality and the profile of infant mortality by age of mother. Studies of mortality patterns have shown that due to biological factors males generally experience higher mortality than females in infancy and early childhood. Infant mortality by age of mother has also been found to be higher for the youngest and the oldest mothers.

Table 23 Probabilities of infant and child death for periods before the survey

Periods (years)	Probabilities of death		
	$_1q_0$	$_4q_1$	$_5q_0$
25–29	0.115	0.096	0.211
20–24	0.099	0.072	0.171
15–19	0.077	0.066	0.143
10–14	0.076	0.068	0.144
5–9	0.067	0.050	0.117
0–4	0.068	–	–

Source: GFS 1979–80

The comparative mortality levels of male and female children given in table 24 show that the infant and child mortality rates for male children were higher than corresponding rates for females for all the five-year periods before the survey, except for the most distant period (25–29 years) which showed a lower male infant mortality rate. The period rates also showed a generally declining trend, with the exception of the male mortality rates ($_1q_0$) which exhibited alternating high and low rates over the periods. The infant mortality rates by age of mother at birth given in table 25 also exhibited the expected U shape; that is, with higher rates for the youngest and oldest mothers. The profile obtains in the different periods before the survey. Examination of the infant mortality rates over time by age of mother (horizontal entries in table 25) again show a generally declining trend over the five-year periods before the survey.

In summary the data from the maternity history enable us to undertake a detailed analysis of infant and child mortality. It is, however, important to consider the effects of memory lapses in such retrospective information; the irregularities observed in the annual rates may be due to recall lapses resulting in misplacement of events in single calendar years. The irregularities are however very much reduced when the data are presented for five-year periods before the survey. The data for five-year periods consequently showed a generally declining trend of infant and child mortality. Another limitation of the data is that the average age of mother at the time of birth of children becomes progressively younger as the data used refer further into the past, and information given for the past is consequently restricted to younger women and, in view of the relationship between age of mother and infant and child mortality, this would occasion some distortions in overall estimates for periods before the survey.

Subject to these deficiencies the data do not show any strong evidence of selective or differential omissions of deaths although in comparison with indirect estimates from external sources the levels of mortality estimated directly from GFS generally appear to be low in all categories of the data. The problem of misplacement of events which affects estimates of time trends is also minimized when the estimates are presented for five-year periods instead of single calendar years before the survey.

Table 24 Probabilities of death in the first year ($_1q_0$) and first five years ($_5q_0$) of life for periods before the survey, by sex of child and type of area of residence

Sex of child	Probabilities of death	Periods (years) before the survey					
		1–4	5–9	10–14	15–19	20–24	25–29
Boy	$_1q_0$	0.077	0.074	0.088	0.082	0.110	0.104
	$_5q_0$	–	0.127	0.158	0.145	0.187	0.212
Girl	$_1q_0$	0.057	0.062	0.064	0.072	0.088	0.127
	$_5q_0$	–	0.110	0.130	0.142	0.156	0.209

Source: GFS 1979–80

Table 25 Probability of death in the first year of life ($_1q_0$) by periods before survey and by age of mother at time of child's birth[a]

Age at birth	Total	Periods (years) before the survey						
		1–4	5–9	10–14	15–19	20–24	25–29	30–34
10–14	0.101	–	–	(0.143)	(0.075)	(0.177)	(0.071)	(0.191)
15–19	0.094	0.094	0.070	0.079	0.090	0.116	0.127	0.216
20–24	0.074	0.059	0.067	0.091	0.070	0.087	0.108	
25–29	0.064	0.059	0.065	0.060	0.072	0.075		
30–34	0.073	0.068	0.077	0.067	0.088			
35–39	0.056	0.049	0.050	0.089				
40–44	0.102	0.100	0.105					
45–49	(0.125)	(0.125)						

[a] Figures in brackets are based on less than 100 births.
Souce: GFS 1979–80

7 Summary of Findings

We have in this evaluation of the GFS data attempted to assess the quality of the survey data and ascertain the plausibility of the main findings of the survey. We have examined the quality of age reporting, and of data relating to nuptiality, fertility, and infant and child mortality.

7.1 AGE REPORTING

Myers' index of age digit preference showed that age reporting was comparatively better in the GFS than in the 1970 census. Nevertheless the degree of digit preference in the GFS was excessive. It was greater for females than for males, and, as expected, was greater for the rural population than for the urban population. The age and sex ratios calculated from grouped data also showed significant deviations from the expected values. Apart from the transference of women out of the sample age limits (largely from the age group 45–49 to the age group 50–54 in the household survey), the observed rugged and discordant patterns of the age and sex ratios may partly reflect the residual effects of age mis-statement and partly the effects of the age-sex selective emigration of Ghanaians in recent years.

7.2 NUPTIALITY

The GFS has shown that the institution of marriage was as prevalent in 1979–80 as in 1971, as both periods showed high proportions of women having ever been married at each successive age. For women aged 15–19, however, the proportion ever married was slightly lower in the GFS than in the 1971 SE – 30.9 per cent in the GFS compared to 31.8 per cent in the 1971 SE. Reverse survival of the GFS sample to 1971, however, showed higher proportions of women in the age groups 15–19 and 20–24 having ever been married compared to the proportions obtained in the 1971 SE. The apparent inconsistency may be due to the fact that the women in the GFS sample were survivors of the 1971 female sample population and therefore cannot replicate or constitute a representative sample of the latter. Alternatively, age mis-statement combined with incorrect reporting of duration since first marriage may also produce this pattern.

Generally, the survey data do not show any uni-directional trend in marriage rates or in age at first marriage as the levels fluctuate randomly for all age groups over the five-year periods before the survey. For the age group 15–19, however, the age at first marriage appears to have been rising; this is shown by the generally decreasing levels, over the five-year periods, of the proportion of this age group who have ever been married. The increasing proportion of younger women who are educated or at school over the last two or three decades accounts for this.

7.3 FERTILITY

The levels and trends of fertility have been examined through the analysis of the age-specific and cohort rates by period. Compared with the 1971 SE, coverage of births in the GFS was more complete, giving a TFR of 6.99 for the period 1969–71 compared with 5.93 from the 1971 SE. Age-specific rates calculated for single calendar years showed fluctuating levels which may be attributable to sampling variation and heaping on rounded years or durations. Nevertheless the results show a decline in fertility in the past few years, as can be seen in the declining estimated TFRs of 7.10, 6.97 and 6.52 for the three five-calendar-year periods before the survey.

Cohort–period analysis of the fertility data confirms that a small decline in the levels of fertility occurred in the recent past. The decline was most significant for the urban sub-population and for the 15–19 age group due to the rising age at first marriage.

Some omission and misreporting of dates of births of children, however, seems to have occurred, particularly among three subgroups, the rural, uneducated and those who did not report their exact date of birth, in some displacement of births towards later ages or periods, particularly for very early events. The data, however, did not show any strong evidence of selective omission of births by sex or by survival of the child.

7.4 INFANT AND CHILD MORTALITY

Compared with indirect estimates based on population census data on number of children ever born and the proportion surviving, the levels of infant and child mortality obtained from the GFS generally appear to be low. The data, however, do not show any strong evidence of selective or differential omissions of deceased children, and there is no evidence of greater omissions of deaths in the more distant past. Differential levels of infant and child mortality by sex of child and age of mother at birth also showed the expected patterns; that is, higher mortality levels for male children compared with females, and higher rates for the youngest and the oldest mothers.

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Appendix A — Cohort–Period Fertility Rates

Table A1 Fertility rates by cohort and period and cumulative rates by cohorts (P) and periods (F) and their ratios (P/F): urban

Current age group	Five-year period before the survey							
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39
A Birth-cohort fertility rates								
15–19	0.037	0.001						
20–24	0.173	0.050	0.001					
25–29	0.234	0.193	0.043	0.003				
30–34	0.253	0.249	0.197	0.055	0.001			
35–39	0.192	0.268	0.291	0.233	0.065	0.001		
40–44	0.156	0.224	0.285	0.262	0.175	0.035	0.000	
45–49	0.083	0.148	0.215	0.275	0.292	0.187	0.044	0.000
B Cumulative fertility of real cohorts (P)								
15–19	0.190	0.004						
20–24	1.122	0.259	0.007					
25–29	2.366	1.196	0.230	0.016				
30–34	3.775	2.509	1.266	0.281	0.004			
35–39	5.256	4.295	2.953	1.496	0.329	0.004		
40–44	5.679	4.899	3.780	2.357	1.048	0.173	0.000	
45–49	6.221	5.808	5.067	3.990	2.615	1.154	0.221	0.000
C Cumulative fertility of synthetic cohorts (F)								
15–19	0.190	0.004						
20–24	1.053	0.256	0.007					
25–29	2.222	1.222	0.221	0.016				
30–34	3.488	2.466	1.206	0.293	0.004			
35–39	4.450	3.808	2.663	1.459	0.329	0.004		
40–44	5.230	4.927	4.086	2.769	1.204	0.177	0.000	
45–49	5.643	5.667	5.163	4.144	2.665	1.110	0.221	0.000
D P/F ratios								
20–24	1.066							
25–29	1.064	0.978						
30–34	1.082	1.018	1.050					
35–39	1.181	1.128	1.109	1.025				
40–44	1.086	0.994	0.925	0.851	0.870			
45–49	1.102	1.025	0.982	0.963	0.981	1.040		

Table A2 Fertility rates by cohort and period and cumulative rates by cohorts (P) and periods (F) and their ratios (P/F): rural

Current age group	Five-year period before the survey							
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39
A Birth-cohort fertility rates								
15–19	0.053	0.001						
20–24	0.236	0.065	0.000					
25–29	0.285	0.226	0.061	0.004				
30–34	0.268	0.281	0.216	0.065	0.005			
35–39	0.223	0.289	0.275	0.212	0.079	0.006		
40–44	0.170	0.253	0.297	0.275	0.212	0.051	0.000	
45–49	0.097	0.202	0.261	0.284	0.266	0.198	0.063	0.002
B Cumulative fertility of real cohorts (P)								
15–19	0.268	0.003						
20–24	1.506	0.325	0.001					
25–29	2.882	1.455	0.323	0.018				
30–34	4.178	2.839	1.432	0.351	0.026			
35–39	5.418	4.305	2.859	1.486	0.424	0.030		
40–44	6.294	5.443	4.180	2.693	1.316	0.258	0.002	
45–49	6.863	6.379	5.370	4.063	2.645	1.316	0.325	0.012
C Cumulative fertility of synthetic cohorts (F)								
15–19	0.268	0.003						
20–24	1.450	0.327	0.001					
25–29	2.876	1.459	0.307	0.018				
30–34	4.215	2.866	1.387	0.343	0.026			
35–39	5.328	4.312	2.761	1.405	0.421	0.030		
40–44	6.179	5.575	4.247	2.782	1.479	0.285	0.002	
45–49	6.663	6.584	5.555	4.200	2.807	1.276	0.316	0.012
D P/F ratios								
20–24	1.039							
25–29	1.002	0.998						
30–34	0.991	0.991	1.032					
35–39	1.017	0.998	1.036	1.058				
40–44	1.019	0.976	0.984	0.968	0.890			
45–49	1.030	0.969	0.967	0.967	0.942	1.031		

Table A3 Fertility rates by cohort and period and cumulative rates by cohorts (P) and periods (F) and their ratios (P/F): schooling

Current age group	Five-year period before the survey							
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39
A Birth-cohort fertility rates								
15–19	0.037	0.001						
20–24	0.203	0.047	0.000					
25–29	0.248	0.185	0.036	0.001				
30–34	0.252	0.263	0.182	0.042	0.001			
35–39	0.184	0.230	0.265	0.208	0.067	0.005		
40–44	0.147	0.250	0.280	0.290	0.200	0.036	0.000	
45–49	0.073	0.167	0.225	0.305	0.287	0.138	0.036	0.000
B Cumulative fertility of real cohorts (P)								
15–19	0.191	0.005						
20–24	1.254	0.237	0.002					
25–29	2.351	1.112	0.186	0.006				
30–34	3.695	2.437	1.122	0.211	0.004			
35–39	4.801	3.880	2.729	1.404	0.361	0.024		
40–44	6.010	5.276	4.029	2.629	1.181	0.181	0.000	
45–49	6.164	5.800	4.964	3.836	2.309	0.873	0.182	0.000
C Cumulative fertility of synthetic cohorts (F)								
15–19	0.191	0.005						
20–24	1.208	0.239	0.002					
25–29	2.448	1.165	0.183	0.006				
30–34	3.706	2.480	1.093	0.213	0.004			
35–39	4.628	3.631	2.418	1.256	0.341	0.024		
40–44	5.361	4.878	3.818	2.703	1.341	0.205	0.000	
45–49	5.725	5.715	4.946	4.231	2.777	0.896	0.182	0.000
D P/F ratios								
20–24	1.038							
25–29	0.960	0.954						
30–34	0.997	0.983	1.026					
35–39	1.037	1.068	1.128	1.118				
40–44	1.121	1.082	1.055	0.972	0.881			
45–49	1.077	1.015	1.004	0.907	0.831	0.974		

Table A4 Fertility rates by cohort and period and cumulative rates by cohorts (P) and periods (F) and their ratios (P/F): no schooling

Current age group	Five-year period before the survey							
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39
A Birth-cohort fertility rates								
15–19	0.075	0.000						
20–24	0.232	0.084	0.001					
25–29	0.286	0.247	0.075	0.006				
30–34	0.269	0.275	0.224	0.073	0.005			
35–39	0.221	0.298	0.285	0.223	0.076	0.004		
40–44	0.170	0.243	0.297	0.268	0.201	0.049	0.000	
45–49	0.096	0.192	0.254	0.278	0.270	0.204	0.061	0.002
B Cumulative fertility of real cohorts (P)								
15–19	0.377	0.000						
20–24	1.586	0.426	0.005					
25–29	3.068	1.636	0.404	0.030				
30–34	4.229	2.885	1.512	0.390	0.027			
35–39	5.538	4.432	2.940	1.516	0.402	0.020		
40–44	6.139	5.287	4.072	2.589	1.251	0.245	0.002	
45–49	6.789	6.307	5.346	4.076	2.685	1.336	0.318	0.010
C Cumulative fertility of synthetic cohorts (F)								
15–19	0.377	0.000						
20–24	1.537	0.421	0.005					
25–29	2.968	1.654	0.379	0.030				
30–34	4.312	3.027	1.501	0.393	0.027			
35–39	5.418	4.518	2.926	1.506	0.409	0.020		
40–44	6.271	5.734	4.409	2.844	1.415	0.263	0.002	
45–49	6.753	6.694	5.680	4.235	2.764	1.281	0.309	0.010
D P/F ratios								
20–24	1.032							
25–29	1.034	0.989						
30–34	0.981	0.953	1.007					
35–39	1.022	0.981	1.005	1.006				
40–44	0.979	0.922	0.923	0.910	0.884			
45–49	1.005	0.942	0.941	0.962	0.971	1.043		

Table A5 Fertility rates by cohort and period and cumulative rates by cohorts (P) and periods (F) and their ratios (P/F): knew exact date of birth

Current age group	Five-year period before the survey							
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39
A Birth-cohort fertility rates								
15–19	0.037	0.000						
20–24	0.202	0.043	0.000					
25–29	0.256	0.197	0.041	0.001				
30–34	0.256	0.255	0.197	0.057	0.002			
35–39	0.199	0.269	0.276	0.227	0.076	0.003		
40–44	0.164	0.231	0.289	0.273	0.201	0.047	0.001	
45–49	0.091	0.175	0.225	0.300	0.258	0.200	0.052	0.000
B Cumulative fertility of real cohorts (P)								
15–19	0.188	0.002						
20–24	1.223	0.215	0.001					
25–29	2.476	1.198	0.212	0.005				
30–34	3.836	2.557	1.284	0.299	0.012			
35–39	5.254	4.257	2.912	1.529	0.393	0.015		
40–44	6.031	5.214	4.057	2.618	1.245	0.239	0.006	
45–49	6.500	6.047	5.172	4.047	2.547	1.258	0.258	0.000
C Cumulative fertility of synthetic cohorts (F)								
15–19	0.188	0.002						
20–24	1.197	0.216	0.001					
25–29	2.475	1.202	0.208	0.005				
30–34	3.753	2.474	1.193	0.293	0.012			
35–39	4.750	3.820	2.576	1.429	0.390	0.015		
40–44	5.567	4.977	4.022	2.794	1.397	0.247	0.006	
45–49	6.020	5.852	5.147	4.294	2.686	1.247	0.246	0.000
D P/F ratios								
20–24	1.022							
25–29	1.001	0.997						
30–34	1.022	1.033	1.076					
35–39	1.106	1.114	1.130	1.070				
40–44	1.083	1.048	1.009	0.934	0.892			
45–49	1.080	1.033	1.005	0.943	0.948	1.008		

Table A6 Fertility rates by cohort and period and cumulative rates by cohorts (P) and periods (F) and their ratios (P/F): 'years ago' for the age or date of birth

Current age group	Five-year period before the survey							
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39
A Birth-cohort fertility rates								
15–19	0.064	0.000						
20–24	0.220	0.074	0.001					
25–29	0.269	0.233	0.061	0.006				
30–34	0.252	0.273	0.213	0.056	0.007			
35–39	0.221	0.298	0.260	0.185	0.072	0.007		
40–44	0.175	0.245	0.285	0.244	0.174	0.037	0.000	
45–49	0.107	0.210	0.258	0.268	0.252	0.178	0.075	0.005
B Cumulative fertility of real cohorts (P)								
15–19	0.321	0.000						
20–24	1.476	0.374	0.005					
25–29	2.847	1.500	0.337	0.031				
30–34	4.005	2.745	1.380	0.315	0.037			
35–39	5.218	4.112	2.620	1.318	0.391	0.034		
40–44	5.801	4.925	3.699	2.274	1.054	0.183	0.000	
45–49	6.768	6.232	5.181	3.890	2.548	1.290	0.400	0.020
C Cumulative fertility of synthetic cohorts (F)								
15–19	0.321	0.000						
20–24	1.423	0.369	0.005					
25–29	2.769	1.532	0.311	0.031				
30–34	4.029	2.898	1.376	0.308	0.037			
35–39	5.135	4.390	2.677	1.236	0.395	0.034		
40–44	6.011	5.615	4.102	2.456	1.266	0.216	0.000	
45–49	6.547	6.667	5.393	3.798	2.524	1.107	0.374	0.026
D P/F ratios								
20–24	1.037							
25–29	1.028	0.979						
30–34	0.994	0.947	1.003					
35–39	1.016	0.937	0.979	1.067				
40–44	0.965	0.877	0.902	0.926	0.833			
45–49	1.034	0.935	0.961	1.024	1.010	1.166		

Table A7 Cohort–period fertility rates, cumulative rates for real (P) and synthetic (F) cohorts and P/F ratios for first order births

Current age group	Number of women	Five-year period before the survey							
		0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39
A Birth–cohort fertility rates for first birth order									
15–19	1371	0.042	0.001						
20–24	1220	0.104	0.047	0.001					
25–29	1011	0.040	0.104	0.038	0.003				
30–34	802	0.008	0.044	0.091	0.044	0.003			
35–39	703	0.002	0.011	0.042	0.084	0.054	0.003		
40–44	579	0.001	0.004	0.018	0.044	0.091	0.036	0.000	
45–49	439	0.000	0.001	0.004	0.018	0.044	0.086	0.040	0.002
Average age of cohort at survey		17.33	22.31	27.23	32.01	37.25	41.86	47.08	
B Cumulative fertility of real cohorts (P)									
15–19		0.213	0.003						
20–24		0.759	0.237	0.003					
25–29		0.923	0.723	0.205	0.015				
30–34		0.956	0.914	0.695	0.238	0.017			
35–39		0.984	0.973	0.916	0.707	0.284	0.014		
40–44		0.974	0.967	0.945	0.857	0.636	0.183	0.002	
45–49		0.977	0.977	0.973	0.952	0.861	0.640	0.210	0.009
C Cumulative fertility of synthetic cohorts (F)									
15–19		0.213	0.003						
20–24		0.735	0.237	0.003					
25–29		0.935	0.755	0.193	0.015				
30–34		0.977	0.974	0.650	0.236	0.017			
35–39		0.989	1.031	0.859	0.658	0.288	0.014		
40–44		0.996	1.054	0.947	0.879	0.740	0.196	0.002	
45–49		0.996	1.058	0.967	0.970	0.961	0.626	0.202	0.009
D P/F ratios									
20–24		1.033							
25–29		0.987	0.958						
30–34		0.979	0.938	1.069					
35–39		0.996	0.944	1.067	1.074				
40–44		0.978	0.918	0.998	0.974	0.859	1.166		
45–49		0.982	0.923	1.006	0.981	0.896	1.022		

Table A8 Cohort–period fertility rates, cumulative rates for real (P) and synthetic (F) cohorts and P/F ratios for fourth order births

Current age group	Number of women	Five-year period before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Birth–cohort fertility rates for first birth order								
15–19	1371	0.037	0.039					
20–24	1220	0.023	0.011	0.012				
25–29	1011	0.081	0.016	0.004	0.003			
30–34	802	0.180	0.088	0.018	0.001			
35–39	703	0.188	0.192	0.105	0.020	0.001		
40–44	579	0.158	0.211	0.195	0.086	0.014	0.000	
45–49	439	0.094	0.180	0.212	0.182	0.092	0.018	0.000
B Cumulative fertility of real cohorts (P)								
15–19		0.787	0.603					
20–24		0.290	0.175	0.120				
25–29		0.530	0.124	0.042	0.020			
30–34		1.435	0.537	0.099	0.010	0.002		
35–39		2.535	1.593	0.634	0.111	0.009		
40–44		3.321	2.534	1.478	0.503	0.071	0.002	
45–49		3.888	3.419	2.517	1.456	0.547	0.089	0.000
C Cumulative fertility rates of synthetic cohorts (F)								
15–19		0.378	0.194					
20–24		0.493	0.249	0.257				
25–29		0.899	0.331	0.278	0.210			
30–34		1.797	0.770	0.367	0.217	0.076		
35–39		2.739	1.729	0.890	0.320	0.083	0.011	
40–44		3.526	2.784	1.866	0.751	0.152	0.013	
45–49		3.995	3.686	2.928	1.660	0.610	0.102	0.000
D P/F ratios								
20–24		0.589						
25–29		0.590	0.373					
30–34		0.799	0.698	0.268				
35–39		0.926	0.922	0.712	0.347			
40–44		0.942	0.910	0.792	0.669	0.466		
45–49		0.973	0.928	0.860	0.877	0.897	0.873	

Table A9 Marriage-cohort fertility rates, cumulative rates for real (P) and synthetic (F) cohorts and P/F ratios

Current age group	Number of women	Five-year period before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Marriage-cohort fertility rates								
0–4	1117	0.335						
5–9	1084	0.291	0.331					
10–14	820	0.273	0.307	0.326				
15–19	718	0.236	0.285	0.306	0.305			
20–24	630	0.166	0.251	0.287	0.306	0.323		
25–29	409	0.127	0.214	0.275	0.297	0.320	0.308	
30–34	160	0.078	0.186	0.252	0.259	0.255	0.286	0.337
Average years of exposure in first rate for cohort								
		2.53	2.41	2.31	2.44	2.38	2.27	1.80
B Cumulative fertility of real cohorts (P)								
0–4		0.853						
20–24		2.310	0.796					
25–29		3.674	2.333	0.754				
30–34		4.853	3.756	2.286	0.742			
35–39		5.681	5.010	3.721	2.272	0.767		
40–44		6.315	6.079	5.095	3.757	2.366	0.699	
45–49		6.702	7.010	6.357	5.050	3.641	2.131	0.606
C Cumulative fertility rates of synthetic cohorts (F)								
0–4		0.853						
5–9		2.310	0.796					
10–14		3.674	2.333	0.754				
15–19		4.853	3.756	2.286	0.742			
20–24		5.681	5.010	3.721	2.272	0.767		
25–29		6.315	6.079	5.095	3.757	2.366	0.699	
30–34		6.702	7.010	6.357	5.050	3.641	2.131	0.606
D P/F ratios								
0–4	0.975	0.589						
5–9	0.995	0.590	0.373					
10–14	1.005	0.799	0.698	0.268				
15–19	1.023	0.926	0.922	0.712	0.347			