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No. 7 - 1963

with special reference to conditions and trends of fertility in the world

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Department of Economic and Social Affairs

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CONTENTS

	Page
I. SUMMARY OF PRINCIPAL FINDINGS	
A. Levels of fertility	1
B. Trends of fertility	4
C. Factors related to levels and trends of fertility	6
II. MEASURES OF FERTILITY AND SOURCES OF DATA	
A. Definition and significance of principal measures of fertility	10
B. Sources of data and basis of estimation	11
C. Types of data on fertility trends and extent of their availability	14
III. LEVELS AND TRENDS OF FERTILITY IN AFRICA	15
A. Sources and limitations of data	15
B. Recent levels of fertility	19
C. Trends and future outlook	25
D. Notes on fertility data and estimates for countries	26
IV. LEVELS AND TRENDS OF FERTILITY IN ASIA	
A. Present levels	42
B. Trends	48
C. Notes on fertility data and estimates for countries	55
V. LEVELS AND TRENDS OF FERTILITY IN MIDDLE AND SOUTH AMERICA	
A. Present levels	66
B. Trends	73
C. Notes on fertility data and estimates for countries	79
VI. LEVELS AND TRENDS OF FERTILITY IN EUROPE, NORTHERN AMERICA, OCEANIA AND THE SOVIET UNION	89
A. Present levels	92
B. Trends	93
VII. AGE PATTERNS OF FERTILITY	101
A. Sources and limitations of data	102
B. Types of age patterns of fertility	106
C. Model age patterns of fertility	110
D. Geographical distribution of types of age patterns	111
E. Factors associated with different age patterns of fertility	113
F. Shifts in age patterns	117
G. Theoretical model age patterns of fertility	121
VIII. RURAL-URBAN AND EDUCATION DIFFERENCES OF FERTILITY	
A. The significance of fertility differentials	122
B. Measures of fertility differences and their interpretation	123
C. Low-fertility countries	124
D. High-fertility countries	129

CONTENTS (*continued*)

	Page
IX. ECONOMIC AND SOCIAL FACTORS RELATED TO DIFFERENCES IN LEVELS OF FERTILITY ..	134
A. Indicators of economic and social development	134
B. Distributions of countries by levels of fertility and of social and economic indicators	135
C. Variations of economic and social indicators among countries classified by levels of fertility	141
D. Variations of fertility among countries classified by levels of economic and social indicators	144
E. Correlations of indicators with fertility and among themselves	145
F. " Threshold " values of indicators for initiation of a decline of fertility	148

Chapter I

SUMMARY OF PRINCIPAL FINDINGS

A. Levels of fertility

1. *Scope of data*

There has been a considerable improvement during the last decade in information on fertility in the economically less developed regions of the world. Approximate values of crude birth rates and gross reproduction rates have been established for many countries, especially in Africa, where the level of fertility was previously a matter of conjecture. These new indications have been obtained in some cases by means of household sample-survey inquiries on births and deaths, while in other cases population censuses or demographic sample surveys have for the first time provided data on age structure of the population from which estimates of the fertility level could be derived. Thus it has become possible to chart previously unknown territories on the world map of fertility and to make a far more comprehensive study than was formerly possible on the variations of fertility and related factors in the less developed regions. Fertility levels in these regions are the principal concern of the present report, the United Nations having recently published a detailed analysis of fertility trends in industrialized countries.[1]

Data considered satisfactory at least as a basis for an approximate estimate of the level of the crude birth rate have been obtained for 123 countries (or other territorial units) having an estimated population of 250,000 or more in 1960. In nearly all cases it has been found possible also to estimate the gross reproduction rate (GRR). These countries contain approximately 70 per cent of the world population, including virtually all the population of Europe, the USSR, Northern America, Middle and South America and 87 per cent of that of Africa and Oceania, but only about 50 per cent of the population of Asia. The low figure for Asia is due mainly to the fact that satisfactory data are lacking for China (mainland).

Fertility measures for each country are shown in the regional tables in Chapters III-VI of this report. These estimates refer to 1960 or to the latest date of available data for each country — in the great majority of cases to dates since 1950, but in a few cases to dates as long ago as the early 1940's. The estimates vary greatly in reliability. The sources of data and methods of estimation are described in Chapter II.

[1] *Recent Trends in Fertility in Industrialized Countries*, United Nations publication, Sales No.: 57.XIII.2.

Table 1.1. Estimated crude birth rates and gross reproduction rates for the regions of the world

(Weighted averages of rates for 1960 or most recent dates of available data for countries within each region)

Region	*Crude birth rate*	*Gross reproduction rate*
World total	35-36 [a]	2.25-2.31 [a]
Developing regions	41-42 [a]	2.6 -2.7 [a]
Africa	48	3.0
North Africa	46	2.9
West Africa	54	3.4
South and East Africa	45	2.7
Asia (excluding USSR)	40-41 [a]	2.5 -2.6 [a]
South West Asia	45	3.0
South Central Asia	44	2.9
South East Asia	49	2.9
East Asia	35-37 [a]	2.1 -2.3 [a]
Middle and South America	41	2.8
Middle America	45	3.0
South America	40	2.7
More developed regions	22	1.4
Northern America	24	1.8
Europe	19	1.3
Northern and Western Europe.	18	1.3
Central Europe	18	1.2
Southern Europe	21	1.3
Oceania	24	1.8
USSR	25	1.4

[a] Range of estimated values corresponding to alternative estimates for China (mainland).

2. *Average levels of fertility in regions of the world*

Fertility is about twice as high, on the average, in the developing as in the more developed regions of the world. This difference is brought out by the estimates of crude birth rates and gross reproduction rates for regions, presented in table 1.1. The average gross reproduction rate for the regions of Africa, Asia, Middle and South America is estimated to be about 2.7, while the average for Northern America, Europe, Oceania and the USSR is 1.4. These are weighted averages of recorded or estimated rates for countries within each region as of 1960 or the date of latest available information.[2] For the regions of Africa, Asia, and Middle and South America, there are some differences between the birth rate estimates

[2] In computing the estimate for East Asia, a range of values based on the best available information for China (mainland) was used.

Table 1.2. Distribution of countries by level of crude birth rate

(Excluding countries having fewer than 250,000 inhabitants in 1960 and those having no satisfactory data. Countries are classified according to levels of crude birth rates in 1960 or at the most recent dates of available data)

Crude birth rate per 1,000 population	World total	Less developed regions	More developed regions	Africa	Asia (excluding USSR)	Middle and South America	Europe (excluding USSR)	Northern America	Oceania	USSR
Total	123	88	35	37	24	27	29	2	3	1
Under 15	3	—	3	—	—	—	3	—	—	—
15.0-19.9	18	1	17	—	1	—	17	—	—	—
20.0-24.9	14	4	10	—	2	2	7	1	1	1
25.0-29.9	4	1	3	—	1	—	1	1	1	—
30.0-34.9	3	3	—	—	1	2	—	—	—	—
35.0-39.9	11	11	—	3	4	4	—	—	—	—
40.0-44.9	22	21	1	9	3	9	1	—	—	—
45.0-49.9	29	28	1	13	7	8	—	—	1	—
50.0-54.9	12	12	—	5	5	2	—	—	—	—
55.0-59.9	5	5	—	5	—	—	—	—	—	—
60.0 and over	2	2	—	2	—	—	—	—	—	—

shown in table 1.1 and those given in recent issues of the *Demographic Yearbook* and other United Nations publications prepared before the results of the present survey of fertility became available.

3. *Distribution of countries by level of fertility*

The distribution of the 123 countries by estimated level of the crude birth rate is shown in table 1.2 for the world as a whole and each major region. The corresponding distribution by estimated level of the gross reproduction rate appears in table 1.3 for the 122 countries for which this measure could be calculated.

The distributions for the world as a whole are strikingly bi-modal. Two groups of countries are clearly distinguished: a high-fertility group and a low-fertility group, with remarkably few countries on the borderline between them. The dividing line can be drawn at a crude birth rate of 30 per 1,000 population and a gross reproduction rate of 2.0.[3] As the two tables show, the division between the high-fertility and low-fertility groups of countries corresponds closely to the location of the countries in developing or more developed regions, respectively. The countries with birth rates above 30 and gross reproduction rates above 2.0 are found almost exclusively in Africa, Asia and Middle and South America, while countries with rates below these levels are located, with few exceptions, in the economically more advanced regions. The exceptions to this rule are generally countries which are not typical, in regard to their levels of economic and social development, of the regions in which they are located.

[3] For countries with a GRR of 2.0 or higher, the unweighted mean rate is 2.94, while for countries with a GRR of less than 2.0 it is 1.41. The difference between the two means can be expressed as 1.53 ± 0.07, the latter value being the standard error. Since the difference between the means is more than 21 times its standard error, the two groups of countries are clearly distinct in a statistical sense, in respect of their fertility levels.

Table 1.3. Distribution of countries by level of gross reproduction rate (GRR)

(Excluding countries having fewer than 250,000 inhabitants in 1960 and those having no satisfactory data. Countries are classified according to levels of GRR in 1960 or at the most recent dates of available data)

Level of gross reproduction rate	World total	Less developed regions	More developed regions	Africa	Asia (excluding USSR)	Middle and South America	Europe (excluding USSR)	Northern America	Oceania	USSR
Total	122	87	35	37	24	26	29	2	3	1
Under 1.0	1	—	1	—	—	—	1	—	—	—
1.0-1.2	14	1	13	—	1	—	13	—	—	—
1.3-1.5	13	2	11	—	—	2	10	—	—	1
1.6-1.9	10	3	7	—	3	—	4	2	1	—
2.0-2.3	7	6	1	3	—	3	—	—	1	—
2.4-2.6	12	12	—	8	4	—	—	—	—	—
2.7-2.9	24	24	—	9	6	9	—	—	—	—
3.0-3.2	19	19	—	8	3	8	—	—	—	—
3.3-3.5	20	18	2	8	7	3	1	—	1	—
3.6 and over	2	2	—	1	—	1	—	—	—	—

4. *Differences in fertility levels among countries in Africa, Asia, Middle America and South America*

The only exceptions to the rule of high fertility in Africa, Asia, Middle America and South America (i.e., estimated gross reproduction rates below 2.0 for countries considered in this study) are Argentina, Cyprus, Israel, Japan, the Ryukyu Islands, Uruguay and Zanzibar. Japan's gross reproduction rate in recent years has been at the level of 1.0 — one of the lowest in the world. The most recent estimated rates for Argentina, Cyprus, Israel, the Ryukyu Islands and Uruguay are in the range of 1.3 to 1.7, slightly above the average of the low-fertility group. Argentina, Israel, Japan and Uruguay are exceptions in their levels of development as well as fertility; their economic and social conditions contrast with those of their Latin American and Asian neighbours. Cyprus, the Ryukyu Islands and Zanzibar exhibit the rare combination of low fertility with a modest level of development. The influence of Greek culture doubtless has an important bearing on fertility in Cyprus, while Japanese influence is almost certainly the main factor responsible for the low present level of fertility in the Ryukyu Islands. Zanzibar, the one country in Africa with an estimated gross reproduction rate below 2.0 (1.9 for the Afro-Arab population in 1958), is a small, little-developed country with a predominantly urban population.

While all other African, Asian, Middle American and South American countries belong to the high-fertility group, the estimates show remarkable variations in degree of highness of their fertility levels.

In Africa, there seems to be a belt of exceedingly high fertility, composed of countries with gross reproduction rates estimated at 3.3 or higher, stretching across West Africa from Guinea and Mali to Niger and Nigeria. Some spots of equally high fertility appear in eastern and southern Africa, including Northern Rhodesia, Rwanda, possibly Kenya and the Sudan. As indicated in chapter III, however, the basis for fertility estimates for some of these countries is weak. A zone of much lower fertility seems to be centred in the Congo Basin; gross reproduction rates in the relatively moderate range of 2.1 to 2.4 are indicated for Congo (Leopoldville), Gabon, Cameroon and Central African Republic. Rates far below the African regional average are estimated also for Basutoland, Madagascar and Portuguese Guinea, as well as Zanzibar.

For certain countries in Asia, estimated fertility levels are considerably higher than the average for the region in which they are located. The Republic of Korea is outstanding in this respect in East Asia, while for a group of countries in the south-east, including the Philippines, North Borneo, Sarawak, Cambodia and Thailand, estimated gross reproduction rates of 3.2 and above are found. Singapore also belonged to this group in the early 1950's, but fertility in Singapore has dropped in the last few years to a more moderate level. Pakistan seems to have an exceptionally high fertility rate for the south central region. In the south-west, estimates for Iraq and Jordan are well above the regional average, and Iran also seems to be somewhat higher. A zone of more moderate fertility is located in South Central Asia, including India, Nepal, Burma and Ceylon, with estimated gross reproduction rates in the range of 2.5 to 2.7. If the estimate for China (mainland) is at all indicative, the average level of fertility in that country also is no more than moderately high. The dubious figure for the mainland, together with the much more reliable statistics of China (Taiwan), Hong Kong and now Singapore, suggest the definition of a Chinese cultural zone of relatively moderate fertility, gross reproduction rates not exceeding 2.8.

In Latin America, the area of generally highest fertility seems to be the Middle American mainland; gross reproduction rates at the exceedingly high level of 3.3 or more are estimated for Costa Rica, El Salvador, Guatemala and Honduras, and the rates for Mexico and Nicaragua appear only slightly lower. Panama is the only country in this area with an estimated rate below 3.0 for recent years. Brazil and the other principal countries of tropical South America make up a subregion of almost equally high fertility.

Countries of only moderately high fertility are found in two zones of Middle and South America: the Caribbean area and the temperate zone of South America. Gross reproduction rates in the relatively low range of 2.1 to 2.3 are estimated for Chile, Cuba and Puerto Rico — countries which stand near the borderline, in respect of economic and social conditions, between the developing and more developed groups. Rates in the range of 2.7 to 2.8 are estimated for the principal French and former British West Indies islands (Guadeloupe, Jamaica, Martinique and Trinidad) and for Haiti. In the Caribbean area, only the Dominican Republic appears to have exceptionally high fertility; the estimated gross reproduction rate of 3.2 for this country contrasts with the more moderate estimate of 2.8 for Haiti, sharing the same island; but the estimates for both these countries are based on weak statistics of population by age groups. Paraguay, the least developed country in temperate South America, also has the highest estimated gross reproduction rate in that area (2.9 for 1940-1945).

The differences in levels of fertility among developing countries have not received enough attention in demographic studies. The wide differences indicated by present information are highly significant for assessing future prospects for population growth and studying the determinants of fertility in countries where it is high. In general, little is yet known of the factors responsible for the differences of fertility among these countries. In some cases, they may be explained partly by errors of estimation or lack of up-to-date information. The present basis for estimates of the fertility level is weak in many cases, particularly for countries in Africa. It should be a priority task of demographic data-collection to fill the remaining gaps in data on the levels of fertility, to strengthen the basis for estimates where it is now weak, and to obtain necessary material for studying factors related to the fertility differences among the developing countries. Intensive field studies and

analysis of existing data pertaining to such factors deserve high priority in programmes of research on the demography of these countries.

5. *Differences of fertility levels among countries in Europe, Northern America, Oceania and the USSR*

The only country of high fertility in Europe at present is Albania, with a gross reproduction rate calculated at 3.4 for 1960. Albania is also an exception to the generally high position of the European countries on the world-wide scale of economic and social development. The remainder of Europe constitutes a relatively homogeneous region of quite low fertility, as 24 of the 29 European countries considered in the present study have gross reproduction rates of 1.5 or lower according to data for 1960. The Soviet Union, with an estimated gross reproduction rate of 1.4, can be considered as an eastward extension of this low-fertility region.

The principal countries of European settlement in Northern America and Oceania (Canada, the United States, Australia and New Zealand), and also Israel, belong to a group of not quite so low fertility, their gross reproduction rates being in the range from 1.7 to 2.0. The gross reproduction rate of the " white " population of South Africa is likewise at this level. The rate for Argentina is lower (1.4 according to the estimate for 1961).

Apart from Australia and New Zealand, the only country in Oceania represented in this study is the Fiji Islands. None of the other Pacific Islands meets the requirement of population size (250,000 or more inhabitants in 1960) except New Guinea and Papua, for which data are lacking. Like the Fiji Islanders with their estimated gross reproduction rate of 3.5 for 1946-1951, the inhabitants of the lesser islands in the Pacific generally conform to the pattern of more or less high fertility and low level of development which is typical of Africa, Asia, Middle America and South America.

B. Trends of fertility

1. *Scope of data*

For nearly all countries where fertility is now low (in general, the more developed countries), series of birth registration statistics are available which provide a satisfactory basis for studying trends of fertility at least during the last three or four decades. In many cases, historical series of such statistics go back to the nineteenth century and in some cases to the eighteenth. One of the principal exceptions in this respect is the USSR, for which a continuing series of birth rates is on record only since 1950; but earlier data for the Soviet Union and the European part of the former Russian Empire make it possible to trace approximately the trend of fertility since the end of the nineteenth century.

On the past trends of fertility in countries where it is now high (in general, the developing countries), information is far less satisfactory. Of the 84 countries for which gross reproduction rates exceeding 2.0 have been estimated on the basis of the most recent data, only 15 have series of birth registration statistics reliable enough to serve as a basis for trend analysis over a period of two decades or longer. Estimates derived from census statistics provide indications of past levels and changes of fertility in some additional countries. In this study, series of such estimates relating to several time periods have been obtained for a number of countries of high fertility lacking reliable historical series of registration statistics. For the majority of high-fertility countries, however, no satisfactory data exist for the study of past trends. Almost all countries in Africa lack such data.

2. *Trends in low-fertility countries*

The countries where fertility is low at present can be classified roughly into three groups with regard to the forms of fertility trends during the last three decades (disregarding some exceptions and variations in details of the trends).

The first group includes the majority of countries in northern, western and central Europe, together with Argentina, Australia, Canada, Israel, New Zealand and the United States — on the whole (though with some exceptions) a group of the world's most highly industrialized and economically developed countries, where fertility had been declining for a long time before 1930 and had reached the lowest levels recorded throughout the world at that time. Fertility in these countries dropped still lower in the 1930's, during the economic depression in the Western industrial countries, falling in many cases below the level required for permanent replacement of the population under the conditions of mortality existing at the time. The fertility trend turned upward during the middle or late 1930's in some countries of this group, and the early 1940's in others. Shortly after the Second World War, the group as a whole experienced an extraordinary rise of fertility — a " baby boom " linked with a " marriage boom " as well as with rising marital fertility rates — which brought the birth rates and gross reproduction rates to a peak in the late 1940's or early 1950's. From this high point, the rates dropped more or less sharply for a few years, then levelled off and appear to have become more or less stabilized, in general, at different levels in the last few years.

It seems that the long-term decline of fertility which began during the nineteenth or early twentieth century in the majority of this first group of countries may have run its course by the 1930's, and that the ups and downs of their fertility rates since that time might be considered as short-term fluctuations about a nearly constant level. In some countries of the group (notably Australia, Canada, New Zealand and the United States), the fertility rates of the late 1950's were considerably above the level reached in the early 1930's; the implication is that in these cases the long-term downward trend may have undershot its mark at that time. In other countries, including most of those in north-western Europe, the recent levels of fertility have been about the same as those of the early 1930's or slightly lower.

The second group consists of countries in southern and south-eastern Europe (except Spain). As a group, they were less advanced in industrialization and economic and social development generally than the first group of countries about the 1930's; their fertility rates had entered the long-term decline more recently, and their average fertility level was higher than the average of the first group. The general trend of fertility in countries of the second group continued downward through the 1930's, 1940's and early 1950's, though there were some variations in the tempo and minor interruptions of the trend, including notably some muted repercussions of the early post-war " baby boom " in the first group of countries. The average level of fertility of the second group in the late 1950's was much lower than it had been about 1930, and was nearly on a par with the average for the north-western and central European group.

In some countries of south-eastern and east-central Europe, fertility has not been stabilized recently, but has continued on a decidedly downward trend through the 1950's. This applies to Bulgaria and Hungary, which now have gross reproduction rates among the lowest in the world, and also to Czechoslovakia, Poland and Romania. Liberalization of abortion laws in these countries in the mid-1950's is clearly a factor of importance in the recent rapid declines of their birth rates.

The trend of fertility in the USSR since the 1920's, so far as it can be determined in view of the discontinuous statistical series prior to 1950, has been similar in some respects to that of the first group, and in other respects to that of the second group of countries now having low fertility. The level of Soviet fertility during the 1920's and earlier was quite high. It appears to have dipped sharply in the early 1930's, and to have partly recovered in the middle and later years of this decade, thus paralleling the trend of the first group. There is no indication, however, of any considerable rise of fertility in the Soviet Union following the end of the Second World War; this country seems to have come out of the war period with a distinctly lower fertility than it had in the 1930's and its fertility seems to have declined somewhat further during the early 1950's, to become stabilized at a level slightly higher than the north-western and central European average in the latter years of this decade.

The third group of low-fertility countries consists only of Japan and the Ryukyu Islands — the two countries in which fertility was high up to the end of the Second World War and dropped abruptly to a low level during the 1950's. The recent decline of fertility in these two countries is most impressive. Japan's gross reproduction rate was cut in half in eight years, falling from 2.1 in 1949 to 1.0 in 1957. The estimates for the Ryukyu Islands are much less reliable, but they show an almost equally large reduction, from a gross reproduction rate of 2.8 in 1950 to only 1.6 in 1960. In Japan, the reduction of the birth rate was encouraged by the Government, through legislation and other measures, including those aimed at promoting the use of contraceptives. In the Ryukyu Islands, on the other hand, the decisive decline of fertility has come about without any official encouragement or assistance.

3. *Trends in high-fertility countries*

Although data on past trends of fertility in countries where it is now high are far from sufficient for a general classification of types, they do furnish some indications which may be pertinent to the study of factors affecting fertility and prospects for its future changes in these parts of the world.

Few instances have been found, in this study, of long-continued upward or downward trends in high-fertility countries, resulting in large changes comparable to the past declines in countries where fertility is now low. In this sense, the data imply that the levels of fertility in high-fertility countries generally have probably been relatively stable during recent decades. On the other hand, it seems that rather large short-term variations and appreciable longer-term increases and decreases have not been uncommon. Some reservations should therefore be attached to the assumption often made in studies of the demography of high-fertility countries, that their fertility has generally remained nearly constant for long periods in the past.

Short-term variations more or less closely paralleling the ups and downs of fertility in industrialized, low-fertility countries during the last three decades appear to have been fairly common in high-fertility, developing countries. The dip of fertility rates during the early 1930's and the post-war " baby boom " with its sequel of diminishing fertility during the middle or late 1950's, have by no means been confined to parts of the world where the level of economic and social development is high and the level of fertility is low. In fact, one or both of these features appear in the trends for all the Asian high-fertility, developing countries for which pertinent records or estimates are available; also for Mauritius, Réunion, the United Arab Republic and some of the Middle American countries. The amplitude of these variations appears to have been generally smaller, however, in the countries of high fertility than in those of low fertility. The explanation of these parallels is not readily apparent.

Considerable decreases of birth rates have been recorded during the last few years in several Asian countries of high fertility. The most notable case is that of Singapore, where the registered crude birth rate dropped from 45.7 to 36.5 and the estimated gross reproduction rate from 3.3 to 2.7 between 1954 and 1961. Lesser decreases have been recorded recently in China (Taiwan) and the Federation of Malaya (now Malaysia) and also in Mauritius and Réunion. There is a suggestion that these countries might be following Japan and the Ryukyu Islands in a transition to a distinctly lower level of fertility. On the other hand, the previous ups and downs of their fertility rates during the last few decades are cause for hesitation in making any definite predictions of this kind.

The opposite tendency, of a persistent rise in recorded birth rates since the Second World War or the early

1950's, is observable in the statistics of several countries in the Caribbean and Middle American mainland areas. A real upward trend of fertility, however, is unequivocally established only for British Guiana, Jamaica, Trinidad and Tobago. For other countries in the areas mentioned, the rise of the recorded rates might be due merely to improving birth registration, although a real rise in fertility associated with better health and other conditions cannot be ruled out. In the countries of the former British West Indies, the recent rise appears to be the counterpart of a decline prior to the 1930's which had brought them to an appreciably lower level of fertility than prevailed in neighbouring Latin countries. Although certain hypotheses have been advanced with regard to causes of these variations, full and definite explanations have not yet been established.

In interpreting the trend of fertility in any country, whether the level be high or low and whether the country be advanced or retarded in development, it is pertinent not only to consider factors and conditions peculiar to the country concerned, but also to view the trend in its world-wide setting. While parallel trends in diverse circumstances may sometimes be attributed to coincidence, this is not, in numerous instances, a satisfactory explanation for similar patterns of trends.

C. Factors related to levels and trends of fertility

1. *Economic and social factors*

Relationships between levels of fertility and the degree of economic and social development of countries have been examined in this study by cross-classifying the estimates of gross reproduction rates for the most recent dates with selected economic and social indicators, and by comparing average gross reproduction rates for countries at different levels of these indicators, and average levels of the indicators for countries at different levels of gross reproduction rates. The indicators selected were income per head, energy consumption per head, proportion of labour force in non-agricultural industries, degree of urbanization, female literacy rate, number of hospital beds, newspaper circulation, cinema attendance, number of radio receivers per 1,000 population, expectation of life at birth, and infant mortality. The results bear out the generalization that a high level of fertility goes with a low degree of economic and social development, and *vice versa*. There are two distinct groups of countries, one standing high on the scale of fertility and generally low on the scales of economic and social indicators, and the other occupying the opposite position. Few countries exhibit the combination of high fertility with a very high value of any of the indicators, or low fertility with a very low value of any indicator. The typical country with a gross reproduction rate above 2.0 was characterized in the 1950's by, for example, an average annual income per head of about $170 (1957-1959 US dollars); about 40 per cent of the male labour force engaged in non-agricultural employment; about 17 per cent of the population residing in urban localities of 20,000 or more inhabitants; about 30 per cent of literates in the female population 15 years of age and over; and expectation of life at birth of about 50 years.

Coefficients of correlation have been calculated, which confirm the strong inverse association between the gross reproduction rate and each of the economic and social indicators when the data for all countries are considered. Yet *within* either group of countries — those with high fertility and a low degree of economic and social development, or those with low fertility and a high degree of development — there seems to be little association between the level of the gross reproduction rate and any of the economic and social indicators. Values of the coefficients of correlation are low and not statistically significant when they are calculated separately for countries having gross reproduction rates of 2.0 or higher, and those having rates below 2.0.

These observations are pertinent to the so-called theory of the demographic transition and its application to the problem of predicting future trends of fertility and population growth in developing countries. Although this theory has been stated in various forms, one of its central tenets is that the characteristically high fertility of pre-industrial societies is rooted in cultural determinants which are resistant to economic and social changes. As such societies undergo industrialization and related economic and social developments, their fertility is little affected, according to the theory, until a fairly high level of development is reached; then the factors maintaining high fertility give way and fertility drops to a much lower level. The findings summarized above are generally consistent with this hypothesis. The supposed resistance of factors of high fertility to social and economic changes is also borne out by the observation that the levels of fertility, in most high-fertility areas, do not appear to have changed very much during recent decades, in spite of considerable progress in health and education, and of accelerating urbanization.

Specific predictions of future fertility trends based on this theory are hazardous, however. One might be tempted to infer from the correlations mentioned above that a major decline of fertility in countries where it is now high would begin when (and not before) they reached a level of development corresponding to typical present values of the various indicators for the less developed countries of low fertility (i.e., something over $350 income per head, more than 60 per cent of male labour force in non-agricultural industries, etc.). But it is hardly necessary to point out that any such prediction depends on a highly unrealistic assumption, namely, that the reaction of fertility to changing economic and social conditions would be independent of all other factors — independent, for example, of the present level of fertility in each country, the characteristics of national culture and social institutions, the population policies adopted by the governments, and the progress of birth control technology.

It should also be noted that some of the ideas found in writings on the demographic transition theory appear

artificial in the light of the findings of the present study — especially the characterization of the fertility of pre-industrial societies and those in early stages of industrial development simply as "high" without regard to the degree of highness. The starting-point of the supposed transition is often represented as a position of equilibrium between high fertility and high mortality rates, such an equilibrium being assumed to exist regardless of the levels of the rates. The subsequent course of population growth is then considered merely as a function of declining mortality and a supposed lag in decline of fertility under the impact of industrialization and connected social and economic changes. Such a representation is patently unrealistic as a general model and is quite inadequate to take account of the difference in growth potential which inheres in an initial gross reproduction rate of 3.5, for example, and one of 2.5. Moreover, variations in the actual course the demographic transition has taken in different countries point to the need for revision in such a model.[4] There is also little basis in present evidence for supposing, as has sometimes been suggested, that the transition would proceed continuously until, in all countries at advanced stages of industrial development, fertility would again be balanced with mortality on a uniform low plane.

2. *Density of population*

Among low-fertility countries, some inverse association between fertility and crude measures of population density is apparent. This is shown, for example, by the following weighted averages of population density per square kilometre of land in three groups of low-fertility countries (GRR less than 2.0) classified according to estimated gross reproduction rate as of the latest date of available information:

Gross reproduction rate	*Average density*
Under 1.30	114
1.30-1.59	16
1.60-1.99	8

These figures reflect mainly the fact that fertility is higher in Canada, the United States, Australia, New Zealand and the Soviet Union than it is, on the average, in Europe and Japan, where the average density of population is comparatively high. But, an inverse relationship by no means holds for all countries. In fact, among the low-fertility countries as a whole, only a low negative correlation was found between population density and the gross reproduction rate. In any case, it does not follow that the lower density is necessarily a cause of higher fertility in the countries mentioned previously, though it is possible that relatively ample space and plentiful natural resources might help to create an expansive national frame of mind more receptive to the formation of large families. Various other causal relationships between fertility and density of population have also been postulated in writings on population theory.[5]

Among the high-fertility countries, the association between fertility and density of population is less easy to establish, although it does appear that the countries with the highest gross reproduction rates are less densely populated on the average than those where fertility is more moderate. This is brought out by the following comparison of weighted average densities (persons per square kilometre of land area) for countries with gross reproduction rates of 2.0 and higher.

Gross reproduction rate	*Average density*
2.00-2.49 [6]	47
2.50-3.09	29
3.10 and over	21

It should be emphasized that the relationship apparent in these averages is by no means consistent in comparisons of density and fertility levels between individual countries or groups of countries.

Some further analysis of the association between fertility and population density is needed. The findings are not conclusive; more detailed analyses would be required to establish whether there is any consistent pattern of relationships between these factors. It would be pertinent, for example, to use more refined measures of density, if possible relating agricultural population to cultivable land. In addition, information on the state of technology and the quality of land resources might give a better indication of the degree of population pressure. It would be appropriate also to extend the analysis to areas within both high- and low-fertility countries.

3. *Ecological, cultural and legal factors*

It is said in some current writings on population problems that the inhabitants of the developing countries generally are procreating with little restraint, at rates near the limits of their physiological capacity. Some writers go so far as to pretend that this was the general rule among human societies throughout the world in the past, before the beginning of the Industrial Revolution and the modern birth-control movement in the West, though those who have more regard for historical evidence make less sweeping generalizations in this respect. If it were true generally in the developing countries at present that free rein is given to the powers of procreation, then the differences in fertility levels among these countries would have to be explained mostly by differences in factors affecting physiological capacity to produce living offspring. Such factors include the general state of health and nutrition and the prevalence of diseases closely linked with pathological sterility, sub-fecundity, and foetal mortality: notably venereal

[4] Ronald Freedman, "The Sociology of Human Fertility: A Trend Report and Bibliography", *Current Sociology* (Oxford), vol. 10/11, No. 2, 1961-62, p. 53.

[5] A summary of various theories of this relationship will be found in: D. E. C. Eversley, *Social Theories of Fertility and the Malthusian Debate*, Oxford, Clarendon Press, 1959.

[6] Including China (mainland). If this country, for which estimates of fertility are not firmly established, were excluded, the inverse relationship would be less apparent.

diseases, malaria, and other debilitating illnesses. In some areas, especially in parts of Africa and in Mongolia, it has been suggested that the explanation of relatively low fertility might be found in factors of this sort. And a rise in fertility in several countries has been thought to be possibly related to the bringing under control of malaria and venereal diseases. In fact, present statistical and medical evidence is not sufficient for estimating the effects of health factors on fertility in Africa or any of the other developing regions, and this remains an important area for future research. On the basis of the information now available, it seems that while these factors may be quite relevant in certain instances, they are unlikely to furnish a general explanation for the wide differences of fertility among developing countries.

The absence of correlation between levels of fertility and levels of mortality in the developing countries is relevant to this question. While mortality rates are not precise measures of the state of health of a population, they nevertheless give some indication of health status, and it would not be unreasonable to expect to find a definite negative correlation between mortality and fertility levels if the differences in fertility levels were caused mainly by factors connected with the general state of health. But it has been found in this study that if any such correlation exists, it is of a low order. It is also relevant that the recent great improvements in health and reductions of mortality rates in many developing countries appear to have been accompanied at most by small increases of fertility, and no increase at all is apparent in the majority of cases where data to show the fertility trend are available. Although the prevalence of ailments most closely linked with sterility, sub-fecundity, and foetal mortality would not necessarily vary in direct proportion to the general level of mortality, these observations make it seem doubtful that such impairments of procreative capacity are mainly responsible for the differing levels of fertility in developing countries.

The alternative is that the powers of procreation are held in different degrees of restraint in these countries, voluntarily or involuntarily, by differences in behaviour pertaining to marriage, sexual relations, and birth of children. The evidence reviewed in the preceding section implies that such behavioural differences would not be related so much to differing economic and social circumstances as to differing cultural traditions. Among the cultural traits which may be important in this connexion are not only specific customs and behavioural norms (such as the moral disapproval of "artificial" birth-control in Roman Catholic societies or the traditional customs in many African societies of prolonging lactation and suspending sexual intercourse during rather long periods after child-birth), but also more general and more fundamental characteristics of culture, relating to such matters as the values attached to family life and children as opposed to competing interests and activities, the spirit of thrift, prudence, and self-discipline, rationality, and the disposition to attempt control of one's destiny. Differences in such characteristics of culture may find expression in patterns of behaviour that are more or less liberal or restrictive, so far as procreation is concerned. While it may be true that men and women in the less developed regions of the world are generally motivated to have numerous children, this does not mean that they necessarily desire to have as many as they are able to produce, nor that there are no important differences between countries in attitudes and aspirations in this respect.

The fertility level may be affected by social norms as to ideal family size, and less directly by norms regarding "intermediate variables",[7] such as age at marriage; forms of marital unions; extra-marital sexual relations; celibacy; divorce; re-marriage of widows and divorcees and the amount of time spent between unions; forms of coitus; frequency and spacing of coitus; inducement of abortion; pre-natal care; and contraceptive practices. Different combinations of these variables may produce the same fertility levels, or populations with different fertility levels may have similar values for some of the variables. Behaviour with respect to these variables may be affected both by socially recognized rules of approved and permissible conduct and by deliberate exercise of individual discretion.

Variations in kinship structure which affect the functional value of children may play a role in creating the existing differences in fertility levels among pre-industrial societies.[8] There is a theory that, in general, corporate kinship systems provide the greatest incentive for large numbers of children, joint-family systems somewhat less, and the nuclear family unit least of all.

Certain means of fertility control that have been prevalent in European societies — delayed marriage, celibacy, and in modern times the use of contraceptives — are known to have little currency in the less developed regions of the world. In fact it is the widespread practice of such forms of fertility control among the former and their virtual absence in the latter that accounts for the sharp existing division between high-fertility and low-fertility countries. But other means of control — notably inducement of abortions, *coitus interruptus*, and restraint in frequency of coitus — may be employed to an important extent and have an important effect on the level of fertility in many developing, as well as industrialized countries. Many demographers assume that deliberate control of fertility by any means is uncommon in the less developed parts of the world. "Natural fertility" is assumed to prevail in these countries; i.e., behaviour of any kind tending to restrict births is held to be generally independent of such considerations as the economic means of the family or the community, the number of children desired, or the consequences of births for the welfare of the parents and of the children already born. This is not at all certain, however, as little investigation has yet been made of the relevant attitudes, motives, and patterns of behaviour in such countries.

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[7] For a classification of "intermediate variables" affecting fertility, *see* Kingsley Davis and Judith Blake, "Social Structure and Fertility: An Analytic Framework", *Economic Development and Cultural Change* (Chicago), vol. 4, April 1956, pp. 211-235.

[8] Ronald Freedman, "The Sociology of Human Fertility: A Trend Report and Bibliography", op. cit., pp. 50-51.

In a recent study, the social and cultural factors relevant to fertility were examined for about 60 small population groups in non-industrial societies for which suitable anthropological and demographic data were available.[9] The conclusions were limited by the fact that the fertility estimates were in many cases not very reliable. Among the factors investigated for which a statistically significant association with the fertility level could not be established were age at marriage, polygamy, divorce, post-widowhood celibacy, contraception and abortion. The data on frequency of intercourse compiled in this study suggested that there were considerable group variations, but the data were inadequate to establish an association with the fertility level. On the other hand, a statistically significant negative association was found between the fertility level and post-partum abstinence. Intensification of research on such aspects of behaviour and customs is an indispensable prerequisite to understanding the determinants of fertility levels and their differences among the developing countries.

Legislation relating to the use, advertisement, and sale of contraceptive devices and to induced abortion may affect the fertility level in some countries, though it is difficult to determine empirically the extent of the influence of such legislation on the birth rate. Among countries of low fertility, there is some evidence of a negative association between the level of the birth rate and the extent of permissiveness of legislation relating to abortions. A causal relationship is not well defined, however, since, while fertility may have been lowered because of the laws, there is also the possibility that the laws were enacted as a response to prevailing practices.

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[9] Moni Nag, *Factors Affecting Human Fertility in Nonindustrial Societies: A Cross-Cultural Study* (Yale University Publications in Anthropology, No. 66), New Haven, 1962.

Chapter II

MEASURES OF FERTILITY AND SOURCES OF DATA

A. Definition and significance of principal measures of fertility

Two principal measures of levels and trends of fertility are used in this study: the *crude birth rate*, and the *gross reproduction rate*. In certain instances, additional measures have been used for particular purposes, for example, the *child-woman ratio* for the study of fertility differentials.[1] The two principal measures are defined below.

1. The *crude birth rate* is the number of births occurring during one year per 1,000 of the corresponding population as of mid-year. This is the simplest and most widely used measure of fertility. It has the advantage over other more refined measures that the data needed for its computation are available for a larger number of countries and time periods.

Related to the entire population, regardless of its composition, the crude birth rate is only a rough measure of fertility. It is a precise measure, on the other hand, of the quantitative contribution of births to population growth and, in this sense, remains indispensable even where alternative measures of fertility are at hand.

The main shortcoming of the crude birth rate as a fertility measure is that it can be considerably affected by variations in composition of a population by sex and age. Other things being equal, that population will have the highest birth rate in which there is the highest proportion of women at child-bearing ages and, more particularly where the concentration of such women at the ages of most frequent childbirth is most pronounced. A comparison between crude birth rates in industrialized and developing countries does not, however, greatly distort the difference in fertility. Because of generally low fertility in one group of countries, and high fertility in the other, the age composition is apt to differ substantially so far as relative proportions of children and aged persons are concerned, but the proportion of persons in the ages of reproductivity does not differ in any systematic way. Therefore, comparisons between crude rates of industrialized and developing countries do not consistently distort the relative levels of fertility, as they do in the case of mortality. This fact is brought out in table 2.1, where the composition of the population by three broad age groups is compared for a number of countries of low and high fertility.[2]

Although there appears to be no systematic distortion in comparisons of fertility between industrialized and developing countries, in terms of the crude birth rate, important fertility differences between two countries, or fertility changes occurring in a country in the course of time can nevertheless be obscured or exaggerated by the effects of variations (1) in the proportion of the population at reproductive ages, (2) in the detailed age distribution of the population within the reproductive ages, and (3) in the ratio of males to females.[3]

2. The *gross reproduction rate* is defined as the average number of daughters that would be born per woman in a group of women, all surviving to the end of the potentially reproductive period of life and bearing daughters at each age in accordance with the rates prevailing among women of various ages in the area and during the period under consideration. The gross reproduction rate is calculated by summing age-specific birth rates for any given year or period of years and multiplying the result by the proportion of female births among all births. (If the age-specific birth rates are calculated for five-year age groups, as is ordinarily the case, the sum must also be multiplied by five.) In general, very little error is incurred by assuming a standard ratio of 105 male per 100 female births, as is done in this study.

Data on births tabulated by age of mother as well as female population classified by age groups are required for such a calculation of the gross reproduction rate. Where the former tabulation is lacking, however, the gross reproduction rate may be estimated from the crude birth rate and the age classification of the female population by assuming that the distribution of age-specific fertility rates of the given population is the same as that of another population believed to have

[1] More elaborate measures, such as specific fertility rates by duration of marriage or order of birth, are not used in this study because the data needed for their computation are rarely available for less developed countries. The use of child-woman ratios (relating number of children of particular ages to number of women of child-bearing ages) is confined to those instances where alternative measures of fertility could not be so readily secured; child-woman ratios are imperfect measures of fertility since they are affected by varying mortality at the ages of childhood and corresponding ages of motherhood, and often also by varying degrees of under-enumeration of children.

[2] In this table, Italy and Spain are examples of countries where birth rates have declined rather recently, leaving a larger proportion of persons at middle ages of life than in countries where birth rates declined at an earlier time.

[3] Further variations affecting the birth rate concern the particular ages at which births occur with greatest frequency, and the postponement and possible subsequent recovery of births under the influence of wars or major fluctuations in economic conditions.

Table 2.1. Per cent composition of population by broad age groups in selected countries

	Per cent distribution			
	All ages	*Under 15 years*	*15-49 years*	*50 years and over*
I. *Industrialized countries*:				
Sweden, 1960	100.0	22.0	47.6	30.4
Belgium, 1960	100.0	23.5	45.4	31.0
Italy, 1960	100.0	24.7	50.8	24.5
France, 1960	100.0	25.6	44.5	29.9
Spain, 1960	100.0	27.4	50.0	22.6
Czechoslovakia, 1959	100.0	27.5	46.5	26.0
New Zealand, 1960 [a]	100.0	31.7	45.4	22.8
II. *Less developed countries*				
Thailand, 1960	100.0	43.2	46.6	10.2
Federation of Malaya, 1957	100.0	43.8	45.4	10.8
Mexico, 1960	100.0	44.4	44.7	10.9
Venezuela, 1961	100.0	44.8	45.5	9.7
China (Taiwan), 1960 ...	100.0	45.1	45.2	9.7

[a] Excluding Maoris.

similar social, economic and cultural characteristics. Such estimates have been made for many countries for purposes of the present study, and in most cases it is unlikely that any very great error has been introduced by lack of knowledge of the age-specific rates. For some countries where birth registration statistics are incomplete and where the crude birth rate has been estimated from other data, the incomplete registration statistics have been used to define the distribution of the age-specific rates. In these cases, no error would result if the degree of completeness of registration were the same for births to women in all age groups.[4]

Of the two measures used in this study, the gross reproduction rate is, in most circumstances, the more satisfactory for analysing fertility differences among countries, as well as the time trends within a country. Like expectation of life at birth in the case of mortality, it is the composite expression, in a single measure, of the combined effect of fertility rates prevailing at each age, in complete independence of the composition of population in regard to sex and age.

B. Sources of data and basis of estimation

1. *Definitions and relative reliability of types of data and estimates*

The measures of fertility levels used in this study for each country are classified according to sources of data and basis of estimation into four categories arranged in decreasing order of relative reliability, namely: (A) "complete" birth registration statistics, (B) sample survey data, (C) "reverse-survival" estimates, and (D) other estimates. A fifth category, (E) no satisfactory data, includes statistics judged to be inadequate for a satisfactory indication of the level of fertility, as well as complete absence of any statistical basis for fertility estimates. The definitions of these categories are stated below.

(A) "*Complete*" *registration statistics.* These are statistics derived from civil registration systems of comprehensive national scope, reported by the national statistical services to the Statistical Office of the United Nations as "complete" for the most recent years, in the sense that at least 90 per cent of births are believed to be registered. Also included in this category for the purpose of the present analysis are a few countries with incomplete registration where a basis exists for estimating the extent of omissions and correcting the statistics; tests conducted in these countries indicated that registration was close to 90 per cent complete some few years ago. In some cases, on the other hand, statistics officially reported to be "complete" have not been thoroughly tested and may not really satisfy the criterion of 90 per cent completeness.

The birth rates based on "complete" registration data shown in this report are those available to the Statistical Office of the United Nations as of September 1963. Some of the rates for recent years are subject to later revisions, which may result either from corrections to the birth totals or to adjustments in the population base, for example, to accord with the results of a new census.

(B) *Sample survey data.* Under this heading are countries lacking satisfactory registration statistics, where sample surveys have been conducted including inquiries about births and deaths having occurred in each household during a stated period. This method has been used in India and to an increasing extent in Africa since the Second World War. The reliability of the results of the African surveys is generally uncertain,

[4] Studies of birth registration in the United States have indicated a variation in completeness of registration for different age groups of women. In Canada, on the other hand, data from the 1941 census did not disclose any significant differences in this respect. *Recent Trends in Fertility in Industrialized Countries* (United Nations publication, Sales No.: 57.XIII.2), p. ix.

since rigorous tests of the returns have not yet been attempted. It is known, however, that such data are subject to possibilities of considerable error, either in the direction of understatement as a result of omissions in reporting or of overstatement as a result of erroneous reporting of births and deaths which occurred outside the period of reference. At best, their quality is inferior to that of statistics derived from a well-functioning system of civil registration. Moreover, in a few cases, the sample surveys have been carried out only in parts of the country and the results may not be representative of fertility in the country as a whole.

(C) " *Reverse-survival* " *estimates.* For a number of countries lacking both reliable birth registration statistics and data on births from household sample surveys, estimates have been derived from census or sample survey data on age groups of the population by the method of " reverse-survival ". The method is to increase the recorded number of children in a given age group by a life-table survival coefficient, so as to estimate the number of births from which these children are survivors. In most instances, the 5-9 age group has been used for this purpose, since children at these ages are generally more completely enumerated in the census than are younger children. The accuracy of results depends to a large extent on the accuracy of the population statistics by age groups, especially the accuracy of the count of children in the age group taken as a basis for the estimate of births. In addition, the estimates are affected by errors in the survival coefficients, which often have to be estimated from more or less vague information on the general level of mortality and with the help of model life tables. In deriving the birth rates, the base population has been obtained by " reverse-surviving " the entire population by five-year age groups, rather than by relating the " reverse-survived " birth cohort to intercensal population estimates. This practice greatly reduces the amount of error resulting from the choice of an inappropriate life table, since, in view of the correlation between death rates at various ages, both the numerator and denominator will be subject to errors of the same direction. Distortion of the age structure by migration is an additional source of error in some cases, but this type of error, too, is reduced by " reverse-surviving " the entire population.

" Reverse-survival " estimates have been classified with regard to the most important factor affecting their reliability, i.e., the reliability of the population statistics by age groups, under two sub-headings: (1) relatively reliable data; and (2) data of low or uncertain reliability.

(D) *Other estimates.* For a few countries, fertility measures have been estimated by other methods considered generally to give less reliable results than those listed above. In some cases, estimates have been based on census or household survey data on the number of children born to each woman during her lifetime, while in other cases they have been made with the help of models showing relationships between age structure and vital rates of stable populations.

(E) *No satisfactory data.* In addition to countries having no civil registration statistics or other data considered to be satisfactory as a basis for estimating fertility measures, this category includes countries having incomplete registration statistics and some with statistics of which the degree of completeness has not been reported to the Statistical Office of the United Nations. Incomplete registration statistics may serve in some cases as an approximate indication of the level of fertility; at any rate, one can usually assume that the true level is no lower than that indicated by such statistics. However, where no adequate tests have been conducted to determine the degree of completeness, estimates based on such data are largely guesswork.

2. *Extent of availability of data and estimates of each type*

A summary of the types of information on the level of the crude birth rate in recent years for countries in each region of the world is presented in table 2.2, in terms of the number and population of countries for which statistics or estimates of each type are available. While nearly all the population in the economically more advanced regions of the world is covered by " complete " birth registration statistics, such data are available for countries containing only 40 per cent of the estimated population in Middle and South America, 8 per cent in Asia (outside the USSR) and a mere 2 per cent in Africa. In the case of Middle and South America, the gaps in information on levels of fertility have been largely filled by fairly satisfactory estimates using the " reverse-survival " method. For Africa and Asia, the present state of information is less satisfactory in spite of the data provided by recent sample surveys, as relatively good-quality census statistics of population by age groups providing a firm basis for " reverse-survival " estimates are not yet as widely available in Africa and Asia as in Latin America.

The extent of improvement in the availability of data for less developed regions in recent years is shown by the fact that a study of world population trends published as recently as 1957 [5] gave registered or estimated birth rates for only five countries in Africa, fourteen in Asia and twenty-one in Latin America. By comparison, the present study includes such data for thirty-seven countries in Africa, twenty-four in Asia and twenty-seven in Latin America.

In spite of the recent progress in obtaining fertility measures for areas where they were previously lacking, countries remaining in the category of " no satisfactory data " still contain about a fourth of the world population. Such countries account for 44 per cent of the estimated population in Asia (outside the USSR), 14 per cent in Africa, and 13 per cent in Oceania. As already mentioned, many countries in this category are not entirely without statistics which may give an approximate indication of the fertility level.

Of all countries for which registration data or estimates of crude birth rates are available, there is only one, Surinam, for which, owing to the lack of popula-

[5] *Report on the World Social Situation* (United Nations publication, Sales No.: 57.IV.3), pp. 6-9.

Table 2.2. Types of data or estimates on crude birth rates

Types of data or estimates	World total	Less developed regions	More developed regions	Africa	Asia (excluding USSR)	Middle and South America	Europe (excluding USSR)	Northern America	Oceania	USSR
					Number of countries [a]					
Total	153	116	37	48	41	27	29	2	5	1
"Complete" registration statistics	60	27	33	3	9	15	28	2	2	1
Sample survey data	20	20	—	19	1	—	—	—	—	—
"Reverse-survival" estimates	38	36	2	11	14	11	1	—	1	—
(*a*) Based on relatively satisfactory data	(18)	(16)	(2)	(2)	(5)	(9)	(1)	—	(1)	—
(*b*) Based on data of poor or uncertain quality	(20)	(20)	(—)	(9)	(9)	(2)	(—)	—	(—)	—
Other estimates	5	5	—	4	—	1	—	—	—	—
No satisfactory data	30	28	2	11	17	—	—	—	2	—
					Per cent of population					
Total	100	100	100	100	100	100	100	100	100	100
"Complete" registration statistics	36	10	99	2	8	40	98	100	84	100
Sample survey data	17	24	—	28	26	—	—	—	—	—
"Reverse-survival" estimates	19	27	1	35	22	59	2	—	3	—
(*a*) Based on relatively satisfactory data	(7)	(10)	(1)	(16)	(4)	(56)	(2)	—	(3)	—
(*b*) Based on data of poor or uncertain quality	(12)	(17)	(—)	(19)	(18)	(3)	(—)	—	(—)	—
Other estimates	2	3	—	21	—	1	—	—	—	—
No satisfactory data	26	36	0	14	44	—	—	—	13	—

[a] Excluding countries having fewer than 250,000 inhabitants in 1960.

tion data classified by sex and age, it has not been possible to calculate a gross reproduction rate.

Information on births by age of mother is lacking for a larger number of countries. For fourteen African countries, ten Asian countries, and two countries in Middle and South America, the age pattern of fertility had to be estimated with reference to data of other countries in order to calculate the gross reproduction rates. For six countries in Africa and one in South America, census data on the number of children ever born to women of different age groups were utilized in estimating the age pattern of fertility, in the absence of current registration data on births by age of mother. For two other African countries the estimates of gross reproduction rates were derived from stable population models showing similarities in age structure to those of the countries concerned.

3. *Principal areas lacking satisfactory measures of fertility level*

China (mainland) is by far the most important country remaining without a satisfactory measure of fertility. Official estimates of the Chinese birth rate are on record for the years 1952-1957, based on results of surveys and reports, from areas where registration is considered to be satisfactory. The basis of these estimates, however, is not stated in detail in available published reports, and discrepancies have been noted between the birth rates and official figures relating to the death rates, the age structure and growth of population in China (mainland).

Other countries of two million or more inhabitants for which no satisfactory data are yet available for estimating the fertility level include Afghanistan, North Korea, Saudi Arabia, Syria, all of Viet-Nam, and Yemen, in Asia; and Chad, Ethiopia, Nyasaland, Sierra Leone and Somalia, in Africa.

4. *Data on number of children born to women during their lifetime*

Another source of information on fertility, not widely used in the present study, is the retrospective data collected in many population censuses and sample surveys on the total numbers of children born to each woman during her lifetime. Generally, such data are collected for all women of reproductive age and beyond and are tabulated for five-year age groups, at least throughout the child-bearing years. If these data are accurate, estimates of age-specific birth rates can be derived from them by differencing the average numbers of births reported for women of successive age groups. This procedure has been followed in estimating the

age pattern of fertility for a small number of countries, as indicated above. For women past reproductive age, the average number of lifetime births reported can be converted into an estimate of the gross reproduction rate simply by multiplying by the proportion of female births among all births. Such an estimate of the gross reproduction rate relates to fertility during a period of several decades prior to the census or survey, when the women reporting were passing through the reproductive period of their lives.

Reports on lifetime births, however, generally suffer from serious under-reporting since older women, in particular, fail to report all the children born to them. Children who died young, many years before, are especially likely to be overlooked. Another common deficiency of these data is the failure to clearly distinguish between women who did not report on the number of children they had borne and those who reported having had no children. While reports on lifetime births by young women, say up to 25 or 30 years of age, have been found to be subject to relatively little understatement, for older women the errors appear to increase with advancing age. It has been shown, however, that these data, when analysed in conjunction with age-specific birth rates derived from current sample surveys, may give a better estimate of the birth rate than could be derived from either set of data alone.[6] In the present study, retrospective data on lifetime births have been used only in a few instances as indicators of fertility levels, but they have been used to a greater extent for the study of fertility differentials in urban and rural areas (see chapter VIII).

[6] Economic Commission for Africa, Seminar on Population Problems in Africa, "Analysis of African Demographic Data as an Aid for Economic and Social Planning", United Nations, E/CN.14/ASPP/L.6, E/CN.9/Conf.3/L.6, 10 August 1962.

C. Types of data on fertility trends and extent of their availability

Information on past fertility trends in the less developed regions of the world is far less satisfactory than information on the recent levels. At least approximate indications of fertility trends are available for twenty countries in Middle and South America, seventeen in Asia and only four in Africa. For some of these countries the data pertain only to the period since the Second World War. In some cases, the only available data are age distributions from two consecutive population censuses.

In contrast with the paucity of data for studying fertility trends in the developing regions, birth registration data of satisfactory quality have been in existence for a long period in most countries in the industrialized regions. Nearly all European countries have reliable birth registration data going back to at least the early years of the present century, and some much earlier. The same is true for Australia and New Zealand. On the other hand, satisfactory civil registration dates only from the 1920's in Canada and from the 1930's in the United States.

The types of data available for the study of past fertility trends in the different regions are summarized in table 2.3.

Until recent decades, even in the industrialized countries, estimates of population by sex and age were available only for years in which population censuses were taken, generally at decennial or longer intervals. Therefore, refined measures for studying fertility trends, such as the gross reproduction rate, can be computed for fewer past time periods than can the crude birth rate.

Table 2.3. Number of countries in each region having specified types of data for studying fertility trends

Region	*Satisfactory birth registration data*	*Age data from two or more population censuses*	*Incomplete birth registration data*
World total	54	19	9
Africa	1	3 [a]	3 [a]
Asia	7	9	1
Middle and South America	15	4 [b]	2 [b]
Europe	27	2 [c]	2 [c]
Northern America	2	—	—
Oceania	2	1	—
USSR	—	—	1 [d]

[a] Both types of data were used for studying fertility trends in Algeria, Tunisia and the United Arab Republic.
[b] Both types of data were used for studying fertility trends in Honduras.
[c] Both types of data were used for studying fertility trends in Albania and Greece.
[d] "Complete" registration data are available for recent years.

Chapter III

LEVELS AND TRENDS OF FERTILITY IN AFRICA

Although Africa still remains as the region of the world where data on fertility, as well as other demographic statistics, are least developed, it is now possible to draw up a provisional statistical picture of the levels of fertility in most parts of the continent, thanks mainly to the recent censuses and demographic sample surveys conducted in African countries where the vital rates were formerly unknown. Such a picture is presented in figures 3.1 and 3.2 in the form of maps of estimated crude birth rates and gross reproduction rates for countries in this region. Table 3.1 shows the estimates of crude birth rates and gross reproduction rates for 1960, or as of the latest date of available information for each country in Africa. These indications make it appear that Africa generally is a region of high fertility, but that fertility is much higher in some countries than in others.

For most of the countries shown in table 3.1 the estimated fertility levels pertain only to indigenous populations. In countries where there are important minority groups not covered by these estimates, information on the size of such groups is given in the country notes in section D.

A. Sources and limitations of data

Only three of the major African countries (i.e., countries with 250,000 or more inhabitants) have birth registration statistics regarded as "complete" for all the principal ethnic groups of their population, namely Mauritius, Réunion and Tunisia. South Africa has "complete" statistics for the "white", "coloured" and "Asiatic" segments of its population, but not for the Bantu, who constitute the large majority.[1] For other African countries, the fertility measures are mainly of types (B) and (C) in the classification described in chapter II, namely, (B) rates derived from results of census or sample survey inquiries on births having occurred in households during a 12-month period preceding the census or survey date, and (C) estimates by "reverse-survival" from census or survey data on numbers of children of certain age groups in the population. The thirty-seven countries for which data are available have an aggregate population amounting to about 85 per cent of the total for all Africa. The principal African countries now lacking adequate bases for estimates of the fertility level include Chad, Ethiopa, Gambia, Liberia, Mauritania, Nyasaland, Senegal, Sierra Leone, Somalia, South West Africa and Swaziland. (An estimate of Senegal's birth rate is shown in the table, but, as explained in the country notes below, its statistical basis is not satisfactory.)

Type (B) estimates derived from the results of recent censuses and sample surveys in African countries are generally of uncertain reliability, as the quality of these data has not, in general, been rigorously tested. It is apparent, however, that they are subject to the possibility of considerable error, and that the rates are exaggerated, in some instances, by erroneous inclusion in the reports of births having occurred outside the reference period.[2] Moreover, in the case of sample surveys carried out only in parts of a country, notably in Cameroon, the data may not be representative of fertility in the whole country. The basis for type (C) estimates for African countries is relatively weak in most cases, as the reliability of statistics on age groups of the population obtained in African censuses and sample surveys is generally poor. Moreover, abnormalities of age structure in many of the countries, due to immigration or emigration, tend to bias estimates of this type. Thus the quality of the estimates of fertility indices in Africa is less satisfactory, on the whole, than in other regions of the world.

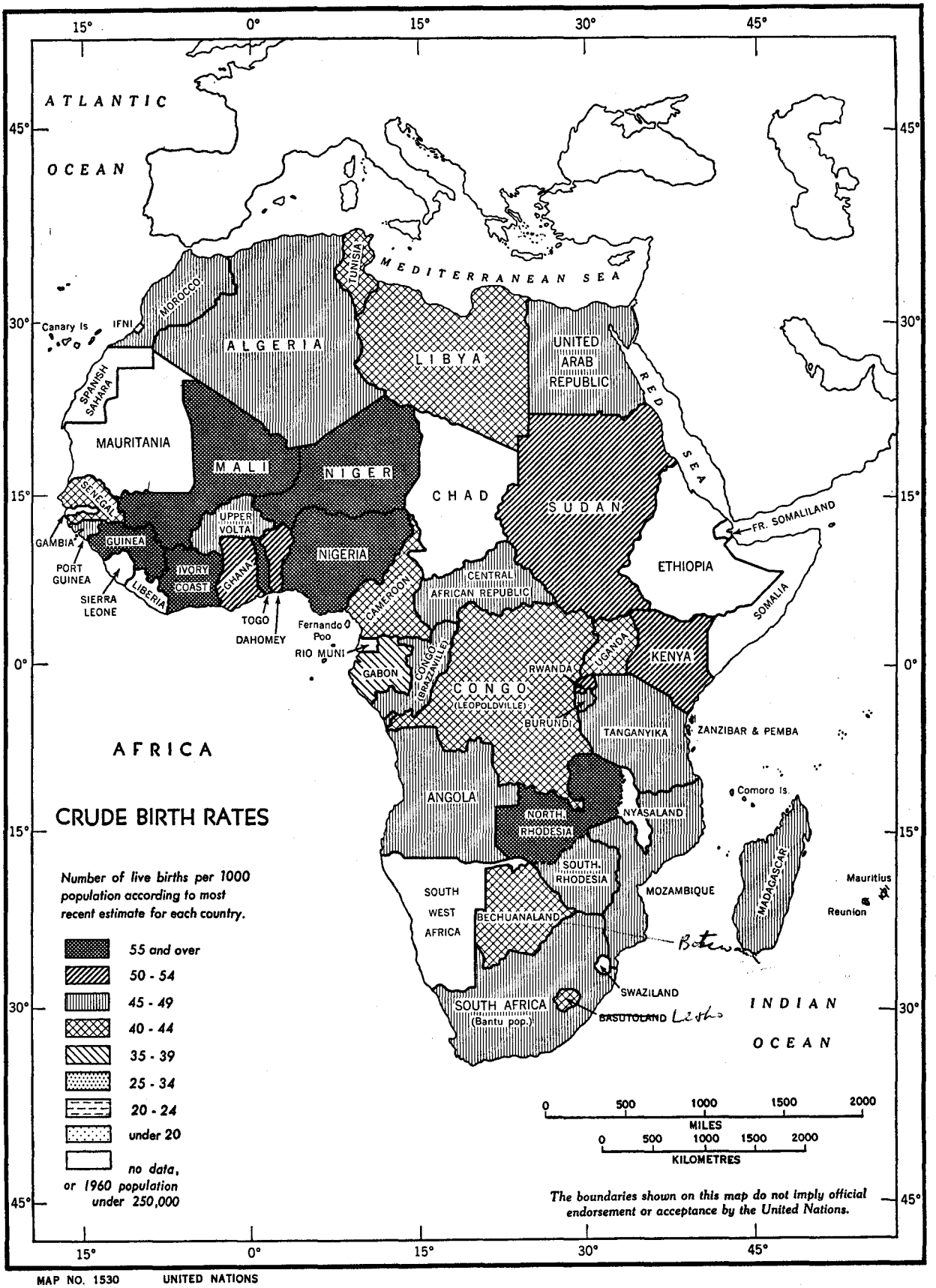
One of the most common types of error in African statistics of population by sex and age groups seems to be exaggeration of the ages reported for girls who have recently attained puberty. This results in an understatement of the number of girls in the age group 10-14 years and an overstatement of the number of women in the child-bearing ages, with a consequent downward bias in the gross reproduction rate, a fertility index for which the numbers of women in child-bearing age groups form the base. There may also be a tendency in some cases to understate the ages reported for girls who have not quite reached puberty and a consequent inflation of the age group 5-9 years at the expense of 10-14. In this case, any "reverse-survival" estimates based on the number of children enumerated in age group 5-9 would of course be biased upward.

Another feature very commonly observed in African population statistics is a deficit of males, particulary

[1] Separate fertility measures for these groups of the population in South Africa are included in table 3.1, but the table does not include available data for non-indigenous groups (generally of much smaller numbers) in other African countries.

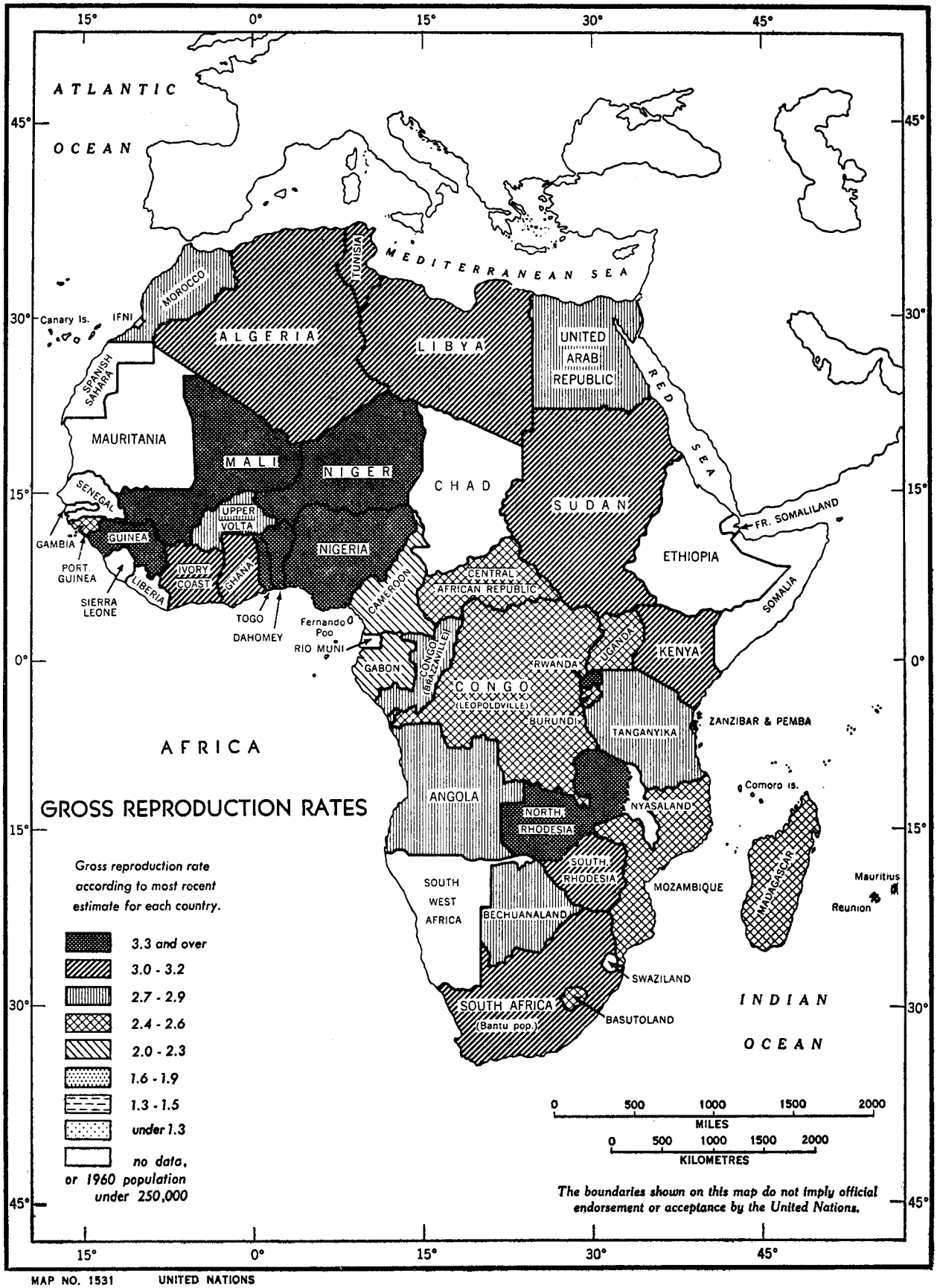
[2] The possibility of under-reporting of births in some surveys cannot be overlooked, although the tendency to extend the reference period, and hence exaggerate the birth rate, is thought to be more common in Africa.

Figure 3.1



MAP NO. 1530 UNITED NATIONS
AUGUST 1963

Figure 3.2



MAP NO. 1531 UNITED NATIONS
AUGUST 1963

in the young adult ages. One cause of such a deficit may be emigration of young men seeking employment in other countries, but this obviously cannot be the explanation in all cases, since deficits of males in countries of emigration should be balanced by excesses of males in countries of immigration. The fact that the deficit appears even in the statistics of countries known to have a net inward balance of migration implies that omissions in the enumeration of young men are common in the censuses and demographic sample surveys of African countries, although much higher male than female mortality in early adulthood may not be entirely ruled out as a possible contributing factor.[3] Such omissions and the consequent understatement of the size of the total population would tend somewhat to exaggerate the crude birth rate. Even if the deficit of males was real, the crude birth rate would still tend to exaggerate the level of fertility unless the number of births was diminished proportionately as a result of the absence of the emigrants.

Such irregularities of sex-age structure cause deviations from normal relationships between the crude birth rate on the one hand and the gross reproduction rate on the other hand. A striking example is afforded by the data for the Central African Republic. The crude birth rate for this country is estimated at the rather high level of 48 per 1,000 population, while the estimate of the gross reproduction rate is 2.4 — well below the level of the majority of African countries. For comparison, the corresponding estimates for the United Arab Republic are only 45 for the crude birth rate, but 2.8 for the gross reproduction rate. In general, under the conditions found in Africa the gross reproduction rate seems to be the better index of fertility levels, being less affected by the abnormalities and errors in the data on sex-age structure than is the crude birth rate. In calculating the gross reproduction rate for many African countries, however, the pattern of child-bearing among women of different age groups has to be estimated, thus introducing an additional element of error, though probably a slight one.

Data on the number of children born alive to each woman during her lifetime have been obtained in the censuses and sample surveys of many African countries,

[3] For the continent as a whole, a conservative estimate of the number of " missing " males is approximately 4 million, or 4.5 per cent of the estimated total male population of Africa. This estimate has been made, on the assumption that the enumerated figures for female population by age groups are accurate, by calculating the numbers of males that would correspond to normal sex ratios for each age group. The calculations refer to the data for the countries listed in table 3.1, other than those having " no satisfactory data ".

Table 3.1. Estimated fertility levels in African countries

Region and country	*Year*	*Basis* [a]	*Crude birth rate (births per 1,000 population)* [b]	*Gross reproduction rate* [b]
North Africa				
Algeria: Moslems	1944-1949	C(2)	45	3.0
Libya	1944-1949	C(2)	43	3.0
Morocco: Moroccan Moslems	1945-1960	C(2)	47	2.9
Sudan	1955-1956	B	52	3.0-3.5
Tunisia	1960	A	43.7	3.1
United Arab Republic: Egyptian region	1950-1955	C(1)	45	2.8
West Africa				
Cameroon: five provinces of Northern Cameroon	1960	B	42	2.3
Central African Republic: Central and West Ubangi	1958-1959	B	48	2.4
Chad		E	...	...
Congo (Brazzaville)	1960-1961	B	47	2.8
Dahomey	1961	B	54	3.3
Gabon	1960-1961	B	36	2.1
Gambia		E	...	...
Ghana	1950-1955	C(2)	51	3.0
Guinea	1955	B	62	3.4
Ivory Coast	1957-1958	B	55	3.0
Liberia		E	...	...
Mali	1960-1961	B	56	3.4
Mauritania		E	...	...
Niger: sedentary population	1959-1960	B	61	3.5
Nigeria	1952-1953	D	53-57	3.6-3.8
Portuguese Guinea	1940-1945	C(2)	47	2.4
Senegal	1960	E	(40)	...
Sierra Leone		E	...	...
Togo	1958-1960	B	55	3.3
Upper Volta	1960-1961	B	49	2.9

Table 3.1. *(continued)*

Region and country	*Year*	*Basis* [a]	*Crude birth rate (births per 1,000 population)* [b]	*Gross reproduction rate* [b]
South and East Africa				
Angola	1940-1945	C(2)	49	2.7
Basutoland	1956	B	40	2.4
Bechuanaland	1936-1941	C(2)	41	2.7
Burundi	1957	B	47	2.6
Congo (Leopoldville)	1955-1957	B	43	2.4
Ethiopia		E	...	...
Kenya: Africans	1948	D	50	2.9-3.4
Madagascar	1950-1955	C(2)	45	2.4
Mauritius	1960	A	39.6	2.8
Mozambique	1945-1950	C(2)	47	2.6
Réunion	1960	A	44.3	3.1
Rhodesia and Nyasaland, Federation of:				
Northern Rhodesia: Africans	1950	B	57	3.5
Nyasaland		E	...	...
Southern Rhodesia: Africans	1953-1955	B	45	3.1
Rwanda	1957	B	52	3.3
Somalia		E	...	...
South Africa:				
Bantu population	1950-1955	C(1)	46	3.0
Coloured population	1960	A	47.8	3.2
White population	1960	A	25.3	1.8
Asiatic population	1960	A	35.4	2.2
South West Africa		E	...	...
Swaziland		E	...	...
Tanganyika	1957	D	46	2.7
Uganda	1959	B	42	2.6
Zanzibar and Pemba:				
Zanzibar	1958	D	32	1.9
Pemba	1958	D	45	2.4

[a] *Basis for rates:* A — "Complete" birth registration statistics; B — Sample survey data; C — "Reverse-survival" estimates: (1) Based on relatively satisfactory data on population by age groups; (2) Based on age data of relatively poor or uncertain reliability; D — Other estimates; E — No satisfactory data.

[b] ... Data not available.

in addition to data on births during a recent 12-month period. With a few exceptions, the data of the former type indicate lower fertility levels than are indicated either by data of the latter type or by "reverse-survival" or other estimates for the same countries. This is what would be expected in view of the tendency toward under-reporting of lifetime births, mentioned in chapter II above. In the present study, data on lifetime births have been disregarded in most cases in estimating levels of fertility, though they are used for some other purposes.

B. Recent levels of fertility

North Africa. North Africa, with the possible exception of the Sudan, appears as a homogeneous subregion in respect of the fertility level, as the estimated gross reproduction rates for the other North African countries lie within the narrow range of 2.8 to 3.1. The estimate for the Sudan, indicating a possibly higher rate, is of questionable reliability, for reasons stated in the notes on this country in section D, below. It should be noted that the large minority of population of European origin in Algeria and the non-indigenous groups of population in Morocco are excluded from the base data for the fertility estimates. These groups aside, the North African coastal countries are culturally homogeneous and fairly similar in their levels of economic and social development, as represented by the indicators in table 3.2. The ethnic make-up of the Sudan's population is more heterogeneous, and this country is at a less advanced stage of development than its northern neighbours. These differences may be related to the possibly higher level of fertility indicated by the data for the Sudan.

The Moslem religion is generally considered as favouring high fertility. While nothing is said in the Koran about the question of birth limitation, the value of large families is strongly emphasized. Pre-Islamic Arab society, with its patriarchal family organization, placed great emphasis on the importance of having numerous sons, and these values were not modified by Islam but, on the contrary, solidified.[4] Early marriage is encouraged

[4] Mahmoud Seklani, "La fécondité dans les pays arabes: données numériques, attitudes et comportements", *Population* (Paris), vol. 15, Oct.-Dec. 1960, pp. 831-855.

Table 3.2. Selected characteristics of African countries

Country	Gross reproduction rate (latest available data)	Density of population per square kilometre, 1960	Percentage married, females aged 15-19 [a] 1950-1960	Percentage literate among population 15 years and over, 1950-1960	Percentage of population in localities of 20,000 and over, 1950-1960	Percentage of male labour force engaged in non-agricultural activities, 1950-1960	Per caput national income, U.S. dollars, [b] 1957-1959
Zanzibar and Pemba	2.1	116	...	5-10 [c]	19 [d]	...	100-199
Gabon	2.1	2	...	1-5 [e]	7 [f]	...	100-199
Cameroon	2.3 [g]	9	...	5-10 [c, h]	2 [h, i]	...	Under 200 [j]
Central African Republic	2.4	2	44 [k]	1-5 [e]	7 [l]	16 [m]	Under 100
Congo (Leopoldville)	2.4	6	45	35-40 [c]	9 [d]	22	Under 100
Madagascar	2.4	9	...	27 [n]	8 [d]	...	100-199
Basutoland	2.4	22	...	35 [o]	0 [i]	6 [p]	Under 100
Portuguese Guinea	2.4	16	44	2	0 [i]	...	Under 100
Burundi	2.6	80	...	5-10 [c]	2 [q]	...	Under 100
Mozambique	2.6	8	34	1-5 [c]	2 [i]	18	Under 100
Uganda	2.6	27	...	25-30 [c]	1 [d]	...	Under 100
Angola	2.7	4	...	1-5 [c]	6 [i]	...	Under 100
Bechuanaland	2.7	0	...	20-25 [c]	12 [i]	...	Under 100
Tanganyika	2.7	10	...	5-10 [c]	3 [d]	...	Under 100
Congo (Brazzaville)	2.8	3	...	1-5 [e]	16 [r]	...	100-199
Mauritius	2.8	342	41	48	27 [d]	57	200-299 [s]
South Africa	2.8	13	...	40-45 [c]	33 [d]	52	300-399
UAR: Egyptian region	2.8	26	32 [t]	23 [u]	29 [i]	38	100-199
Morocco	2.9 [v]	26	55 [v]	10-15 [c]	24 [d]	34 [v]	100-199
Upper Volta	2.9	16	...	1-5 [e]	2 [w]	...	Under 100
Algeria	3.0 [v]	5	36 [v]	8 [v]	14 [d]	17 [v]	200-299
Ghana	3.0	28	...	20-25 [c]	12 [d]	36	100-199
Ivory Coast	3.0	10	50 [x]	1-5 [e]	7 [d]	...	100-199
Libya	3.0	1	32	21	24 [i]	43	100-199
Réunion	3.1	134	...	43	17 [i]	...	200-299
Southern Rhodesia	3.1 [y]	8	...	20-25 [c]	15 [i]	...	...
Tunisia	3.1	33	39	15-20 [c]	19 [i]	32	100-199
Kenya	2.9-3.4 [y]	12	...	20-25 [c]	4 [i]	...	Under 100
Sudan	3.0-3.5	5	...	7 [z]	4 [aa]	13	Under 100
Dahomey	3.3	17	...	1-5 [e]	6 [i]	...	Under 100
Rwanda	3.3	101	...	5-10 [c]	0 [bb]	...	Under 100
Togo	3.3	25	...	5-10 [c]	5 [aa]	...	Under 100
Guinea	3.4	12	79	1-5 [e]	5 [aa]	...	Under 100
Mali	3.4	3	...	1-5 [e]	2 [w]	...	Under 100
Niger	3.5	2	...	1-5 [e]	0 [w]	...	Under 100
Northern Rhodesia	3.5 [y]	3	...	20-25 [c]	0 [i]	...	...
Nigeria	3.6-3.8	38	...	10-15 [c]	11 [aa]	...	Under 100
Senegal	...	15	...	1-5 [e]	20 [w]	...	100-199

[a] Except as noted, figures are derived from a population census or sample survey taken during 1950-1960.

[b] Estimates of the United Nations Statistical Office. In a few instances, the estimates relate to *per caput* national product.

[c] UNESCO estimate for around 1950.

[d] From United Nations, *Demographic Yearbook, 1960*, table 8, and *1962*, table 11.

[e] According to a UNESCO estimate for 1950, about 1-5 per cent of the adult population of former French Equatorial Africa, a territory which included the Central African Republic, Chad, Congo (Brazzaville) and Gabon, was literate. The same percentage literate was estimated for former French West Africa, including Dahomey, Guinea, Ivory Coast, Mali, Mauritania, Niger, Senegal and Upper Volta.

[f] Percentage of total population living in Libreville, the capital, which had an estimated population of 31,000 in 1961.

[g] For 5 provinces of North Cameroon.

[h] For former French Cameroons.

[i] Estimate for 1950 prepared by the Bureau of Applied Social Research (Columbia University) as part of a study of world urbanization trends.

[j] For former British Cameroons, under 100 according to rough estimates; for former French Cameroons, 100-199.

[k] For females 14-19 years of age.

[l] Percentage of total population living in the urban agglomeration of Bangui, which had an estimated population of 81,700 in 1958.

[m] For both sexes combined.

[n] Percentage of persons 14 years of age and over able either to read or write Malagasy.

[o] Percentage of persons of all ages able either to read or write Sesuto.

[p] For 1946.

[q] Percentage of total population living in the urban agglomeration of Usumbura, which had an estimated population of 47,000 in 1960.

[r] Percentage of total population living in urban agglomeration of Brazzaville, which had an estimated population of 93,500 in 1959, and in the city of Pointe-Noire, which had an estimated population of 54,000 in 1958.

[s] For 1961.

[t] For age group 16-19 years.

[u] For 1947.

[v] For Moslem population only.

[w] France, Haut Commissariat de la République en Afrique Occidentale Française, *A.O.F., 1957; tableaux économiques*, p. 100. Percentage relates to total population living in cities of 20,000 inhabitants and over. Data for principal cities are based on results of censuses of 1954, 1955 or 1956, while those for other localities are estimates for 1956.

[x] For the subdivision of Bongouanou.

[y] For African population.

[z] Data relate to persons 5 years of age and over.

[aa] *Economic Bulletin for Africa*, vol. II, June 1962. United Nations publication, Sales No.: 62.II.K.3.

[bb] Information is available only on the population of the capital city, Kigali, which had an estimated population of 4,000 in 1959.

by the economic organization of the family, in which girls become a burden to their fathers after reaching a certain age. The custom of early marriage has proved highly resistant to social change in the Arab countries, even though in recent years some steps have been taken toward the enactment of legislation governing the minimum age at marriage for girls.[5] Divorce, easily obtained under Moslem law, is particulary common in cases of sterile marriages and unions which produce only daughters. When divorce occurs, remarriage is generally rapid.

West Africa. The sub-region of West Africa consists of the countries lying to the south of Morocco, Algeria and Libya and west of the Sudan and Congo (Leopoldville). The map of fertility levels in this sub-region is incomplete as satisfactory data are lacking for six of the twenty principal countries.

Present estimates indicate that exceedingly high fertility prevails in much of West Africa. Crude birth rates above 50 and gross reproduction rates of 3.0 and up appear to be the rule in the countries west of Cameroon and Chad, only Portuguese Guinea, Upper Volta and possibly Senegal having estimated rates below these levels, and in the case of Portuguese Guinea the estimate is not very reliable. The estimated gross reproduction rate of Nigeria, in the range of 3.6 to 3.8, is one of the highest in the world, but this estimate is one of the weakest in Africa; it was made by comparing available data on age structure of the Nigerian population with stable population models. For all other countries in this group except Ghana, the fertility indices have been estimated from the results of demographic sample survey inquiries on births during specified 12-month periods (type B) and there is a possibility, as already mentioned, that the results may be exaggerated. In general, somewhat lower fertility levels are indicated by estimates derived from the sample survey data on age structure of the population, using " reverse-survival " or other methods. The reliability of the latter estimates is poor, however, because the data on population structure show gross irregularities which appear to be due partly to incomplete enumeration and inaccurate reporting of ages, and partly to migratory movements.

In sharp contrast with Nigeria and the countries to the west, Cameroon, Central African Republic and Gabon belong to a zone of much lower fertility, which continues to the south-east in Congo (Leopoldville), if the present estimates are indicative of true fertility levels. The estimated gross reproduction rates for Cameroon, Central African Republic and Gabon are in the range of 2.1 to 2.4. The former territory of French Equatorial Africa, to which these three countries belonged before their independence, was believed at various times to be undergoing depopulation.[6]

South and East Africa. The remainder of the continent, together with the islands of Madagascar, Mauritius and Réunion, constitute the sub-region of South and East Africa. The map shows a veritable patchwork of fertility levels in this sub-region. Fertility is extremely high (gross reproduction rates of 3.3 and over, according to the estimates) in Northern Rhodesia, Rwanda and perhaps Kenya. Gross reproduction rates of 2.4 or less — distinctly low for Africa, though not low on a world-wide scale — are estimated for Madagascar and Zanzibar as well as Congo (Leopoldville). For the remainder of the countries in South and East Africa for which data are available at present, the estimated fertility indices are in an intermediate range represented by gross reproduction rates of 2.6 to 3.1. This group includes South Africa by virtue of the rate estimated for the Bantu, as the majority ethnic group, as well as for the " coloured ", although the fertility of the " whites " in South Africa is at a much lower level.

Factors associated with fertility levels in West, South and East Africa. Not much is known of the reasons for the apparent wide differences in fertility among countries in West, South and East Africa. They seem to have little to do with the levels of economic and social development, which are very low almost everywhere in these parts of Africa. The fertility differences would appear to be caused either by differences in traditional attitudes and behaviour with regard to marriage, sexual relations and birth of children, or to factors in the cultural and natural environment affecting the incidence of sterility, sub-fecundity and pregnancy wastage. Present knowledge is not sufficient to identify and estimate the importance of specific factors contributing to the fertility differences.

The generally low level of economic and social development in these sub-regions is manifested by the data in table 3.2, in spite of numerous gaps and weaknesses in the statistics and the fact that some of the series are not up to date. While there are differences of degree in this respect, it is not easy to see any consistent pattern of associations between the estimated fertility levels and the differences in economic and social conditions suggested either by these indicators or other information. In West Africa, for example, Ghana is considered to be somewhat above the average in level of development, and the estimates indicate high fertility in this country. On the other hand, conditions of life in Gabon are considered to be somewhat more favourable than in neighbouring countries, but Gabon's estimated gross reproduction rate is the lowest in the sub-region. Togo, bordering on Ghana, and Cameroon, bordering on Gabon, seem to be a step behind in economic and social development; Togo's estimated fertility level is very high, while that of Cameroon is comparatively low. Again, in East Africa, both Kenya and Uganda seem to be somewhat more developed than Tanganyika; Kenya's estimated birth rate is higher and Uganda's is lower than that of Tanganyika. In short, the differences in levels of fertility seem to bear little relation to the levels of economic and social development.

Some differences in age of women at marriage are indicated by the figures available for a few countries, as shown in table 3.2, on the percentages of females

[5] *Ibid.*

[6] Lord Hailey, *An African Survey*, Revised 1956; a study of problems arising in Africa south of the Sahara (London, Oxford University Press, 1957), p. 121; and George H. T. Kimble, *Tropical Africa*, vol. I, Land and Livelihood (New York, Twentieth Century Fund, 1960), p. 116.

reported as married in the age group 15-19 years. The differences in this respect, however, could play only a rather minor part in bringing about the observed differences in levels of fertility. Available information indicates that in the age groups from 20 years up, nearly all women are married in all countries of the region.

Polygamy, which is prevalent in much of Africa, has often been said to have a depressing effect on fertility. Such an effect may result from lower average frequency of coitus for wives in polygamous marriages than would occur under monogamy. The tendency to reduce fertility would be all the greater if the husband had less frequent intercourse with one wife than with another, and the effect would be especially great if a substantial number of wives in polygamous marriages were more or less completely left out of sexual relations[7]. Studies in some parts of Africa, and elsewhere, have shown lower age-specific fertility rates for women in polygamous marriages than for those in monogamous unions,[8] but other studies have failed to bring out any large or consistent differences in this respect.[9] Even the finding of appreciable differences of this kind is not in itself conclusive evidence that polygamy depresses fertility, since this institution may facilitate early and universal marriage of women and quick re-marriage of widows and divorcees, particularly where there is a deficit of male in proportion to female population of marriageable ages. Data on the extent of polygamy are not available for enough countries in Africa to make possible a comprehensive study of the association, if any, between this factor and the differing levels of fertility. Polygamy is known, however, to be prevalent in several countries where the estimated level of fertility is very high.

Widowhood is responsible for some loss of reproductive capacity in the female population within the potentially fertile age range. The importance of this loss depends on the male mortality rates, the chances of remarriage of widows, and the average delay in remarriage. Even though rather quick remarriage is customary, the diminution of fertility on account of widowhood may be considerable under conditions of high mortality such as are still found at present in much of West, South and East Africa. Additional losses of fertility result from divorce and from prolonged separation when husbands migrate in search of employment. As already suggested, some wives in polygamous marriages may be more or less completely excluded from reproductive activity during a large part of their potentially fertile years, and the same fate may befall the wife in a monogamous marriage if the husband takes a concubine. Neglect and abandonment may all too often be the lot of women in the informal and relatively unstable unions that are now common in some parts of Africa, where traditional social institutions have been weakened or broken down. It is difficult to estimate the effects of these factors on fertility levels in different African countries; more data are needed on the forms of marriage, the incidence of widowhood, divorce, and separation, and the patterns of sexual behaviour.

The influence upon fertility of emigration of married men, leaving their wives behind, should be considered in the context of traditional African attitudes toward marriage and procreation. With reference to Bechuanaland, one of the main reservoirs of migrant labour for the mines and industries of South Africa, a well-known anthropologist has observed that the husband's absence might not always be regarded as sufficient reason for the wife to refrain from sexual relations, in a society where it was considered right that women should bear as many children as possible.[10] A study of employment and migration history of a sample of married men and of reproductive history of their wives, in Bechuanaland, failed to demonstrate conclusively that labour migration had the effect of depressing fertility.[11] However, in Basutoland, where labour migration reaches much higher proportions (nearly half of adult males were absent at the 1956 census), this might well account for the fact that fertility is estimated to be somewhat lower there than in most African countries.

The strong emphasis on kinship groups which is characteristic of tropical African societies is believed to favour high fertility. Both patrilineal and matrilineal kinship systems are viewed as having the same objective of ensuring continuance of the kinship group through legitimate heirs, and the birth of numerous progeny may be considered as a means of enhancing the prestige and wealth of the group as well as of perpetuating the lineage.[12] It has yet to be ascertained whether differences in levels of fertility among African societies are associated in any consistent way with the traditional forms and social roles of kinship groups.

There are numerous references in anthropological literature to the existence, in various ethnic and tribal groups, of knowledge of various devices for inducing abortion or preventing conception. While it is unlikely, in general, that the folkloric contraceptive prescriptions are either very efficient or widely used, inducement of

[7] Polygamy, in fact, often results from diverse social institutions (e.g., the levirate, which obliges men to take responsibility for a deceased brother's household) in which additional wives are not considered as partners in sexual union with the household head, though he is legally responsible for their protection and sustenance.

[8] For example, Vernon R. Dorjahn, " Fertility, Polygyny and Their Interrelations in Temne Society ", *American Anthropologist* (Menasha, Wisconsin), vol. 60, October 1958, pp. 838-860; A. Romaniuk, " Fécondité et stérilité des femmes congolaises ", International Population Conference, 1961 (New York), paper No. 71 (processed), pp. 2-3; and H. V. Muhsam, " Fertility of Polygamous Marriages ", *Population Studies* (London), vol. 10, July 1956, pp. 3-16.

[9] France, Service des Statistiques, *Etude démographique par sondage en Guinée, 1954-1955. Résultats définitifs*, vol. I (Paris [*s.d.*]), pp. 42-43; Meyer Fortes, " A Demographic Field Study in Ashanti ", in Frank Lorimer and others, *Culture and Human Fertility* (Paris, UNESCO, 1954), pp. 253-339; A. T. and G. M. Culwick, " A Study of Population in Ulanga, Tanganyika Territory ", *Sociological Review* (Veele, England), vol. 30, No. 4, 1938 and vol. 31, No. 1, 1939.

[10] Isaac Schapera, " An Anthropologist's Approach to Population Growth; Studies in the Bechuanaland Protectorate ", in *The Numbers of Man and Animals*, J. B. Cragg and N. W. Pirie, ed. (London, Oliver and Boyd, 1955), pp. 23-29.

[11] I. Schapera, *Migrant Labour and Tribal Life* (London, Oxford University Press, 1947), pp. 188-189.

[12] Frank Lorimer and others, op. cit., chapter II; and Lord Hailey, op. cit., p. 30.

abortions might possibly be an important factor in the relatively low fertility of some areas. There is little information on the extent of this practice in different African countries, and no attempt has been made to estimate its possible role in bringing about the observed differences in fertility levels.

Certain African tribal societies are much concerned with the spacing of births. After confinement, women are not permitted to have sexual relations until the infant is able to walk, or is weaned. Observance of this prohibition may be facilitated by the institution of polygamy where it is prevalent. Prolongation of lactation seems to be a common practice in many parts of Africa, possibly made necessary by lack of fit food for infants, other than the mother's milk, and this is conceded to have the effect of lengthening the intervals between pregnancies.

Where traditional taboos have been weakened, as among the urban Bantu of South Africa, and prohibition of intercourse is no longer observed for great lengths of time after childbirth, the desired birth intervals seem to be maintained in some areas by practicing *coitus interruptus* or by other means.[13] In other areas, it is reported that the average intervals between births are being shortened.[14] In still other areas, tribal traditions impose no such restrictions on sexual intercourse following childbirth and there is no disapproval of pregnancies occurring at short intervals. The Ashanti of Ghana are an example of the latter case — a tribe which has been found to have uniformly high fertility.[15] In most of Africa, the relevant facts have not been established in quantitative terms; the kinds of record-keeping and extensive field studies which would yield statistical measures of birth spacing and related aspects of behaviour have yet to be undertaken.

In the opinion of some experts, ill health and the life of hard labour which is the lot of most African women are the principal factors limiting fertility in this part of the world.[16] Malnutrition due to dietary deficiencies and seasonal or year-round under-nourishment may depress fecundity, and debilitating diseases such as malaria, influenza, tuberculosis, leprosy and yaws may have the same effect. Venereal diseases, widespread in large parts of Africa, have a still more direct effect on fecundity. In some areas where tribal authority has been weakened, and in the urban centres where it often breaks down almost completely, extra-marital unions, promiscuity and prostitution favour the spread of venereal disease. The degree of contamination which can be reached in such situations is illustrated by the case of the Nzakaras of Central Ubangi, one half of whom, it is estimated, are afflicted with venereal disease.[17] But in this respect also, comprehensive, reliable data are generally lacking in Africa. Present sources of information are not adequate to provide the basis for reliable estimates of the prevalence of malnutrition under-nutrition and the diseases known to affect fecundity, nor to assess in quantitative terms their effects on the level of fertility in any country in the region.

Some indication of the extent of sterility and its variations from country to country is furnished by statistics of women having reached the end of the potentially fertile period of life who report that they have never borne any children. Such data from recent censuses and sample surveys in several West, South and East African countries are summarized in table 3.3. A clear inverse relation can be seen between the percentages of women beyond age 45 (or age 40 or 50) reported as having borne no children during their lifetime and the estimated levels of fertility among these countries, childlessness being most frequent where fertility is relatively low, and vice versa. The same pattern appears also in such statistics for parts of countries. For example, in the former Belgian Congo, percentages of women 45 years of age and over reporting that they had borne no children ranged in different districts from only 4 per cent to as high as 35 per cent, being highest (with some exceptions) in districts reporting the lowest crude birth rates.[18]

Differences in the extent of life-long childlessness of women may account for a large part of the differences in fertility levels among countries and population groups in Africa. The possible importance of this factor is shown by the figures brought together for a few countries in table 3.4, on average reported numbers of children for all women past child-bearing age and for those reporting one or more children. Among these countries it seems that the differences in levels of fertility are due mainly to differences in the extent of childlessness, though differences in the average numbers of children born to women having at least one child also play an important part.

It is prudent to make ample allowances for errors of reporting before drawing conclusions from these data. In addition to the general tendency toward understatement of the number of children born, in response to inquiries on this subject, there may be factors tending especially to exaggerate the reports of childless women, such as the error made in data processing of recording " none " when the specific number of children has not been stated. The numbers of women having borne no children may be exaggerated considerably, and the

[13] L. T. Badenhorst and B. Unterhalter, " A Study of Fertility in an Urban African Community ", *Population Studies* (London), vol. 15, July 1961, pp. 70-86. The practice of *coitus interruptus* has also been mentioned as possibly being used by the Yao community of Southern Nyasaland, among whom intercourse is forbidden for only four to five months after confinement, while a new pregnancy is not considered desirable until the baby is weaned. *See* J. Clyde Mitchell, " An Estimate of Fertility in Some Yao Hamlets in Liwonde District of Southern Nyasaland ", *Africa* (London), vol. 19, October 1949, pp. 293-308.

[14] In Dahomey it is said that whereas in the past, 30 to 36 months generally elapsed between births, shorter intervals, of less than 20 months, are now increasing in frequency. Dahomey, *Enquête démographique, 1961, Résultats provisoires* [*s.d., s.l.*], p. 7.

[15] Frank Lorimer and others, op. cit., p. 72.

[16] On diseases in tropical Africa, *see* G. H. T. Kimble, *Tropical Africa*, vol. II, Society and Polity (New York, Twentieth Century Fund, 1960), pp. 33-51.

[17] Central African Republic, Secretariat d'Etat aux Relations avec les Etats de la Communauté, *Données de base sur la situation démographique* (Paris, 1961), p. 59.

[18] A. Romaniuk, op. cit.

Table 3.3. Percentages of women aged 45-49 years reported as never having borne a child alive: selected African populations

Country and area or ethnic group	*Year*	*Percentage*	*Estimated gross reproduction rate*
Angola	1950	14	2.7 [a]
Cameroon:			
North Cameroon	1960	12	2.3
Mbalmayo Subdivision	1956	32	1.3
Ebolowa City	1958	51	1.2
Central African Republic:			
Central Ubangi	1959	21	2.4 [b]
Congo (Brazzaville)	1960-1961	20 [c]	2.8
Congo (Leopoldville)	1955-1957	20 [d]	2.4
Ivory Coast:			
First Agricultural Sector	1957-1958	9	3.0
Mali	1957-1958	7	3.4 [e]
Mozambique	1950	15	2.6 [f]
Senegal:			
Middle Valley	1957		
Rural sedentary population		7	3.1
Rural Maures		9	2.1
Low Valley	1957	7	3.0
Upper Volta	1960-1961	6 [g]	2.9
Zanzibar and Pemba:	1958		
Zanzibar town		38 [h]	1.3
Zanzibar island excluding Zanzibar town		25 [h]	2.1

[a] 1940-1945.

[b] 1958-1959.

[c] For women 40-49 years of age.

[d] For women 45 years of age and over.

[e] 1960-1961.

[f] 1945-1950.

[g] For women 50 years of age and over.

[h] For women 46 years of age and over.

Table 3.4. Average number of children ever born alive to all women aged 45-59 and average number ever born alive to fertile women: selected African populations

Country and area or ethnic group	*Year*	*Average number of children ever born alive to all women aged 45-59*	*Average number of children ever born alive to women aged 45-59 who had borne at least one live-born child*
Angola	1950	4.15	4.82
Cameroon:			
Mbalmayo Subdivision	1956	3.20	4.73
Ebolowa	1958	2.00	4.06
Central African Republic:			
Central Ubangi	1959	3.99	5.06
Guinea (whole country)	1955	5.32	5.65
Ivory Coast:			
1st Agricultural Sector	1957-1958	5.87	6.44
Mozambique	1950	3.95	4.63
Senegal (Middle Valley):	1957		
Sedentary population		5.28	5.66
Maures		4.24	4.65

degree of exaggeration may be much greater in some countries or areas than in others.

It also has to be considered that childlessness is not always due to sterility. It may be taken for granted that few women in African societies would willingly remain childless, but involuntary childlessness is not necessarily due to inability to conceive and to deliver a living child. Early widowhood and failure to re-marry promptly, divorce, separation, abandonment and neglect are other possible causes. As already mentioned, there is insufficient quantitative information on the importance of these factors in African countries, as well as a lack of adequate data on the prevalence of diseases and other factors which may cause sterility and sub-fecundity.

C. Trends and future outlook

Information on the trends of fertility in Africa is much poorer than information on the recent levels. Mauritius is the only country in the African region and one of the few developing countries in the whole world that have " complete " birth registration statistics covering the whole population and providing a firm basis for the study of fertility trends over many decades in the past. The trend of registered birth rates in Réunion can be traced reliably only back to 1946. In Tunisia, " complete " registration was achieved only recently; comparison between recent and earlier registration data for this country is hazardous. In Algeria, Tunisia and the United Arab Republic, some perspective on the fertility trend can be obtained by comparing the data from successive censuses on age structure of the population. For the rest of Africa, the past changes in fertility are largely a matter for conjecture.

North Africa. Analysis of the census statistics together with other available demographic data for the Moslems of Algeria and for the population of Tunisia and the United Arab Republic points to the conclusion that fertility in these parts of North Africa has not changed much during the last few decades. The data are discussed briefly in section D of this chapter.

Although social and economic changes and the influence of European ideas favouring limitation of births have made some impression in the cities of North Africa, it is still true that modern European methods of birth control are used only to a small extent, primarily by the best educated and economically most favoured groups of the urban population. In the villages, traditional attitudes and patterns of behaviour relating to fertility remain little affected. It is said that the typical fellah desires many children to contribute to the family income by their work.[19] In regard to Algeria, one writer has offered the opinion that to lower the birth rate of the Moslem population to a moderate level would require a profound change in attitudes which could only be accomplished through a vast economic and cultural development programme.[20]

There are some signs, however, that such a change in popular attitudes may be in the making in parts of North Africa. One factor tending in this direction is the social legislation recently adopted in some North African countries — particularly legislation which tends to raise the status of women through abolition of polygamy, regulation of divorce, and establishment of a legal minimum age for marriage. It has been stated that in Tunisia the traditional attitudes favourable to large families are beginning to weaken, along with a weakening of the patriarchal structure of society. Under modern conditions the burden of raising a child is more apt to rest with the immediate family. In an urban environment more attention is paid to the standards of care and education given to children. School attendance is a particular burden, requiring books, clothing and better food. The common man, it has been said, is becoming increasingly aware of the population problem and its relation to his personal living standards.[21]

The Governments of Tunisia and the United Arab Republic have recently begun to consider policy measures for moderating the birth rate as an aid to economic and social development. The President of the Tunisian Republic is on record in favour of the spread of family-planning information among the people, and in January 1961 the National Assembly adopted legislation authorizing the sale of contraceptives. Contraceptives were imported, a press campaign was conducted to explain their purpose and use, and steps were taken to keep the price of the material at a moderate level. The volume of sales, however, has not been as great as anticipated.[22]

In 1953 the Egyptian Government created a commission to study the national population problem, and in 1954 the Minister of Social Affairs declared in a press conference that birth control was becoming a social necessity for Egypt.[23] Some birth control clinics were established during the middle 1950's. The opening of the question of birth limitation to public debate in the press and elsewhere revealed a sharp division between orthodox Moslem and more liberal religious leaders. Only as recently as 1962 was the principle of family limitation endorsed by the President of the United Arab Republic.[24]

West, South and East Africa. Mauritius and Réunion, the only two countries in the African region having historical series of " complete " registration statistics for their whole population showing the trend of the birth rate over any period of time in the past, are remote islands in the Indian Ocean, far off the African coast and peopled by descendants of Asian, European and mixed as well as African stock. The trend of fertility in these islands has little relevance to the trend or prospects on the African mainland. It is of interest, however, that the birth rate in Mauritius since the 1920's has followed a trend much like that of the low-fertility

[19] Mahmoud Seklani, op. cit.

[20] Léon Tabah, " La population algérienne; croissance, niveau de vie, investissements ", *Population* (Paris), vol. 11, July-Sept. 1956, pp. 429-460.

[21] J. C. Magnin, " La limitation des naissances ", *Institut des Belles Lettres Arabes* (Tunis), third quarter, 1960, pp. 327-331.

[22] Information supplied by the Tunisian " Service des Statistiques ", Demographic Section.

[23] Mahmoud Seklani, op. cit.

[24] *The New York Times*, 31 May 1962.

countries in Europe, Northern America and Oceania, except that the general level of the rate in Mauritius was much higher and the ups and downs were not so great. The Mauritius birth rate dropped to a low point in the early 1930's and rose in the later 1930's and 1940's to a peak in 1952, from which it has subsided since. The series of birth rates for Réunion, beginning in 1946, closely parallels the trend in Mauritius, at a higher level. The data for these two areas are tabulated and discussed further in section D, below.

Among the peoples of the West, South and East African continent, very little is known of the past trends of fertility, although the question has been a topic of considerable speculation. While some studies of small population groups have reported evidences of declining or rising fertility,[25] the findings have seldom had a firm statistical basis.

With regard to the future in these parts of Africa, it is easier to foresee some of the social and cultural changes which may be in store than to predict the effects on fertility. On the one hand, there are forces at work which may lead to increases in birth rates; these include the decline of polygamy, abandonment of tribal taboos affecting child-spacing, control of malaria and other sterility-producing diseases, and improvements in diets. On the other hand, increasing urbanization, detribalization, and breakdown of traditional social institutions may lead to greater instability of marital unions and possibly to further increases of venereal disease, thus tending to lower fertility.[26] Without better information than now exists on the factors determining fertility levels and their differences in the countries of West, South and East Africa, any prediction of the future trend can be little better than guesswork. It can be said, however, that no major, general decline of fertility, such as has been experienced in European society and more recently in Japan, appears to be imminent in these parts of Africa. "The emergence of a positive small-family ideal seems as yet to be hardly above the horizon, even among African societies that are most advanced in the autonomous development of modern economic, cultural, and political techniques."[27]

D. Notes on fertility data and estimates for countries

North Africa

Algeria. The estimated fertility indices shown in table 3.1 for this country refer only to the Moslem population. The European population, numbering 980 thousand in the total of 9,145 thousand persons enumerated at the census of 1954, has much lower fertility. The crude birth rates of the Europeans, based on "complete" birth registration statistics, averaged 22 for 1947-1949, 20 for 1950-1954 and 18 for 1955-1959.

For the Moslem population, birth registration is incomplete. The crude birth rate of 45 per 1,000 for 1944-1949 and the gross reproduction rate of 3.0 shown in table 3.1 were estimated by "reverse-survival" from 1954 census data for the age group 5-9 years.[28] Although the reliability of the census statistics by age groups is judged to be relatively poor, these estimates agree well with the results of other analyses of available data on fertility of the Algerian Moslems, which indicate that the crude birth rate is in the middle 40's,[29] and has changed little during the last three decades.[30] One of the indications of approximately constant fertility is the similarity of age structures shown by the 1948 and 1954 census data, both showing about 43 per cent of the Moslem population in the age group under 15 years.

Birth registration statistics for Moslems in northern Algeria, corrected on the basis of results of surveys in several areas, showed crude birth rates ranging from 42 to 44 during 1926-1950. Data for thirty urban communes showed an average birth rate between 43 and 47 during the early 1950's, and an average of 46 was estimated for all urban communes in 1954. These findings led to the conclusion that the Moslem birth rates were about the same in the large cities, smaller urban communes and rural areas, and that the level of the birth rate in the early 1950's was probably between 44 and 46.[31]

The modal age at marriage for girls is 17 years, but often they marry by the fifteenth year, and by age 20 nearly three-quarters of the women are married.[32]

Libya. General registration of births and deaths in Libya is not yet organized, although a beginning was made in towns in 1962. The tabulations of population statistics by age from the 1954 census furnish the only basis for estimating the fertility level, and it must be emphasized that these data are only approximate, as this was the first general population census ever taken in Lybia, and accurate enumeration is exceedingly difficult in the circumstances existing in this country. The estimates of the crude birth rate and the gross reproduction rate shown in table 3.1 were derived by "reverse-survival" from the census statistics of children 5-9 years of age. The gross reproduction rate was calculated on the assumption that the pattern of age-specific birth rates was similar to that for Egyptian localities having health bureaux.

Morocco. The fertility estimates shown for Morocco in table 3.1 refer to the Moslem population only. Sample

[25] For example, Schapera found some evidence of declining fertility among the Tawana of Bechuanaland, which he attributed to cultural shock. I. Schapera, *Married Life in an African Tribe*, London, 1940.

[26] According to data collected in the mining belt of Northern Rhodesia, urban first marriages were less stable than rural first marriages, and tribal out-marriages less stable than in-marriages. J. Clyde Mitchell, "Marriage Stability and Social Structure in Bantu Africa", International Population Conference, 1961 (New York), paper No. 115 (processed), pp. 5-6.

[27] Frank Lorimer and others, op. cit., p. 133.

[28] In calculating the gross reproduction rate, the pattern of fertility by age of mother was assumed to be the same as for Egyptian localities having health bureaux.

[29] L. Henry, "La situation démographique", *Population* (Paris), vol. 9, Oct.-Dec. 1954, p. 722; Léon Tabah, op. cit., p. 432.

[30] Jacques Breil, *Etude de démographie quantitative*, vol. II in *La population en Algérie*, Rapport du Haut Comité Consultatif de la Population et de la Famille (Paris, Imprimerie Nationale, 1957), particularly p. 110.

[31] Jacques Breil, op. cit., p. 111.

[32] Léon Tabah, op. cit., p. 432.

tabulations from the 1960 census display marked irregularities in age structure for the Moroccan Moslems, suggesting serious deficiencies in age reporting. It is said that most Moroccan Moslems do not know the exact year of their birth.[33] Poor reporting appears to affect even the young ages. Whereas 16.3 per cent of the total population was reported as being 5-9 years of age, only 9.3 per cent was reported in the 10-14 age group. " Reverse-survival " birth rates have been calculated from the numbers reported in the three youngest age groups, the results being as follows:

Year of birth	*Age group in 1960*	*Crude birth rate*
1955-1960	0-4	49.6
1950-1955	5-9	53.9
1945-1950	10-14	36.7

The average birth rate for the period 1945-1960, derived by " reverse-survival " of the three age groups, is 47. The gross reproduction rate is 2.9. [34-35]

These estimates cannot be accepted with much confidence in view of the unsatisfactory nature of the base data from which they were calculated. The 10-14 age group as enumerated in the 1960 census may be severely understated, owing to a tendency of youths in the latter years of this age class to overstate their ages. If this is the case, the true birth rate may lie closer to the upper limit of the range shown in the above table.

" Reverse-survival " of the number of children aged 5-9 in the 1952 census of Moroccan Moslems gave a crude birth rate of 48, but these data also appeared to be of uncertain reliability. The corresponding gross reproduction rate estimated from the 1952 data was only 2.5; the 1952 census returns showed an abnormally low ratio of males to females in the child-bearing ages, which suggested a possible exaggeration in the enumeration of women at these ages.

An independent estimate of the crude birth rate in Morocco for 1959-1960, in the range of 47 to 50, has been obtained from the proportion of children under one year of age among the population counted in the 1959-1960 survey of household expenditures.[36]

As in Algeria, the fertility of the Europeans and other non-indigenous groups in Morocco is much lower than that of the Moslems. The crude birth rate of the non-indigenous population in the former French Protectorate, based on " complete " registration statistics, averaged 27 for 1945-1954. Non-indigenous ethnic groups constituted 3 per cent of the total population in the whole country in 1960, according to the preliminary census results.

Birth registration statistics for the Moslem population of Morocco refer only to the area of the former Spanish Protectorate and Tangier, and these statistics are incomplete. In fact, it is estimated that not more than 20 per cent of all births in the country are registered.[37]

Sudan. The only basis for estimates of fertility in the Sudan is provided by the results of the sample census carried out in 1955-1956.[38]

In this census, each household was asked to report on births having occurred during the twelve months preceding the census enumeration. The results indicated a crude birth rate of 52 for the whole country, but the rates obtained for some provinces were so high as to give cause for suspicion that the average for the whole country might have been exaggerated as a result of erroneous inclusion of births having occurred outside the specified twelve-month period.[39]

The population of each sex was classified in the census by broad age groups: for males, under 1 year, 1-4 years, 5 years to puberty, and puberty and over; for females, the same age groups plus a subdivision of the last group to show separately those of child-bearing age and those past child-bearing age. Fertility estimates based on these data indicated a gross reproduction rate in the range of 3.0-3.5 and a crude birth rate of 45-54. These estimates were made by computing various ratios of age groups as shown by the Sudan census figures and comparing them with the corresponding ratios in model stable populations having various combinations of fertility and mortality levels.[40] Ratios involving children under 5 years of age were not used because this age group was judged to have been subject to greater error of enumeration than the other groups.

In table 3.1 the crude birth rate given for the Sudan is the rate of 52 obtained from the data on births during the recent twelve-month period, while the estimate of the gross reproduction rate is the range of 3.0-3.5 indicated by the analysis of the age structure of the population.

Tunisia. Tunisia is the only North African country with birth registration statistics regarded as " complete ". The level of the fertility indices based on the registration data, which are shown in table 3.1,[41] is confirmed by estimates derived from the 1956 census data on children 5-9 years of age, by the " reverse-survival "

[33] Morocco, Ministère de l'économie nationale, Statistiques économiques et sociales du Maroc, 1er partie, *Cours de démographie et économie marocaines*, by Paul Dubois (Rabat, August 1962), p. 12.

[34-35] In calculating the gross reproduction rate the pattern of age-specific birth rates shown by Egyptian registration data for localities with health bureaux was assumed to apply to Morocco.

[36] " La population du Maroc: Premiers résultats du recensement de 1960 ", " Notes et documents ", *Population* (Paris), vol. 17, July-September 1962, p. 559.

[37] *Ibid.*

[38] Sudan, Department of Statistics, *First Population Census of Sudan, 1955/56*, Interim Reports and Final Reports (Khartoum, 1958, 1960).

[39] The analytical findings stated here and in the next paragraphs are those of a study carried out jointly by the United Nations and the Government of the Sudan, the report of which is being prepared for publication.

[40] See chapter II, section B, above, for reference to the methodology of such estimates.

[41] The gross reproduction rate was calculated on the assumption that the age pattern of fertility is like that of Egyptian health bureau localities.

method, which yielded a crude birth rate of 44 and gross reproduction rate of 3.0 for 1946-1951.

United Arab Republic: former Egyptian region. Birth registration in this country is considered to be incomplete except in localities having health bureaux, where births and deaths are registered in the public health offices rather than the tax collectors' offices, as in other parts of the country. In the health bureau localities, which contained about 45 per cent of the total population, a birth rate of 46.6 was registered in 1960. This agrees fairly well with the rate of 45 for 1950-1955 shown in table 3.1, which was estimated by " reverse-survival " from 1960 census data on children 5-9 years of age.

Birth registration has been compulsory in Egypt since 1912, and birth certificates are required for many purposes, including school enrolment, army service and employment. Nevertheless, some births escape registration, and there are varying estimates of the extent of omissions. The registered crude birth rate has averaged between 42 and 44 per 1,000 for quinquennial periods from 1906 to 1955, with the exception of the two war-time periods and the years 1955-1959 when it was slightly lower. On the other hand, the registered rate in the areas having health bureaux has been about 45 during most of the present century. On the assumption of complete registration in the health bureau areas, the percentage of under-registration for the country during 1925 to 1940 was estimated at about 4 per cent.[42] Another estimate of birth under-registration during the period 1917-1946 placed the maximum at 11 per cent.[43] In a recent study, the extent of birth under-registration was estimated at 6-7 per cent during the 1950's on the assumption that the birth rates of rural areas without health bureaux were equal to those of rural areas with health bureaux.[44]

The sex and age distribution of the population as shown by the 1960 census results exhibits much irregularity and does not provide a very satisfactory basis for deriving an estimate of the birth rate. According to these data, 42.7 per cent of the population was under 15 years of age. This represents a rise over the proportions under 15 years of age estimated for previous census dates: 39.7 in 1917, 39.2 in 1927 and 1937, and 38.9 in 1947.[45]

[42] S. H. Abdel-Aty, " Life-Table Functions for Egypt Based on Model Life-Tables and Quasi-Stable Population Theory ", *Milbank Memorial Fund Quarterly* (New York), vol. 39, April 1961, pp. 350-377.

[43] M. A. El-Badry, " Some Demographic Measurements for Egypt Based on the Stability of Census Age distributions ". *Milbank Memorial Fund Quarterly* (New York), vol. 32, July 1955, p. 303. From a life-table calculated for this period, the author estimated the crude birth rate within the range of 42-47 per 1,000.

[44] M. A. El-Badry, " Trends in the Components of Population Growth in the Arab Countries of the Middle East: A Survey of Present Information " (paper presented to the Conference on Demographic and Economic Trends in the Developing Countries, New York, October 1963), table 2, p. 53.

[45] Figures for 1917, 1927 and 1937 from: N. H. Carrier and A. M. Farrag, " The Reduction of Errors in Census Populations for Statistically Underdeveloped Countries ", *Population Studies* (London), vol. 12, March 1959, pp. 240-285. Figure for 1947 is based on adjusted age distribution of Abdel-Aty, op. cit.

By " reverse-survival " of the number of children enumerated at ages 5-9 in the 1960 census, a crude birth rate of 45 and a gross reproduction rate of 2.8 were derived for 1950-1955 (table 3.1).[46] For the same period, the crude birth rate calculated from registration data for the whole country was 43.8, while for the Health Bureau localities it was 50.4.

West Africa

Cameroon. The crude birth rate and gross reproduction rate estimates shown for this country in table 3.1 are derived from reports on births in a twelve-month period, obtained in a sample survey conducted in 1960 in five departments of North Cameroon which contain about one third of the country's population.[47] The relatively moderate level of fertility indicated by these estimates is confirmed by data on age structure of the population in 1957, which are consistent with a gross reproduction rate in the range from about 1.8 to 2.0. The accuracy of the data on age structure is questionable, however, as the statistics for North Cameroon, like those for so many other countries in West, South and East Africa, show a deficit of males at ages between 15 and 35 years and an inflated proportion of female population in the child-bearing ages.

The sample survey data indicate lower fertility for Moslems than for other ethnic groups in North Cameroon. The gross reproduction rate for the Moslems was estimated at only 1.5, and the data on lifetime births for Moslem women over age 55 showed a progressive increase in average number of children for successively higher age groups, suggesting that fertility had declined from a higher level some decades ago. Twenty per cent of the Moslem women aged 40-49 years reported never having borne a child.

Some decades ago it was thought that fertility was higher in the south and the forest areas than in northern Cameroon.[48] Recent data indicate, however, that areas of relatively moderate or low fertility are not confined to the northern part of the country. In 1956, a census of the subdivision of Mbalmayo (48,000 inhabitants) in the South indicated a birth rate of 26 and a gross reproduction rate of only about 1.3.[49] A birth rate of 30 was derived from the 1958 census of Ebolowa, also in the South, but this census was confined to urban places.

Central African Republic. The indices shown in table 3.1 are based on reports of births during a twelve-month

[46] The pattern of age-specific birth rates, available only for the Health Bureau localities, was assumed to be the same for the entire country in calculating the gross reproduction rate.

[47] Cameroon, Service de la Statistique, *Enquête démographique par sondage, Nord-Cameroun* (Résultats provisoires), December 1960 (processed), pp. 15-16.

[48] Robert R. Kuczynski, *The Cameroons and Togoland; A Demographic Study* (London, Oxford University Press, 1939), p. 145.

[49] Cameroons (French Trust), Service de la Statistique Générale, *Résultats du recensement de la subdivision de Mbalmayo (1956); Population autochtone* (processed).

period obtained in a 1959 sample survey in West and Central Ubangi, representing 90 per cent of the total population of the Central African Republic.[50]

The survey data show only about 90 males for every 100 females, the disparity between the sexes being particularly large at ages 20 to 40. It is thought that the field workers may sometimes have overstated the age of adolescent girls who were married.[51] The consequent depression of the gross reproduction rate in relation to the level of the crude birth rate has already been mentioned.

More detailed data on fertility are available for Central Ubangi, which has a population of about 400,000, or about one third of the country's total. Fertility appears to be somewhat lower in this district than in the remainder of the country. This is reflected both in the age structure and in the birth rates based on the reports of vital events in the previous year. Only 35 per cent of the population was under 15 years of age, as compared with 44 per cent in the West. The crude birth rate was estimated at 39 per 1,000 and the gross reproduction rate at 2.0.[52] About a quarter of the married men in Central Ubangi had more than one wife.[53]

One reason for the lower fertility in Central than in West Ubangi is the prominence in the Central region of the Nzakara tribe, which has extraordinarily low fertility. A census of the urban centre of Bangassou in 1955 showed only 15-20 per cent of the Nzakaras to be under 15 years of age. According to one theory, the members of this tribe of former conquerors have become dispirited and lost their will to reproduce; they are said to use both contraceptive devices and abortion in their effort to avoid having offspring.[54] On the other hand, a recent medical-sociological study among these people found that many women sought help in overcoming sterility.[55] It is now thought that a high sterility rate may stem from the large number of extramarital unions in a population where over half are contaminated with venereal disease. In addition, undernourishment is thought to be a factor.

Chad. Although there is no reliable basis for estimating the birth rate of Chad, some clue to the level of fertility may be obtained from the available estimates of population distribution by two broad age groups for 1955 and three groups for 1957 and 1961. The accuracy of these data is questionable, as they show much higher ratios of children to adults in the male than in the female population, and there is no adequate basis for judging to what extent this irregularity may be due to emigration of adult males or mortality conditions rather than to errors in the data. For both sexes combined, about 40 per cent of the population was under age 15 according to the 1955 data, and 43-44 per cent under 18 in 1957 and 1961. On the basis of various ratios computed from these age distributions, matched with corresponding ratios in stable population models (assuming the expectation of life at birth to be between 30 and 40 years), the gross reproduction rate could be estimated in the range of 2.5 to 2.7. The basis for this estimate, however, is considered too weak to be satisfactory. Moreover, much higher fertility is suggested by a 1962 survey in Fort-Lamy, which gave a crude birth rate of 51.[56]

Congo (Brazzaville). The estimates for this country are based on provisional results of a sample survey carried out in 1960-1961, in regard to births during a twelve-month period.[57] The cities of Brazzaville and Pointe-Noire, having been enumerated previously, were not covered by this survey. The rates quoted in the present study are based on provisional hand tallies of data for some 36,000 persons out of the total of about 75,000 included in the sample, plus data from a complete enumeration of the 12,000 inhabitants of the urban agglomeration of Dolisie. The births reported during the twelve-month period were not tabulated by age of mother and it was therefore necessary, in estimating the gross reproduction rate, to use an age distribution derived from data collected in the survey on numbers of children ever born alive to women of each age.

Estimates of the gross reproduction rate derived from statistics of population by age groups (1955 and 1957 data as well as those from the 1960-1961 survey) are below the level indicated by the reports on births in the twelve-month period. According to various ratios computed from the age data for the female population, matched with stable population models, the estimated gross reproduction rate would be between 2.0 and 2.6. Not much confidence can be placed in such estimates based on the erratic statistics of population by age groups obtained in most African censuses and surveys.

Higher fertility was indicated by the census of the urban centre of Pointe-Noire and a survey of the prefecture of Kouilou, both in 1958. A crude birth rate of 54 was found in both places.[58] On the other hand, a crude birth rate of only 25 was found in an intensive survey carried out in 1951-1952 among a small sample of the Likouala tribe, who inhabit the central region of the country along the banks of the Congo and its

[50] Age-specific fertility rates have thus far been published only for Central Ubangi. The gross reproduction rate has been calculated by assuming the same distribution of the rates by age of mother for West Ubangi.

[51] Central African Republic, *Données de base sur la situation démographique*, op. cit., p. 15.

[52] Central African Republic, Service de la statistique générale, Mission socio-économique Centre-Oubangui, *Enquête démographique Centre-Oubangui, 1959*; méthodologie, résultats provisoires (Paris 1960), pp. 35-36.

[53] *Ibid.*, p. 29.

[54] Central African Republic, *Données de base sur la situation démographique*, op. cit., p. 59.

[55] Dr. A. Laurentin, *Etude sur les causes de la dénatalité chez les Nzakaras*, Paris, 1959. Quoted *ibid.*, p. 59.

[56] France, Institut national de la statistique et des études économiques (hereinafter designated I.N.S.E.E.), *Données statistiques* (Paris), January-March 1963, pp. 82-83.

[57] Congo (Brazzaville), Service de Statistique, and France, I.N.S.E.E., *Enquête démographique, 1960-61*; Résultats provisoires (Paris, 1961), p. 13.

[58] Congo (Brazzaville), Statistique générale, *Recensement démographique de Pointe-Noire, 1958*, by F. Ganon (I.N.S.E.E., France) (Paris, 1961), p. 59. *Données statistiques* (Paris), Oct.-Dec., 1962, p. 3.

tributaries.[59] The low birth rate of these people seemed to be due largely to a very high sterility rate; of women who had reached the menopause, 25 per cent reported never having borne a child. The drinking of sterility-producing potions was mentioned as a possible cause of this, but no evidence of it was found. The average birth interval among women having borne two or more children was found to be three years and two months. Although about 43 per cent of married men had more than one wife, polygamy was not thought to be an important factor contributing to the low fertility level, since custom forbade that the first wife be neglected when the husband took a second wife, and strictly regulated the periods during which each wife in turn was to cohabit with the husband. Prolonged lactation and restrictions on sexual relations until the child can walk are no doubt factors tending to moderate fertility, but in view of the high infant mortality rate, it was considered unlikely that the median duration of this suspension would exceed one year.

Dahomey. The estimated crude birth rate of 54 per 1,000 is derived from the 1961 sample survey data on births during the preceding year.[60] The gross reproduction rate of 3.3 shown in table 3.1 was calculated from unpublished age-specific birth rates supplied by courtesy of I.N.S.E.E.

Children under 15 years of age made up 45 per cent of the surveyed population, a percentage which is found in model stable populations having gross reproduction rates in the range of 3.2 to 3.5 and life expectancy at birth of 30 to 40 years (corresponding to the level of mortality indicated by the Dahomey survey results).

Data on age structure of the population in 1950 showed only 35 per cent of the population under age 15, which would imply a considerably lower level of fertility than estimated for 1961. The 1950 estimates, however, were considered to be of questionable reliability.[61] Fertility may have increased to some extent during recent years; the average interval between births is believed to have been shortened as a result of relaxation of taboos against intercourse following childbirth until the infant is weaned, but statistical evidence on this point is lacking.[62]

Gabon. Provisional results of a sample survey taken in 1960-1961 yielded the estimated crude birth rate of 36 and age-specific fertility rates from which the estimate of 2.1 for the gross reproduction rate was obtained.[63] The latter rate is consistent with available data on the age structure of the population for 1955 and 1956, showing the age groups under 15, and 15 and over, for 1955, and under 18, 18-59, and 60 and over, for 1956.[64] Gross reproduction rates in the range of 1.5 to 2.1 are found in model stable populations with the age structure indicated for Gabon and mortality levels consistent with what is known of the conditions of health in this country. As in many other African countries, the age data for each sex show deficits of young adult males.

It has been stated that the rural population of Gabon is decreasing, in part because of male emigration to lumbering centres and other areas of greater economic opportunity,[65] but perhaps also partly because of a low rate of natural increase. In the capital city of Libreville (17,000 inhabitants), a 1960-1961 demographic survey showed a crude birth rate of 43 and a gross reproduction rate of 2.4.[66] If it is true that the rural areas have markedly lower fertility than the capital, the extensive practice of polygamy and the prevalence of sterility-producing diseases may be contributing factors. While only about 4 per cent of adult males in Libreville were married in polygamous unions, this figure approached 30 per cent in some rural areas.

Ghana. The crude birth rate estimate of 51 for 1950-1955 and corresponding gross reproduction rate of 3.0 shown in table 3.1 were obtained by " reverse-survival " from the number of children 5-9 years old shown by a preliminary 10 per cent sample tabulation of the 1960 census results.[67] Almost the same crude birth rate for 1955-1959 (50 per 1,000) was obtained by " reverse-survival " from the 1960 data for the age group under 5 years. Birth rate estimates from census data for this age group are commonly understated because of under-enumeration of young children. While it is possible that the 1960 census in Ghana was relatively free of this particular error, there are signs of other inaccuracies in the statistics of population by age and sex obtained from this census. A deficit of males in relation to females appears in the age range 20-30 years, although Ghana is a country of net immigration rather than emigration of male workers; this deficit is probably due either to omissions in the enumeration of young men or to misstatement of ages of females, or both.

At the 1948 census, data were obtained on number of children born to each woman during her lifetime. An analysis of a sample tabulation of the results yielded an estimate of 52 for the crude birth rate. In addition, Ghana has civil registration statistics, considered to be somewhat incomplete, for a registration area consisting of urban localities which contains 12 per cent of the country's population. The crude birth rate recorded for the registration area in 1959 was 55.2.

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[59] Jean Crocquevieille, " Etude démographique de quelques villages Likouala (Moyen Congo) ", *Population* (Paris), vol. 8, July-Sept. 1953, pp. 491-510 (including comment by L[ouis] H[enry], pp. 491-492).

[60] France, I.N.S.E.E., *Données statistiques* (Paris), January-March 1963, pp. 82-83.

[61] *Demographic Yearbook*, 1960, United Nations publication, Sales No.: 61.XIII.I, table 5.

[62] Dahomey, *Enquête démographique, 1961...*, op. cit., p. 7.

[63] The age-specific birth rates were supplied by courtesy of I.N.S.E.E. (France).

[64] Age data from the 1960-61 survey were not available to the United Nations at the time of preparation of this report.

[65] George P. Patten, " Gabon ", *Focus* (publication of the American Geographical Society), vol. 12, October 1961, p. 3.

[66] Gabon, Service de Statistique, and France, I.N.S.EE., *Recensement et enquête démographiques, 1960-1961; Résultats pour Libreville* (Paris, 1962), pp. 41-42.

[67] In calculating the gross reproduction rate, the pattern of fertility by age of mother was assumed to be the same as that of Guinea.

In view of all the evidence, it seems possible that the birth rate in Ghana increased during the latter half of the 1950's, from a level which was already very high.

Generalizing for rural areas of Southern Ashanti, one writer has observed:

> "To be childless is the greatest personal tragedy and humiliation for both men and women and the larger the family the prouder is the parent. In Southern Ashanti a public ceremony of congratulation is performed for a couple who have 10 living children. . . . Even the widespread African custom which prohibits intercourse between the parents of a nursing child until it is able to walk is not practised in Ashanti. A woman is secluded for 40 days after childbirth and then given a further 40 days of convalescence. She then returns to her husband and normal sexual relations are resumed. . . . Ashanti wives say they expect to have a pregnancy every two or three years." [68]

Among Ashanti girls, menstruation usually begins about the sixteenth year, and by the next year the first marriage takes place.[69] The Ashanti ethnic group numbered more than a fifth of Ghana's total population in 1948, and the customs of this group are influential in determining national patterns.

Guinea. The demographic sample survey of Guinea was carried out in 1955 by the French Administration. The extraordinarily high value of 62 for the crude birth rate was derived from the reports on births during the twelve months preceding the survey. The high value of this rate was due partly to a highly abnormal population structure with a very low ratio of males to females (only 90.8 males per 100 females in the population as a whole). This, in turn, was said to be due partly to seasonal emigration of males to Senegal.[70] The gross reproduction rate, which is calculated in relation only to the female population of child-bearing age, is also very high (3.4), but better aligned with the rates for neighbouring West African countries.

As has been mentioned in the case of the Sudan, it is possible that the birth rate is exaggerated as a result of a tendency to extend the reference period for which births were reported beyond the specified twelve months. Moreover, it is possible that re-surveys undertaken as part of the verification procedure may have led to some over-counting of vital events.[71]

The distribution of population by single years of age, which is available for Guinea, makes it appear likely that there was under-enumeration of children aged one and two years and over-enumeration of infants under one year of age, as the numbers reported at ages 1 and 2 were only about half as large as the number under 1 year. If the enumerators or respondents had a tendency to report an age of less than 1 year for children past their first birthday, it is likely that a corresponding error might also have affected the reports of births, tending to exaggerate the number having occurred during the twelve months preceding the survey. A possible cause of deficient reporting of children at age 2 is exaggeration of their ages, so that some would appear at age 3 or higher.[72]

Alternative estimates of the crude birth rate were made by "reverse-survival" from the statistics of population by age groups. From the number of children reported in the age group under 5 years, a birth rate of 54 was estimated for 1950-1955, and from the number in the age group 5-9, a rate of 61 for 1945-1950. The former estimate is likely to be understated because of the under-enumeration of children 0-4 years of age which is usual in censuses and sample surveys. On the other hand, the rate derived from the reported number of children aged 5-9 may be an over-estimate, as there is a possibility of this age group having been exaggerated in the survey returns by understatement of the ages of children who were actually 10-14 years old. Such a possibility is suggested by the fact that the reported number of girls aged 10-14 is markedly deficient.[73]

Although no exact estimate of the level of fertility in Guinea is possible on the basis of present information, the results of the various calculations point to the conclusion that it is at least fairly high and possibly very high.

Women marry even younger in Guinea than in most other African countries, according to the survey results. At ages 15-19, 79 per cent of girls were reported as married, and by age 20, 96 per cent had been married at least once. These are the highest figures reported for West African countries. Polygamy is common, as evidenced by the fact that 38 per cent of all married women were in polygamous unions. Age-specific fertility rates were slightly lower for women in polygamous than for those in monogamous marriages.[74]

Ivory Coast. The estimated crude birth rate of 55 per 1,000 is based on reports of births during a twelve-month period obtained in a 1957-1958 sample survey of the whole country conducted by the French administration. As the publications of the survey results do not include data by age groups for all surveyed areas, it was necessary to resort to estimates in calculating the gross reproduction rate of 3.0 shown in table 3.1. The data used for this purpose were a distribution of

[68] Meyer Fortes, "A Demographic Field Study in Ashanti", in Frank Lorimer and others, op. cit., p. 265.

[69] *Ibid.*, p. 297.

[70] *Etude démographique par sondage en Guinée, 1954-1955...*, op. cit., p. 7.

[71] It is reported, for example, that whenever infant deaths were considered to have been grossly under-reported in a village, a team was sent to reinterview the women. Quoted in Ranjan Kumar Som, "On Adjustments for Non-Sampling Errors and Biases in the Estimation of Vital Rates", paper prepared for the International Population Union Conference, Ottawa, 1963, pp. 2-3.

[72] *Etude démographique par sondage en Guinée, 1954-1955 . . .*, op. cit., p. 8.

[73] This cohort was born during 1940-1945 and the possibility of a depressed birth rate during the war years has also been mentioned. *Ibid.*, p. 12. The structure of the male population does not show such a deficit, however. In applying the method of "reverse-survival", survival ratios from the United Nations model life table with expectation of life at birth of 27.5 years, corresponding to the level of mortality found in the 1955 survey in Guinea, were used. This level of mortality is somewhat higher than that derived from sample surveys in most other African countries. If it were over-estimated, the effect would be a slight tendency to exaggerate the estimate of the birth rate.

[74] *Ibid.*, pp. 42-43.

population by sex and broad age groups for 1961, pertaining to the whole country, furnished by the Government of the Ivory Coast to the Statistical Office of the United Nations, and more detailed age distributions of population and births by age of mother derived from the 1955-1956 survey of Bongouanou district[75] and the 1957-1958 survey of the First Agricultural Sector of the Ivory Coast.[76]

Bongouanou is a coffee and cocoa plantation area with a relatively high level of living, in the eastern forest region of the country. In the 1955-1956 survey of this area, women were asked to report on births in more than one twelve-month interval. Approximately the same crude birth rates, in the range of 54-55 per 1,000, were indicated for 1953 and 1954, and the gross reproduction rate for the whole period covered was estimated at 2.8. The survey data on sex-age structure of the population displayed the irregular features common in such data for tropical African countries: an abnormally high proportion of females of reproductive ages and a deficit of males in young adult age groups, although there had been recent immigration of young unmarried men into the area.

Instability of marriage is a serious social problem in Bongouanou.[77] It is reported that women who are widowed or divorced during their child-bearing years generally remarry without much delay, but there is no available measure of the average length of intervals between widowhood or divorce and remarriage. Sterility is reported to be a frequent cause of divorce. Numerous children are considered to be a source of prestige. Certain abortifacient and contraceptive devices are known but are said to be little used.

In the Bongouanou survey, unlike most other surveys in tropical Africa, the data obtained on numbers of children born to women during their lifetime indicated a higher fertility level than was estimated on the basis of the reports of births during the recent periods. An average of 6.5 children was reported by women past reproductive age, the highest average reported in any of the African surveys, corresponding to a gross reproduction rate of 3.2.

The First Agricultural Sector, surveyed in 1957-1958, includes Agboville, Aboisso, Grand-Bassam and Lagunes, and has about 6 per cent of the population of the Ivory Coast. The survey was confined to rural areas. A crude birth rate of 59 and a gross reproduction rate of 3.7 were calculated from the reports of births during a twelve-month period.

Mali. The estimate of 56 for the crude birth rate is based on provisional results of a 1960-1961 survey with regard to births during a twelve-month period.[78] Detailed age data were not available for all the surveyed areas at the time of preparation of the present report. The gross reproduction rate of 3.4 was estimated on the assumption that the data available for Haute Vallée, Sikasso and Koutiala on age structure of population and age pattern of fertility rates were representative of the whole country. For these areas, individual crude birth rates were 53, 58 and 52, respectively, with corresponding gross reproduction rates of 3.4, 3.1 and 3.2.

In the country as a whole, the survey data show 43 per cent of the population to be under 15 years of age. The detailed data on population by sex and age available for some areas show the usual irregularities: deficit of males and an abnormally high ratio of the age group 20-30 to the age group 10-20 in the female population.

Niger. The very high crude birth rate of 61 per 1,000 (for sedentary population) is derived from 1959-1960 sample survey reports on births during a twelve-month period.[79] The estimated gross reproduction rate of 3.5 has been calculated from unpublished age-specific birth rates.[80] According to the survey data, 43.8 per cent of the population is under 15 years of age. This percentage is found in stable population models having gross reproduction rates between 3.0 and 3.2 and expectation of life at birth between 30 and 40 years.

Nigeria. For the Federation of Nigeria, demographically the most important country in Africa, with more than 35 million inhabitants in 1960, the basis for fertility estimates is still very weak. For nearly a hundred years under the former British administration, attempts were made to develop an effective civil registration system, but the records instituted afforded no statistics on which estimates of vital rates for the country as a whole could be based.[81] This state of affairs continues at present, although official vital statistics of unknown degree of completeness are published for Lagos, the capital city, and records thought to have some possible statistical value are maintained in a part of Northern Nigeria.[82]

The age structure of the population, set forth in five broad age groups at the 1952-1953 census, affords the only present basis for estimating the fertility level. The gross reproduction rate estimate in the range of 3.6-3.8 and the crude birth rate estimate of 53-57 shown in table 3.1 were obtained by calculating various age ratios from these data and comparing them with corresponding ratios in stable population models, assuming levels of mortality that appeared to be appropriate for Nigeria.

The age ratios used for this analysis were selected with the aim of minimizing the effects of suspected

[75] Ivory Coast, Service de la statistique et de la mécanographie, *Enquête nutrition - niveau de vie, subdivision de Bongouanou, 1955-1956*, Paris, 1958.

[76] Ministère de la France d'Outre-mer, Service des statistiques, *Etude démographique du premier secteur agricole de la Côte d'Ivoire, 1957-1958; Résultats provisoires*, Paris, 1958.

[77] J.-L. Boutillier, *Bongouanou, Côte d'Ivoire. Etude socio-économique d'une subdivision.* Paris, Berger-Levrault, 1960. Reviewed in *Population* (Paris), vol. 16 (January-March 1961), p. 145.

[78] Data furnished to the Statistical Office of the United Nations.

[79] France, I.N.S.E.E., *Données statistiques* (Paris), January-March 1963, pp. 82-83.

[80] Supplied by courtesy of I.N.S.E.E.

[81] Robert R. Kuczynski, *Demographic Survey of the British Colonial Empire*, vol. I, West Africa (London, Oxford University Press, 1948), p. 634.

[82] An unofficial crude birth rate of 49 for 1957 has been published, but the source is unknown. See *Demographic Yearbook*, 1961, United Nations publication, Sales No.: 62.XIII.I.

biases in the census data on age structure. Possibilities of bias are indicated by the following ratios of males per 100 females calculated from the data:

All ages	96	7-14 years	118
Under 2 years	97	15-49 years	88
2-6 years	103	50 years and over ..	85

The deficit of males at ages 15-49 might be due to emigration of workers, but there are no adequate statistics on this subject. Nigeria is not known as a large exporter of migrant labour, and seasonal migration is believed to be confined mainly within the borders of the country. The same questionable masculinity ratios are evident in separate tabulations by age and sex for the northern, western, and eastern regions, suggesting systematic omissions in enumeration or misreporting of ages rather than effects of migration. Exaggeration of the ages of adolescent girls is another possible explanation of the high ratio of males to females at ages 7-14 and the low sex ratio at ages 15-49. The sex ratio of 97 for ages under 2 years is inconsistent with the normal excess of males over females at birth observed in many parts of the world, even allowing for high infant mortality.

The estimate of the birth rate for the population as a whole is approximately in the same range as the registered rate in Lagos, which has varied in recent years between 50 and 60. Registration in Lagos, however, is of unknown completeness, and the birth rate may be exaggerated as a result of the inclusion of non-resident births occurring in the city's hospitals.

Portuguese Guinea. Birth statistics are available for Portuguese Guinea, but the registered crude birth rates for 1945-1949 are too low to be credible. The detailed age classification available from the 1950 census exhibits major irregularities, caused either by migration or errors in enumeration and reporting of ages. The fertility indexes shown in table 3.1, a crude birth rate of 47 and a gross reproduction rate of 2.4, have been estimated by " reverse-survival " of this population and are subject to the limitations of the census data. It was assumed that the pattern of fertility by age of mother estimated for Angola is applicable to Portuguese Guinea for the purpose of calculating the gross reproduction rate.

Senegal. Provisional results available from a sample survey covering the whole of Senegal, carried out in 1960, gave a crude birth rate of 40 per 1,000 on the basis of reports of births during a twelve-month period.[83] The provisional 1960 figures show 41 per cent of the population to consist of children under age 15. This percentage suggests a higher fertility level than would be consistent with the reported crude birth rate of 40. Detailed age classifications from the 1960 survey had not been published at the time of preparation of this report. In the absence of additional information which would shed light on the apparent inconsistency noted above, there seems to be no satisfactory basis for estimating the fertility level at present.

In 1957, a survey was conducted in the middle valley of the Senegal River, which forms the boundary between Senegal and Mauritania, and which includes approximately 350,000 inhabitants, about three-fourths of them on the Senegal side of the river. Those on the Senegal side constituted about 10 per cent of the estimated total population of Senegal in 1957. An estimated crude birth rate of 45 and gross reproduction rate of 2.8 were derived from these survey data on births during a twelve-month period.[84]

Togo. The fertility estimates for Togo are based on reports of births during a twelve-month period obtained in a sample survey conducted in 1961 to supplement the information derived from a general census taken during 1958-1960.[85] Only provisional results of the survey, not including age-specific fertility rates, were available at the time of preparation of the present report. The estimate of the gross reproduction rate (3.3) was obtained by assuming the age pattern of fertility rates to be the same as that of Guinea. The 1958-1960 data on age structure of the population give further evidence of high fertility, showing 47 per cent of the population to be under age 15. Various age ratios computed from these statistics correspond to stable population models having gross reproduction rates in the range of 3.0 to 3.8. Earlier estimates, for 1952, 1956 and 1957, showed only 40-42 per cent of the population under age 15.

Upper Volta. The estimated crude birth rate of 49 per 1,000 is based on provisional results of a 1960-1961 sample survey with regard to births during a twelve-month period.[86] The sample was considered to be representative of the whole population of the country with the exception of the communes of Ouagadougou and Bobo-Dioulasso, which had a population of 100,000 out of 4.4 million for the country as a whole. The estimated gross reproduction rate of 2.9 is slightly lower than the rate published in the survey report (3.0). The latter rate was computed from age-specific fertility rates referring to a slightly larger total number of births than the number to which the crude birth rate relates. The age-specific rates were accordingly adjusted slightly downward in computing the estimated rate of 2.9 for comparability with the crude rate.

A " reverse-survival " estimate of the crude birth rate based on survey data of population by age groups confirms the moderately high level of fertility, the estimated rate being in the low 50's. The data on popula-

[83] France, I.N.S.E.E., *Données statistiques* (Paris), January-March 1963, pp. 82-83.

[84] France, I.N.S.E.E., *La moyenne vallée du Sénégal* (Etude socio-économique), by J.-L. Boutillier *et al.* (Paris, Presses Universitaires, 1962), pp. 39-41. The crude birth rate is officially given as 44.6 and the gross reproduction rate computed from published age-specific birth rates is 2.9. However, the data used for calculating the crude birth rate and age-specific fertility rates were collected in a different manner — the former from the head of the household, the latter from women — and these data are not exactly the same. It has been estimated that the published crude birth rate of 44.6 corresponds to a GRR of 2.8, while the GRR of 2.9 corresponds to a crude birth rate of 47.

[85] Togo, Service de la statistique générale, *Bulletin de statistique* (Lomé), No. 3, 1962, pp. 1-3.

[86] Upper Volta, Service de statistique, and France, I.N.S.E.E., *La situation démographique en Haute-Volta. Résultats partiels de l'enquête démographique* 1960-1961 (Paris, 1962), p. 37.

tion by sex and age for Upper Volta, contrary to the usual pattern for West, South and East African countries, show an excess of males over females in the total population, although thousands of workers are said to go each year to other countries, particularly the Ivory Coast and Ghana, where they remain for varying periods.[87] The Upper Volta data, however, like those for other countries in the region, show a marked deficit of females at ages 10 to 20 and an excess at ages 20 to 24, probably due to age misreporting.

Age-specific fertility rates based on the survey data on births during the twelve-month period were cumulated for successive age groups and compared with survey reports on numbers of children born to women during their lifetime. The cumulated rates agreed well with the reported average lifetime numbers of births per woman up to the age of about 30 years. At higher ages, the two series diverged, confirming the supposition that older women commonly understated the number of children born during their lifetime.[88]

South and East Africa

Angola. The only official data on live births in Angola, supplied by the Portuguese Government, represent baptisms recorded in church registers. Birth rates derived from these reports are so far understated that they give no indication at all of the fertility level.

The estimated rates shown in table 3-1 were calculated by " reverse-survival " from 1950 census data, tabulated in five-year age groups.[89] The census data provide only a weak basis for such estimates. For the " non-civilized " population, which is the vast majority, the census has been described as an estimate based on the poll-tax registers.[90] Every adult male is issued a tax booklet in which are recorded, in addition to his tax payment, the names of his wife (or wives) and children, and their birth dates. The statistics show a marked deficit of males and a disproportionately large number of females in the age groups 15-49. The records do not indicate any sizeable emigration of workers, although there is undoubtedly some clandestine movement.

The system of contract labour in Angola may have a depressing effect on the fertility of marriages. According to an unofficial statement, in 1954 there were 379,000 contract labourers and 420,000 " free ". Contracts for work outside the labourer's area are generally for two years, within his area for periods of up to one year.[91]

Basutoland. This colony of the United Kingdom is an enclave within South Africa, with a population composed almost entirely of native Africans. Less than one half of one per cent are of white, Asiatic or mixed race.

At the 1956 census of the African population, the number of males was exceeded by females in the ratio of 73 to 100. Not included in the census total of 638,856 were 112,790 male and 41,992 female absentees, persons working in South Africa for the most part.[92] Immediately following this enumeration, a social survey was conducted of a sample of African households. From the additional demographic data collected, the crude birth rate of 40 given in table 3.1 was obtained. Age-specific fertility rates furnished to the United Nations by the Government of Basutoland were used in calculating the gross reproduction rate of 2.4.

Bechuanaland. The statistics of population by sex and age obtained in the census of 1946 provide the only basis for estimates of the level of fertility in this country. From these data, the rates shown in table 3.1 were estimated by " reverse-survival ".[93] The age reports in the census were admittedly approximations for all but young children.

Genealogical data for some 4,600 women compiled in an anthropological study in 1943 indicated an average of 2.54 daughters per woman having reached the menopause [94] — slightly lower than the estimated gross reproduction rate of 2.7 derived from the census data. These genealogical data may be more reliable than the results of most census or demographic sample survey inquiries on lifetime fertility of women past reproductive age. A correction was made for omissions in reporting of children who had died.

The census data show nearly equal numbers of males and females, despite the well-known fact that Bechuanaland is a source of manpower for mining and other industries in neighbouring countries. In this census, however, known absentees were included, their number amounting to about 13 per cent of the male population over 15 years of age. It was estimated that the average number of men away from home in 1938-1940 was approximately 28 per cent of the total adult male population, and that the corresponding proportion for married men was somewhat less than one-fourth. Men working in the mines commonly return home at harvest time, while those in other occupations generally stay away much longer. In addition to the possible direct effect of the absence of married men tending to diminish fertility, the effects of by-products of the labour migration system have to be taken into account, including detribalization, deferred marriage and heightened incidence of venereal disease. However, as mentioned in a preceding section of this chapter, a sample study of women's reproductive histories in relation to their husbands' migration and employment histories failed to show conclusive evidence that migration lowered fertility.[95]

Burundi. Under the Belgian administration of the former Trust Territory of Ruanda-Urundi, to which

[87] *Ibid.*, p. 7.

[88] *Ibid.*, p. 39.

[89] In calculating the gross reproduction rate, the pattern of fertility by age of mother was estimated from census data on the number of children ever born to women, classified by age groups of the women.

[90] Lord Hailey, op. cit., p. 137.

[91] *Ibid.*, p. 1374.

[92] Basutoland Government, *Basutoland 1956 Population Census; Report by D. H. Taylor, Census Officer* (Maseru, 1958), p. 19.

[93] The age pattern of fertility estimated for Angola was assumed to be applicable to Bechuanaland in calculating the gross reproduction rate.

[94] I. Schapera, *Migrant Labour and Tribal Life*, op. cit., pp. 22-23.

[95] *Ibid.*, pp. 188-189.

Burundi belonged before gaining independence in 1962, estimates of vital rates were arrived at by means of annual demographic sample surveys.[96] The rates shown in table 3.1 were derived from the results of the latest and most comprehensive of these surveys, carried out in 1957. Previous surveys yielded crude birth rates of 49 in 1952, 44 in 1954, 43 in 1955, and 52 in 1956. The estimated rate for 1957 is 47. If the results of the successive surveys are comparable, Burundi's birth rate is remarkably unsteady.

In the report of the 1957 survey, the age classification of the population was given in broad groups only, but a detailed age distribution was given in the report of the 1953-1954 survey.[97] The 1953-1954 data were used in conjunction with the broad groups of the 1957 distribution to obtain estimates of the female population of child-bearing age by 5-year age groups, for the purpose of computing the 1957 gross reproduction rate. It was assumed that the pattern of fertility by age of mother was like that of Upper Volta.

There were only 85 males per 100 females in the population according to the 1957 survey results, and the ratio was even lower among adults.

Congo (Leopoldville), On the basis of information obtained in a sample survey in 1955-1957, birth registration in the former Belgian Congo was estimated to be about 83 per cent complete. The crude birth rate of 43 and the gross reproduction rate of 2.4 shown in table 3.1 were computed from the number of births reported in this survey for the preceding twelve months.

Women outnumbered men in the population enumerated in this survey, the ratio of males to females being particularly low in the ages from 15 to 45. The survey report emphasizes that very few Congolese know their ages with any degree of exactness, and it is believed that there was some exaggeration of the ages of girls under 15 who had borne children. Moreover, some boys aged 15-19 were probably reported at younger ages to escape taxation.[98]

Women in polygamous unions were shown by the survey results to constitute about 30 per cent of all married women. This percentage was found to rise at successively higher ages, suggesting that polygamy might be on the decline, though the differences might possibly be explained merely by the fact that men take a second wife (or a third, etc.) more commonly later in life than when they and their first wives are young. If it is true that polygamy has been declining in the Congo, this might be a factor tending to increase fertility in the course of time, though not necessarily so, for the reasons mentioned in a previous section.

The survey revealed several areas of low fertility in the country resulting mainly from exceedingly high proportions of childless women. In certain districts, the proportion of women aged 45 years and over reported as never having borne a child reached the high level of 35 per cent. Low fertility was found especially in districts where venereal disease was widespread.[99]

Kenya. The fertility indices shown in table 3.1 for Kenya were derived from 1948 census data for the African population, on the number of children reported as having been born to each woman during her lifetime. The calculations were based on the data for women within the potentially reproductive age group, adjusted with regard to the age distribution of these women and the pattern of age-specific fertility rates.[100] In view of the understatement of reports on lifetime numbers of births noted in many other censuses, it appears possible that the fertility rates estimated on this basis for Kenya might be understated. However, reporting of lifetime births is generally most deficient for older women past reproductive age,[101] and the techniques adopted in computing the fertility indices for Kenya made use of the data for women still in the child-bearing span.[102] Moreover, the fertility level indicated by the estimates is rather high, exceeding the levels estimated for other countries in East Africa.

Some confirmation of the high level of fertility estimated for this country may be seen in the fact that 49.4 per cent of the male and 43.8 per cent of the female African population were reported in the census as not yet having reached puberty. The average age of puberty was estimated at 16 years for males and 14 years for females. The reported proportion of males not having reached puberty might have been exaggerated as a result of omission of some adult males in the census enumeration; thus the data for females seem to afford a surer indication of the fertility level. Gross reproduction rates of 3.3-3.6 and crude birth rates of 49-55 per 1,000 are found in model stable populations having about 44 per cent under 14 years of age and mortality levels seemingly appropriate to Kenya's circumstances.

A sample survey carried out in 1957-1958 in the South Nyanza rural district of Kenya revealed a crude birth rate of 46,[103] only slightly lower than that estimated for the African population of the country as a whole

[96] *Rapports soumis par le Gouvernement belge à l'Assemblée générale des Nations Unies au sujet de l'administration du Ruanda-Urundi pendant les années, 1952, 1954, 1955, 1956, 1957*, Brussels, 1953 and 1955-1958.

[97] Victor Neesen, "*Aspects de l'économie démographique du Ruanda-Urundi*", *Bulletin de l'Institut de Recherches Economiques et Sociales* (Louvain), vol. 22, August 1956, p. 480.

[98] Congo, Service des statistiques, *Tableau général de la démographie congolaise. Enquête démographique par sondage, 1955-1957. Analyse générale des résultats statistiques.* (Léopoldville, 1961), p. 23.

[99] *Ibid.*, p. 48.

[100] J. G. C. Blacker, "The Demography of East Africa", in: *The Natural Resources of East Africa*, E. W. Russell, ed. (Nairobi, English Press, 1962), pp. 32-33. The method of adjustment was devised by Brass and Myburgh. W. Brass, "The Derivation of Fertility and Reproduction Rates from Restricted Data on Reproductive Histories", *Population Studies* (London), vol. 7, November 1953, pp. 137-166; C. A. L. Myburgh, "Estimating the Fertility and Mortality of African Populations from the Total Number of Children Ever Born and the Number of These Still Living", *Population Studies*, vol. 10, November 1956, pp. 193-206.

[101] "Analysis of African Demographic Data as an Aid for Economic and Social Planning", by Frank Lorimer. (United Nations, E/CN.14/ASPP/L.6—E/CN.9/CONF.3/L.6, 10 August 1962), p. 14.

[102] See the Brass and Myburgh works mentioned above.

[103] J. G. Grounds, "The Population Structure and Some Vital Statistics of a Rural Area in Kenya", *East African Medical Journal*, vol. 36, December 1959, pp. 644-648.

by the methods described above. In this survey a population register was made of persons living in all households in selected areas, and the same households were revisited after one year to determine the changes which had occurred in household menbership through births, deaths or migration.

Europeans and other non-indigenous groups, excluded from the base data for the fertility estimates, amounted to 3 per cent of Kenya's population in 1948.

Madagascar. The crude birth rate of 45 and the gross reproduction rate of 2.4, shown in table 3.1 for Madagascar, 1950-1954, were estimated by "reverse-survival" from 1960 estimates of population by sex and age groups. The pattern of fertility by age of mother was assumed to be the same as that of Mauritius in computing the gross reproduction rate.

Since 1878, a form of civil registry has been maintained in Madagascar. Statistics of births have been recorded for the various tribes separately and for the city and province of Tananarive as well as the whole country. The data are incomplete and have little value for purposes of indicating fertility levels and trends. For the past 15 years, registered birth rates for the whole country have ranged from 32 to 37 per 1,000 population. It has been estimated that in 1961 birth registration was about 78 per cent complete. The corrected birth rate, according to this estimate, was 47 per 1,000.[104]

In Tananarive Province, where birth registration has been better than in most other parts of the country, the registered birth rates for the years 1946 to 1949 averaged 43.[105] This province is inhabited by the Merino tribe, who are considered to have the highest cultural level of the indigenous peoples of the country. On the basis of a sample survey of 58 rural cantons in Tananarive Province, a crude birth rate of 50 and a gross reproduction rate of 3.2 were estimated for 1956.[106] A 1957 survey gave a birth rate of 52 for this province.[107] Information on the quality of data obtained in these surveys is lacking. Data on sex and age structure of the population show an excess of males over females in Tananarive Province, while a deficit of males appears in the statistics for the country as a whole, reaching substantial proportions in the middle adult ages.

All that is known of attitudes toward procreation in Malagasy society points to the probability of a high birth rate. There is a strong reverence for ancestors, which inspires a desire for many children to perpetuate the line. The importance attached to reproduction may in part explain the sexual liberty permitted to young unmarried people and the practice of a kind of trial marriage.[108] Polygamy, although forbidden by law since 1878, still survives in some tribes.

Mauritius. A fairly accurate historical series of birth registration statistics for Mauritius extends back to the beginning of the twentieth century or even earlier,[109] and the quality of the current statistics is high. Up to the second decade of the twentieth century, the crude birth rate fluctuated around a level of 36-37 per 1,000; it fell to a low level of 30.9 for the average of 1930-1934, then recovered and continued on an upward trend to a peak of nearly 50 per 1,000 in 1950. Some of the post-war rise was undoubtedly due to temporary influences, such as the making up for marriages and births which had been postponed owing to the war.[110] Other explanations have included improved health conditions, a relatively prosperous period in the sugar industry and a stepped-up marriage rate.[111] After 1950, the birth rate trend again turned downward and it appears to have been stabilized near 40 per 1,000 since 1958. The gross reproduction rate reached the level of about 3.0 at the post-war peak and has been in the range of 2.7-2.8 since 1958 (*see* table 3.5).

In this small island, with an estimated population density now reaching about 350 persons per square kilometre, the prospects for future trends of fertility and population growth are a matter of vital concern. A committee appointed by the Government in 1953 to consider the problem of population growth in relation to the standard of living recommended education in family planning, warning that if the birth rate were not lowered voluntarily, population growth might eventually be checked by rising mortality.[112] More recently, the Titmuss Mission strongly recommended the adoption of a vigorous campaign to promote family planning as part of a broad programme of social policies.[113]

Mozambique. The fertility estimates for this territory of Portugal were made by "reverse-survival" from the number of young children reported in the 1950 census. In calculating the gross reproduction rate, the pattern of fertility by age of mother was esti-

[104] Alfred Sauvy, "La République de Madagascar: Population, économie et perspectives de développement", *Population* (Paris), vol. 17, July-September 1962, p. 444. The basis of the estimate of completeness of registration is not stated.

[105] Louis Chevalier, *Madagascar, populations et ressources*, France, I.N.E.D., Cahier No. 15 (Paris, Presses Universitaires de France, 1952), p. 79. In discussing the probable future growth of Madagascar's population, Chevalier estimated that the birth rate for the country as a whole might be about 44, and assumed that it might remain constant at that level (p. 80).

[106] Haut Commissariat de la République française à Madagascar, *Bulletin mensuel de statistique* (Tananarive), No. 26, November 1957, p. 5.

[107] France, I.N.S.E.E., *Données statistiques*, January-March 1963, p. 83.

[108] Louis Chevalier, *op. cit.*, p. 46; George Peter Murdock, *Africa, Its Peoples and Their Culture History* (New York, Mc-Graw-Hill, 1959), p. 219.

[109] Robert R. Kuczynski, *Demographic Survey of the British Colonial Empire*, vol. II, East Africa (London, Oxford University Press, 1949), p. 850 *et seq.* The author considered vital registration to have been fairly complete "for many decades".

[110] Mauritius, Legislative Council. *Social Policies and Population Growth in Mauritius*; Report to the Governor of Mauritius by Richard M. Titmuss *et al.* Sessional Paper No. 6 of 1960 (London, Methuen, 1961), p. 51.

[111] H. C. Brookfield, "Mauritius: Demographic Upsurge and Prospect", *Population Studies* (London), vol. 11, November 1957, p. 106; Mauritius, Central Statistical Office, *Natality and Fertility in Mauritius, 1825-1955* (Port Louis, 1956), pp. 12-13.

[112] Mauritius, Legislative Council, *Report of the Committee on Population, 1953-54*; Sessional Paper No. 4 of 1955.

[113] Mauritius, Legislative Council. *Social Policies . . .*, op. cit., pp. 63, 186-187, 240-245.

Table 3.5. Fertility trends in Mauritius: 1900-1961

Year	Crude birth rate (births per 1,000 population)	Gross reproduction rate
1900-1904	36.9	...
1905-1909	36.1	...
1909-1913	37.5 [a]	2.2 [b]
1910-1914	38.4	...
1915-1919	35.6	...
1919-1923	36.3 [a]	2.2 [b]
1920-1924	37.3	...
1925-1929	37.5	...
1929-1933	31.6 [a]	2.0 [b]
1930-1934	30.9	...
1935-1939	33.8	...
1940-1944	34.0	...
1942-1946	37.3 [a]	2.2 [b]
1950-1954	46.3 [a]	3.0 [b]
1955-1959	41.5	2.8
1955	41.8	2.8
1956	43.8	3.0
1957	43.1	3.0
1958	40.8	2.8
1959	38.5	2.7
1960	39.6	2.8
1961	39.8	2.8
1962	38.6	...

[a] Rates were derived by relating the average annual number of births in the specified five-year period to the population shown by the census at approximately the middle of the period. Hence the rates may differ slightly from rates shown in other studies which were computed on a population base obtained by averaging mid-year estimates for the year concerned.

[b] In calculating the gross reproduction rate, the distribution of fertility rates by age of mother for 1955 was used, this being the first year for which tabulations of births by age of mother were available.

mated from census data on the number of children ever born to women. The Mozambique census was conducted in the same way as that of Angola, by resorting to the poll-tax register, and the estimates of the crude birth rate and the gross reproduction rate obtained for Mozambique are about the same as those for Angola. The reliability of these estimates is poor. It may be true or not that fertility is somewhat lower in Mozambique and Angola than in many other African countries, as the estimates imply. In Mozambique, as in Angola, large numbers of men migrate from their native villages for long periods of work, often at a great distance. At least 200,000 Africans from Mozambique were estimated to be employed outside the country in 1954.[114] This figure amounts to 3 per cent of the estimated population of Mozambique in 1954.

Réunion. Like Mauritius, Réunion is a small, densely populated island far off the African coast in the Indian Ocean. Réunion also has "complete" birth registration statistics. The trend of the birth rate cannot be reliably traced back very far, however, because no accurate census of the population was taken until 1954.[115] A revised series of population estimates for earlier

[114] Lord Hailey, op. cit., p. 137.

[115] A[lfred] S[auvy], "La population de la Réunion", "Notes et Documents", *Population* (Paris), vol. 10, July-September 1955, p. 541. The 1946 census overstated the population by more than 16,000.

Table 3.6. Fertility trends in Réunion: 1946-1960

Year	Crude birth rate (births per 1,000 population)	Gross reproduction rate
1946-1949	42.4	...
1950-1954	49.4	...
1955-1959	46.7	3.2
1952	51.3	3.4
1953	51.2	3.4
1954	49.6	3.4
1955	49.2	3.4
1956	47.7	3.3
1957	47.3	3.3
1958	45.2	3.2
1959	44.2	3.1
1960	44.3	3.1

years was prepared on the basis of the 1954 census returns, and crude birth rates were calculated from the registration data from 1946 onward.

The trend of the birth rate in Réunion since 1946 has been nearly parallel to the trend in Mauritius, at an appreciably higher level. The crude birth rate rose from 42.4 for 1946-1949 to a peak of 51.3 in 1952, then declined steadily to 44.3 in 1960. The gross reproduction rate likewise has followed a declining trend since 1955 (table 3.6). Government statisticians attributed the increasing birth rate during the early post-war years to improved health conditions and social legislation.[116] An increase in marriages appears to have been another factor; 1949 and 1952 were the peak years of the marriage rate. Most of the subsequent decline of fertility occurred in the age-specific fertility rates for women 20-29 years old. The cause and the prospects for continuation of this trend in the future are uncertain. Up to the present, the death rate has declined more rapidly than the birth rate, so that the rate of natural increase has speeded up. An increase of 3.4 per cent per annum has been recorded in some recent years.

Federation of Rhodesia and Nyasaland. The estimates of fertility indices shown in table 3.1 for the African population of Northern and Southern Rhodesia were derived from data on births during twelve-month periods obtained in the 1950 sample survey of Northern Rhodesia and the 1953-1955 survey of Southern Rhodesia. The Southern Rhodesian survey covered only the African population in the villages, excluding the urban areas, which contained 15 per cent of the estimated total African population of Southern Rhodesia in 1950. Europeans and other ethnic groups excluded from the survey data represented 2 per cent of the total population in Northern Rhodesia in 1951 and 7 per cent of the total in Southern Rhodesia in 1951. "Complete" registration statistics for Europeans in both these parts of the Federation are on record.

As the reports of the Rhodesian surveys do not include age-specific fertility rates, it was necessary to estimate

[116] France, I.N.S.E.E., *Annuaire statistique de la Réunion, 1952-55* (Paris, Imprimerie Nationale, 1956), p. 18.

the age pattern of fertility in order to derive estimates of the gross reproduction rates. This was done by assuming the same pattern as shown for Angola. For Southern Rhodesia, rough estimates of the population by five-year age groups based on the 1953-1955 survey were available.[117] For Northern Rhodesia the survey report gives only broad age groups; the five-year groups for the female population of child-bearing ages were estimated on the basis of detailed data on sex-age composition of the Yao tribe of Nyasaland.[118]

Another sample survey of the African population in Southern Rhodesia, taken in 1948, yielded a crude birth rate of 46 — approximately the same as the estimate for 1954.

For Nyasaland, satisfactory data are lacking for estimates of the crude birth rate and other fertility measures. The 1945 census provided data on four age groups of the population of each sex, but the irregularities of these data are so pronounced that no definite indication of the fertility level can be derived. Only 86 males were enumerated for every 100 females, and in the age group 18 years and over, the sex ratio was only 68. Even when adult males were eliminated from the comparisons, indices computed from the age structure corresponded to those of model stable populations covering a wide fertility range, i.e., gross reproduction rates of from 2.2 to 3.8.

The survey data for Southern Rhodesia show a nearly balanced sex ratio, while the ratio indicated for Northern Rhodesia is only 95 males per 100 females. Females past puberty form a larger percentage of the total female population in Northern Rhodesia (about 30 per cent), according to the survey data, than in Southern Rhodesia (25-27 per cent in the surveys of 1948 and 1953-1954). Because of these apparent differences in population structure, the estimated gross reproduction rates (3.5 for Northern and 3.1 for Southern Rhodesia) are probably better than the crude birth rates as a basis for comparing the fertility levels in the two areas, in spite of the fact that the gross reproduction rates were estimated without exact information on the age pattern of fertility or details of age composition of the female population.

A notable feature of the demography and economy of the two Rhodesias is the large number of migrant workers employed in the urban centres. Migrants are drawn from neighbouring countries, especially Nyasaland and Mozambique, as well as from the rural parts of Northern and Southern Rhodesia. Strict government regulations provide that workers moving within each of the three units of the Federation cannot stay away from home more than two years unless accompanied by their families.[119] The effects of this movement on fertility are not clear.

Rwanda. For Rwanda (a part of the former Belgian Trust Territory of Ruanda-Urundi before gaining independence in 1962), the estimated fertility rates are based on the results of the demographic sample survey conducted in 1957 by the Belgian authorities.[120] A crude birth rate of 52 was found in the 1957 survey; earlier surveys yielded rates of 52 in 1952, 45 in 1954, 49 in 1955, and 52 in 1956.[121] These data for Rwanda, like the corresponding figures for Burundi, indicate an unsteady level of fertility. The Rwanda rates exceed the Burundi rates by wide margins in 1955 and 1957 and by narrower margins in 1952 and 1954, but the estimated 1956 rates for the two areas are equal; so it is not certain that fertility is normally higher in Rwanda than in Burundi.

The 1957 survey data for Rwanda, like those for Burundi, show a low ratio of males to females. The proportion of women of child-bearing age within the total female population, according to the survey data, is higher in Rwanda than in most other countries of East, South, or West Africa.

South Africa. The population of South Africa at the 1960 census was 15.9 million, of whom about 11 million were Bantu and other indigenous African peoples, 3 million were classified as " white ", 1.5 million " coloured ", and about half a million " Asiatic ". The fertility estimates shown in table 3.1 for the " white ", " coloured " and " Asiatic " groups are based on birth registration statistics considered to be complete. Although efforts are made to register births and deaths among the Bantu population, the records are incomplete.

For the Bantu, fertility estimates were obtained by " reverse-survival " from the number of children 5-9 years of age enumerated in the census of 1960, according to a 5 per cent sample tabulation. The birth rate of 46 per 1,000 estimated in this way for 1950-1955 is likely to be biased downward as a result of the large immigration into South Africa of workers from neighbouring countries, which inflates the adult population and reduces the proportion of children in the total. The gross reproduction rate, estimated at 3.0, is a more reliable measure of the fertility level.[122] A crude birth rate of 42 and a gross reproduction rate of 2.8 were estimated, by " reverse-survival ", for 1941-1946 on the basis of the 1951 census.[123]

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[117] Federation of Rhodesia and Nyasaland, Central African Statistical Office, *The 1953-1955 Demographic Sample Survey of the Indigenous African Population of Southern Rhodesia* (Salisbury, 1959, processed), p. 10.

[118] J. Clyde Mitchell, op. cit.

[119] International Labour Office, *African Labour Survey* (Geneva, 1958), pp. 131-132, 135.

[120] In calculating the gross reproduction rate shown in table 3.1, the age pattern of fertility was assumed to be like that of Upper Volta.

[121] *Rapport soumis par le Gouvernement belge*, op. cit.

[122] It was assumed that the age pattern of fertility was like that estimated for Angola, in calculating the gross reproduction rate of 3.0.

[123] In another study the crude birth rate has been estimated in the range of 43-47 for 1936-1952. J. L. Sadie, " Differential Aging in South Africa ", *Proceedings of the World Population Conference, 1954*; Papers, Vol. III (United Nations publication, Sales No.: 55.XIII.8 (Vol. III)), p. 531. Badenhorst estimated the birth rate at 38-42 for the period 1936-1946, by " reverse-survival " from the number of children under age 5 enumerated in the 1951 census; his figure may be understated as a result of under-enumeration of this age group. L. T. Badenhorst, " The Future Growth of the Population of South Africa and its Probable Age Distribution ", *Population Studies* (London), vol. 4, June 1950, p. 13.

The Bantu of South Africa are more urbanized than the indigenous peoples of most other African countries. According to the 1951 census, 27 per cent of the Bantus lived in " urban " areas and 13 per cent in places with 20,000 or more inhabitants. Migration to the cities often causes disruption of family life,[124] and irregular unions and prostitution flourish in the towns. Urban living has resulted in some relaxation of tribal customs which are believed to have a retarding effect on fertility. Although the custom of secluding mother and child after confinement is adhered to even in urban areas, the period is generally reduced from the traditional three months to about ten days. A tendency of mothers to shorten the period of lactation to one year has also been observed, but much importance is still attached to the avoidance of another pregnancy until the child is weaned.[125] Sexual relations are often resumed about three months after confinement, it being considered the husband's responsibility to see that another pregnancy does not occur too soon. This is done very often by the practice of *coitus interruptus*, though the use of contraceptives is not unknown.[126] There is little practice of polygamy.

In the view of one South African demographer, the effects of urbanization and detribalization have a tendency to increase fertility.[127] A recent sample survey in a Bantu suburb of Johannesburg, however, indicated a level of fertility not very different from that estimated for the Bantu population of the whole country — a crude birth rate of 44 and a gross reproduction rate of 2.8.[128] Information on intervals between births collected for women aged 45 years and over in this survey showed that only 7 per cent of all births had taken place less than two years after the preceding birth. Forty-five per cent had occurred two to three years after the previous birth, which is about the desired interval according to Bantu mores.

About 30 per cent of the Bantu live on farms outside the tribal area, where they have the status of servants or tenants, since they are not allowed to own land. This group of the Bantu has been found to be extremely conservative, adhering to tribal customs so far as practicable in the environment. The traditional family pattern and the ancestor cult remain relatively undisturbed.[129] Polygamy, however, is almost non-existent.

Thirty-nine per cent of the Bantu were enumerated in Native areas in 1951. Here, of course, the customary tribal attitudes are strongest. " In Bantu society, where the status of a man is measured largely by the size of his kraal and that of a woman by the number of children she has borne, the birth of a child is hailed with great joy as an event of importance to the whole village... The Bantu child is not weaned until two or three years old. Should the mother become pregnant before this, she would 'cut the road' of the first child, making him thin or paralysed, an action that is severely censured. Sexual intercourse will, however, have been resumed long before weaning, very often... accompanied by a rite to ensure the child against harm. "[130]

Social change has occurred even in the Native reserves, however. Among the Christianized inhabitants, European institutions are now part of tribal culture, and even among pagan tribes most of the population has come to know European ways through labour migration, taxation and trade.[131] Polygamy has decreased almost to the vanishing point because of the spread of Christianity and also because polygamists were taxed more than monogamists. At the 1951 census, the percentage married was the same for both sexes, 70 per cent of those having been married according to the Bantu practice of *lobola*, a system which ensures the stability of marriage by requiring a payment of cattle to the parents of the bride. Migration of men to seek work outside the Native areas has resulted in a breakdown of family discipline and an increase of marital infidelity as well as delay of marriage. There are more unmarried women than formerly, and promiscuity and illegitimacy have increased.

For the " white " population, birth registration is stated to have been complete at least since 1920. The trend of the registered crude birth rates since 1911-1915 is shown in table 3.7 along with gross reproduction rates and other fertility measures since 1924-1928. These data indicate no very great changes in the level of fertility since the mid-1920's. It is true that the birth rate dipped during the 1930's, recovered during the 1940's and dropped off again after 1950, following a trend like that observed in many countries of north-western Europe, the United States, Canada, Australia and New Zealand; but the ups and downs in the case of the South African " whites " appear to have been relatively slight.

For the " coloured " population, including persons of mixed European and African, Malayan and East Indian stock, birth rates have been published since 1937, and registration is considered to have been reasonably complete in recent years.[132] The crude birth rate and other fertility measures, shown in table 3.8, have been nearly stationary at a high level since 1946-

[124] L. T. Badenhorst and B. Unterhalter, op. cit., p. 71.

[125] Ellen P. Hellman, " The Native in the Towns ", in *The Bantu-Speaking Tribes of South Africa*, I. Schapera, ed. (London, Routledge & Kegan Paul, 1937), p. 415. See also L. T. Badenhorst and B. Unterhalter, op. cit., pp. 82-83.

[126] Ellen P. Hellman, op. cit., p. 415; L. T. Badenhorst and B. Unterhalter, op. cit., p. 83. In the survey conducted by the latter authors only about 4 per cent of the respondents reported using mechanical contraceptive appliances.

[127] J. L. Sadie, op. cit., p. 534.

[128] L. T. Badenhorst and B. Unterhalter, op. cit., p. 78. Data on births during the last calendar year were obtained from a sample of 1,215 women. It is not likely that there was much under-reporting, because the Bantu mother, who was herself the respondent in the inquiry, usually carries her infant on her back all day, where the interviewer could see it.

[129] Monica Hunter, " The Bantu on European-owned Farms ", in *The Bantu-Speaking Tribes of South Africa*, op. cit., p. 404.

[130] Eileen Jensen Krige, " Individual Development ", in *The Bantu-Speaking Tribes of South Africa*, op. cit., p. 95.

[131] I. Schapera, " Cultural Changes in Tribal Life ", in *The Bantu-Speaking Tribes of South Africa*, op. cit., p. 386.

[132] Under-registration during 1946-1951 has been estimated at 6 per cent. L. T. Badenhorst, " Prospects for Future Population Changes in South Africa ", *Proceedings of the World Population Conference, 1954*, Papers, Vol. III (United Nations publication, Sales No.: 55.XIII.8 (Vol. III)), p. 163.

Table 3.7. Fertility trends of the " white " population in South Africa: 1911-1961

Year	Crude birth rate (births per 1,000 population)	Gross reproduction rate
1911-1915	31.1	...
1916-1920	28.6	...
1920-1924	27.6	...
1924-1928	26.1	1.7
1925-1929	26.1	...
1930-1934	24.5	...
1935-1939	24.7	...
1940-1944	25.6	1.5
1945-1949	26.4	1.7
1950-1954	25.1	1.6
1955-1959	25.0	1.7
1955	24.9	1.7
1956	24.5	1.7
1957	25.1	1.7
1958	24.9	1.7
1959	25.2	1.8
1960	25.3	1.8
1961	25.8	...

Table 3.8. Fertility trends of the " coloured " population in South Africa: 1937-1961

Year	Crude birth rate (births per 1,000 population)	Gross reproduction rate
1937-1939	45.9	...
1940-1944	43.7	...
1946-1949	46.4	3.1
1950-1954	47.4	3.1
1955-1959	46.1	3.1
1955	45.8	3.0
1956	45.1	3.0
1957	47.0	3.1
1958	46.2	3.0
1959	46.3	3.1
1960	47.8	3.2
1961	48.0	...

1949, although some increase in the crude birth rate was registered in 1960 and 1961. The high fertility of the " coloured " population is remarkable in view of the fact that, according to the 1951 census, about two-thirds of the group resided in urban areas. Many are employed as unskilled labourers, domestic servants, or industrial workers, and their living conditions are generally poor.

The " Asiatic " population of South Africa is composed mainly of descendants of indentured labourers imported during the late nineteenth century, about 97 per cent being of Indian origin. Registered crude birth rates for this group since 1945-1949 have followed the trend indicated below: [133]

1945-1949	38.5	1957	30.7
1950-1954	35.3	1958	30.1
1955	34.1	1959	32.0
1956	30.6	1960	35.4

Although birth registration for the " Asiatics " is officially regarded as " complete " for recent years, one writer has estimated under-registration in the amount of 26 per cent for the period 1946-1951.[134] If this is correct, it means that the birth rate of the " Asiatics " in the late 1940's was about 48 per 1,000 that is, fully as high as the rate for the " coloured " population. For the " Asiatics ", unlike the " coloured " group, the registered birth rates show a considerable decline until 1958 and a sharp rise in 1959 and 1960. If registration in the recent years has been nearly complete, but one birth out of four was not registered prior to 1951, the decline of fertility of the " Asiatics " between 1945-1949 and 1958 must have been even greater than the registered rates indicate.

The " Asiatics ", like the " coloured " population, live mostly in urban areas, but their standard of living is higher; they constitute a commercial middle class. The fertility of " Asiatics " in rural areas of South Africa is said to be lower than in urban areas.[135]

Tanganyika. No comprehensive system of birth registration yet exists for the African population of Tanganyika, although some small registration areas have recently been established.[136] The crude birth rate of 46 per 1,000 and the gross reproduction rate of 2.7 shown in table 3.1 were estimated from 1957 census data on the numbers of children born alive to women during their lifetime.[137] The method of estimation was the same as the one used for Kenya.

In the 1948 census, fertility data were obtained for a sample of women who stated their exact ages, and a crude birth rate in the range of 40-45 was estimated from these data.[138] Data were also collected in the 1948 census on births in each household during the year preceding the census, but these were not satisfactory for some districts; they indicated birth rates in some areas as high as 70 or 80 per 1,000.[139]

[133] United Nations, *Demographic Yearbook*, 1961, p. 165. Rates for 1950-1954 and more recent years are reported as provisional.

[134] L. T. Badenhorst, " Prospects for Future Population Changes in South Africa ", op. cit., p. 163. This estimate of under-registration was based on an analysis of population growth between the censuses of 1946 and 1951.

[135] J. L. Sadie, " Differential Aging in South Africa ", op. cit., p. 536.

[136] J. G. C. Blacker and C. J. Martin, " Old and New Methods of Compiling Vital Statistics in East Africa ", International Population Conference, 1961 (New York), paper No. 51 (processed), p. 1.

[137] J. G. C. Blacker, " The Demography of East Africa ", op. cit., pp. 32-33; Blacker, " The Use of Stable Population Models for the Construction of Population Projections; Application to the African Population of Tanganyika ", paper prepared for the International Population Union Conference, Ottawa, 1963.

[138] *Additional Information on the Population of Tanganyika.* (Supplement to *The Population of Tanganyika*) (United Nations publication, Sales No.: 52.XIII.3), p. 6.

[139] *Ibid.*, p. 8. Estimates of the birth rate based on 1948 census data are also given in: C. J. Martin, " Some Estimates of the General Age Distribution, Fertility and Rate of Natural Increase of the African Population of British East Africa ", *Population Studies* (London), vol. 7, November 1953, pp. 189-195.

Both the 1948 and 1957 censuses furnished distributions of the African population by broad age groups. The distributions obtained at the two censuses were nearly the same, indicating the likelihood of little change in fertility having occurred during the interval. Age ratios calculated from the 1957 data and matched with stable population models suggest a gross reproduction rate in the range of 2.7-3.2 and a crude birth rate in the range of 43-52. These indications are consistent with the estimates shown in table 3.1.

A considerable excess of females over males is indicated by the results of both the 1948 and 1957 censuses. It has been suggested that if the reported sex ratio were correct, it might be a result of emigration of males [140] or higher mortality among males than among females.[141] Although there are no comprehensive statistics of migration across Tanganyika's borders, such evidence as is available suggests that the country receives more migrants that it sends out. Migrant workers have been drawn to Tanganyika from former Ruanda-Urundi and from Mozambique.[142]

The African population of Tanganyika is composed largely of Bantu-speaking tribes. Among their traditional customs tending to maintain high fertility is the marriage of girls soon after puberty, often on a probational basis requiring that no dowry be paid until the wife bears a child. " Children were valuable, girls more so than boys." [143] Any children born to a woman during her husband's absence were considered as his after his return. On the other hand, certain customs which would tend to moderate fertility also figure in the traditions of tribes inhabiting this country, including prolonged lactation and prohibition of sexual relations with the mother of an infant until the child can walk.[144]

Uganda. Although registration of births and deaths has been legally compulsory since 1930 throughout Uganda, with the exception of one district, it has been estimated that registration of births is only between 50 and 70 per cent complete.[145] The estimate of 42 per 1,000 for the crude birth rate shown in table 3.1 was derived from 1959 census data, both on births during the preceding year and on numbers of children born to women during their lifetime.[146] About the same crude birth rate was estimated from 1948 census data on lifetime numbers of births,[147] which agreed closely with the 1959 data on this subject. The corresponding gross reproduction rate of 2.6 was estimated on the basis of 1959 data relating to the age pattern of fertility reported for a sample of women, and the age-sex structure of the population.

Unlike most censuses and sample surveys of African populations, the Uganda census showed a slightly larger number of males than females. This seems to have been due entirely to an excess of males among immigrants belonging to tribes not indigenous to Uganda. Among the tribes indigenous to Uganda, females were more numerous than males, although it is stated that there is no large-scale emigration of Africans from Uganda.[148] Another unusual feature of the Uganda census seems to have been over-enumeration of infants, as the number of infants under one year of age enumerated in many areas was greater than the number of births reported for the previous year.[149]

Zanzibar and Pemba. Birth registration in Zanzibar and Pemba is incomplete; it has been estimated that about 70 per cent of births and deaths are registered.[150] The fertility estimates shown in table 3.1 were derived from 1958 census data on numbers of children born to women during their lifetime, adjusted by the same methods applied to the data of other East African censuses.[151] These data referred to women of the Afro-Arab ethnic group, which constitutes about 90 per cent of the population of Zanzibar and 98 per cent of the population of Pemba.

The relatively low fertility in Zanzibar (an estimated gross reproduction rate of 1.9, in contrast with 2.4 for Pemba) seems to be attributable almost entirely to the very low fertility of women in Zanzibar Town, since the data for the remainder of Zanzibar island showed fertility only slightly below that of Pemba. The crude birth rate of Afro-Arab women in Zanzibar Town was estimated to be only 21, and there were indications that the net reproduction rate might be below unity. While a high proportion of unmarried women in Zanzibar Town and the practice of birth control by upper socio-economic groups may be partial explanations, a high rate of sterility is said to be a more important reason. A very large proportion of women in Zanzibar Town reported having borne no children at the end of the potentially reproductive period of life. The cause of this high rate of childlessness is not fully understood; the Zanzibar medical authorities doubted that venereal disease was sufficiently common to be a major factor.[152]

The birth rate of Asian women living in Zanzibar Town was estimated to be about 40, or nearly twice that of the Afro-Arab group, despite the fact that mean age at marriage was about 20 years for the Asian women and only 15 years for the Afro-Arabs.

[140] J. G. C. Blacker, " The Demography of East Africa ", op. cit., p. 31.

[141] *The Population of Tanganyika* (United Nations publication, Sales No.: 49.XIII.2), p. 23.

[142] *Ibid.*, pp. 22-23.

[143] *Ibid.*, p. 22.

[144] *Ibid.*, p. 22.

[145] J. G. C. Blacker and C. J. Martin, op. cit., pp. 1-2.

[146] Uganda, Ministry of Economic Affairs, Statistics Branch, *Uganda Census, 1959*; *African Population* (Entebbe, 1961), pp. 24-25. The methods devised by Myburgh and Brass and applied to the census data of Kenya and Tanganyika were also used in Uganda.

[147] C. J. Martin, " Some Estimates . . .", op. cit., p. 193.

[148] *Uganda Census, 1959*, op. cit., pp. 19-20.

[149] *Ibid.*, p. 15.

[150] J. G. C. Blacker and C. J. Martin, op. cit., pp. 1-2.

[151] J. G. C. Blacker, " Population Growth and Differential Fertility in Zanzibar Protectorate ", *Population Studies* (London), vol. 15, March 1962, pp. 258-266.

[152] *Ibid.*, p. 265.

Chapter IV

LEVELS AND TRENDS OF FERTILITY IN ASIA

A. Present levels

Fertility levels in Asian countries vary over an even wider range, according to present estimates, than those in Africa. At one extreme, the gross reproduction rate of the Philippines is estimated at 3.5 for 1950-1955; at the other extreme, Japan's gross reproduction rate was only 1.0 in 1960. Asia on the whole, however, is a region of high fertility, as gross reproduction rates exceeding 2.0 are indicated for nineteen of the twenty-three principal Asian countries for which data are considered to be fairly satisfactory. Table 4.1 shows for each country either recorded rates for 1960 or the most recent estimates available. The levels are mapped in figure 4.1 in terms of crude birth rates and figure 4.2 in terms of gross reproduction rates.

There are great gaps in present information on the levels of fertility in this region. Satisfactory data are lacking for some of the most populous countries — above all for China (mainland), with its population estimated at 647 million in December 1957, representing more than 40 per cent of the inhabitants of all Asia outside the USSR. Although official estimates of the Chinese crude birth rate have been published for the years 1952-1957, the quality of the data is uncertain, and the estimated rates seem inconsistent with official figures relating to the death rate, age structure and growth of the population for recent years (see notes in section " C " below). The estimated birth rate for Pakistan's 94 million (population enumerated in the 1961 census) is derived from highly erratic census data on age structure of the population and may be considerably in error.

The meagreness of data for Arab countries of south-western Asia constitutes another conspicuous gap in present information on fertility levels. Only Iraq and Jordan in this group of countries have a fairly satisfactory basis for fertility estimates, in the form of census statistics on age groups of the population, which, though not of good quality, are less erratic than the data for Pakistan. There are only incomplete birth registration statistics available for Jordan, Lebanon and Syria, and little basis exists for estimating the levels of fertility in the other Arab countries of this sub-region. Other principal Asian countries lacking satisfactory data include the Republic of Viet-Nam (which has incomplete registration statistics), North Viet-Nam (which has data for several age groups from a 1960 enumeration), Mongolia (which has registration statistics of unknown degree of completeness), and Afghanistan, Laos and North Korea (for which there are no pertinent data).

In spite of these gaps, the quality of data on fertility levels in Asian countries is better, on the whole, than in African countries. Registration statistics reported to the Statistical Office of the United Nations as " complete " are available for seven principal countries in Asia, namely, China (Taiwan), Cyprus, the Federation of Malaya, Hong Kong, Israel, Japan, and Singapore. Two additional countries, Ceylon and the Ryukyu Islands, have nearly complete birth registration statistics. Registration in Ceylon was estimated to be 88 per cent complete in 1953, and the same percentage was estimated for the Ryukyu Islands in 1956. For five countries which lack satisfactory registration statistics, a fairly reliable basis exists for fertility estimates. This group includes India, where repeated national sample surveys have provided data on births having occurred in sample households during specified time-periods (though analyses of the results have made it appear likely that they are somewhat understated), and also Cambodia, Nepal, the Philippines and Thailand. Estimates for the latter countries have been made by the " reverse-survival " method from census or survey statistics of population by age groups, considered to be of relatively satisfactory quality. The nine Asian countries for which " reverse-survival " estimates of the fertility levels have been derived from age statistics of relatively poor or doubtful quality are Burma, Indonesia, Iran, Iraq, Republic of Korea, North Borneo, Pakistan, Sarawak and Turkey. But the appearance of irregularities in the age composition of a population is not a result of faulty reporting alone. For some of these countries, a reduction of births and high infant mortality under wartime conditions altered the population structure to such an extent that the level of the crude birth rate in later years could be considerably affected. The level of fertility as measured by the gross reproduction rate is much less susceptible to this influence.

Three zones of exceedingly high fertility in Asia are indicated by the present estimates. The first is located in South East Asia, including the Philippines, North Borneo, Sarawak, Cambodia and Thailand. The estimated gross reproduction rates of these countries, as of the latest dates of available data, are in the range of 3.2 to 3.5. The second zone includes Iraq, Iran, Jordan and Pakistan, with estimated gross reproduction rates of 3.1-3.4.[1] The third area of very high fertility

[1] There are some indications that the fertility of nomads is lower than that of sedentary groups. Accordingly, average fertility in much of the Arabian peninsula may be somewhat less than that

is the Republic of Korea, for which a gross reproduction rate of 3.1 has been estimated for the period 1950-1955.

of Iraq, for example, though this is not certain. For a study of fertility differences between nomadic and sedentary groups, *see* H. V. Muhsam, "Fertility and Reproduction of the Beduin", *Population Studies* (London), vol. 4, March 1951, pp. 354-363.

The areas of lowest fertility in Asia, according to present information, are Japan and the Ryukyu Islands in the east, and Cyprus and Israel in the west. For Japan, as already mentioned, the gross reproduction rate in 1960 was only 1.0 — one of the lowest rates in the world. The rates estimated for Cyprus, Israel (Jewish

Table 4.1. Estimated fertility levels in Asian countries

Region and country	*Year*	*Basis (see note below)*	*Crude birth rate (births per 1.000 population)*	*Gross reproduction rate*
South West Asia:				
Aden: Protectorate of South Arabia		E	...	...
Cyprus	1960	A	25.3	1.7
Gaza Strip		E	...	...
Iran	1946-1951	C (2)	48	3.1
Iraq	1947-1952	C (2)	48	3.3
Israel: Jewish population	1960	A	23.9	1.7
Jordan	1951-1956	C (1)	45	3.4
Lebanon	1960	E	(39)	...
Muscat and Oman		E	...	...
Saudi Arabia		E	...	...
Syria	1961	E	(25)	...
Turkey	1950-1955	C (2)	43	2.9
Yemen		E	...	...
South Central Asia:				
Afghanistan		E	...	...
Bhutan		E	...	...
Ceylon [a]	1960	A	36.6	*2.5*
India [b]	1958-1959	B	39	2.5
Nepal	1944-1949	C (1)	45	2.7
Pakistan	1946-1961	C (2)	48	3.3
South East Asia:				
Burma	1948-1954	C (2)	43	2.6
Cambodia	1948-1954	C (1)	51	3.3
Federation of Malaya	1960	A	40.9	*2.9*
Indonesia	1951-1956	C (2)	52	2.8
Laos		E	...	...
North Borneo	1950-1955	C (2)	53	3.4
Philippines	1950-1955	C (1)	50	3.5
Portuguese Timor		E	...	...
Sarawak	1950-1955	C (2)	54	3.4
Singapore [c]	1960	A	37.8	*2.8*
Thailand	1950-1955	C (1)	46	3.2
Viet-Nam, North	1960	E	(47)	...
Viet-Nam, Republic of		E	...	...
West Irian		E	...	...
East Asia:				
China (mainland)	1957	E	(37-40)	...
China (Taiwan)	1961	A	38.3	2.7
Hong Kong	1961	A	34.2	2.4
Japan	1960	A	17.2	1.0
Korea, North		E	...	...
Korea, Republic of	1950-1955	C (2)	45	3.1
Mongolia	1958	E	(39)	...
Ryukyu Islands [a]	1960	A	23.1	1.6

... Data not available.

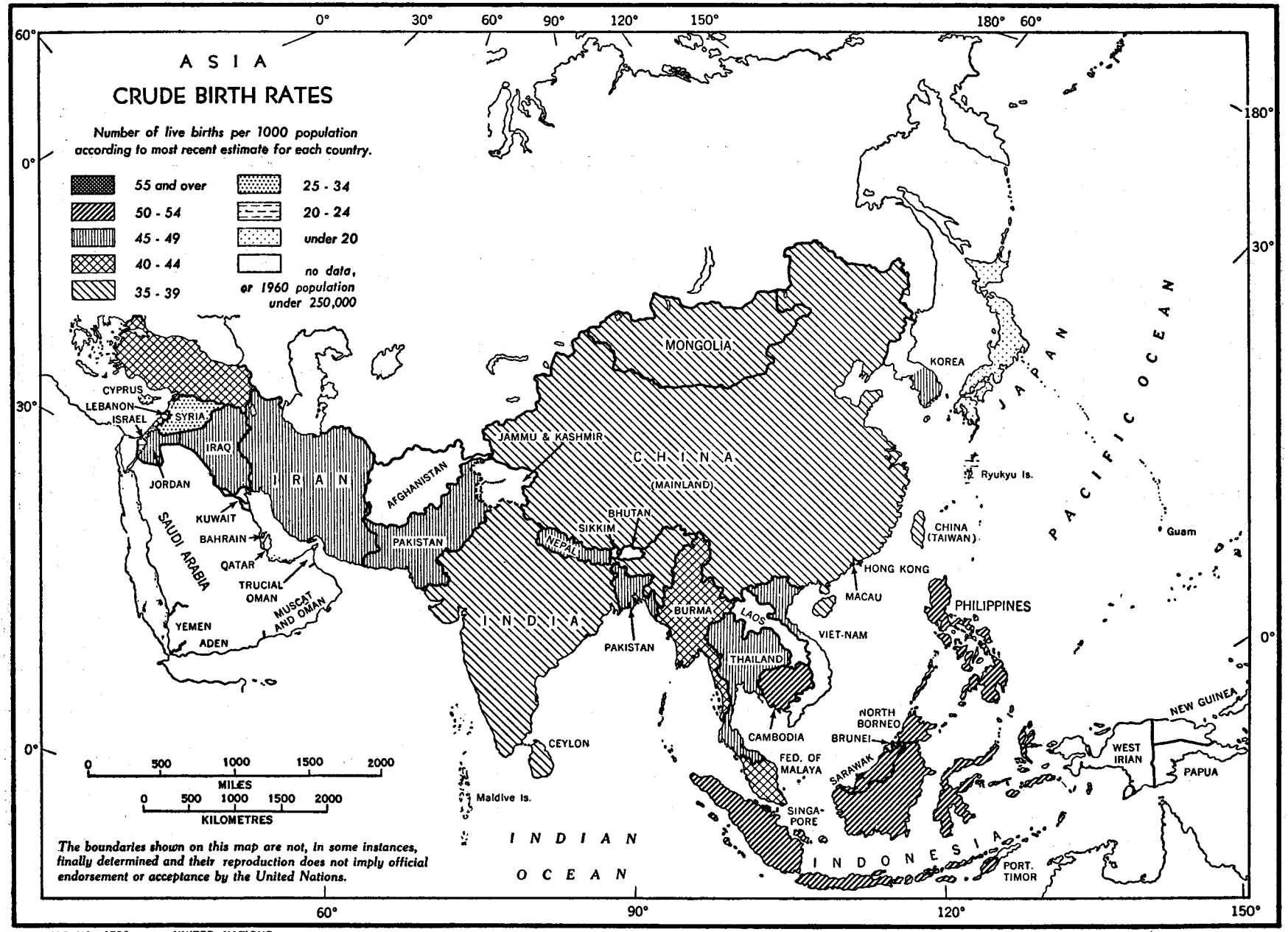
Basis for rates: A — "Complete" birth registration statistics; B — Sample survey data; C — "Reverse-survival" estimates: (1) Based on relatively satisfactory data on population by age groups; (2) Based on age data of relatively poor or uncertain reliability; D — Other estimates; E — No satisfactory data.

Note: For countries with "complete" registration data, official population estimates were used in calculating all rates except those in italics, which are based on population estimates prepared by the United Nations.

[a] Registration data considered to be slightly less than 90 per cent complete.

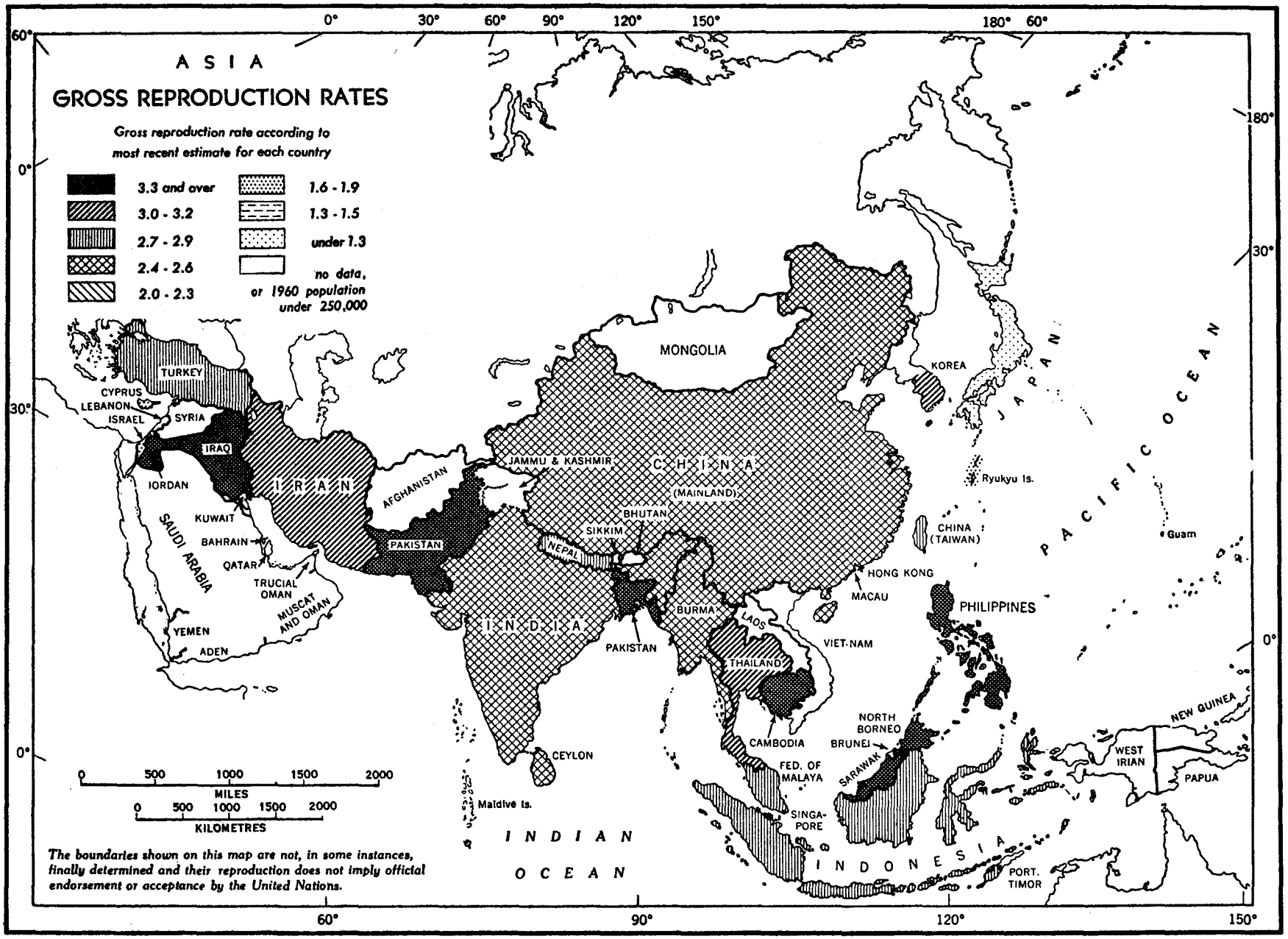
[b] Rates estimated from sample survey returns, probably understated to same extent.

[c] Excluding non-locally domiciled population.



MAP NO. 1532 UNITED NATIONS
AUGUST 1963

Figure 4.1



MAP NO. 1533 UNITED NATIONS
AUGUST 1963

Figure 4.2

population) and the Ryukyu Islands are at the level of 1.6-1.7, which corresponds approximately to the levels recently recorded in a number of European countries, the United States, Australia and the Soviet Union.

The remaining countries of Asia for which data are available fall into the category of moderately high fertility, having estimated gross reproduction rates in the range of 2.4 to 2.9. In descending order of estimated rates, these countries are the Federation of Malaya, Turkey, Indonesia, Singapore, China (Taiwan), Nepal, Burma, Ceylon, India and Hong Kong. The questionable indications for China (mainland) and Mongolia suggest that these countries also may belong in the category of moderately high fertility.

The relatively advanced position of Cyprus, Israel, Japan and the Ryukyu Islands — the four low fertility countries of Asia — with respect to such social and economic indicators as the extent of literacy, degree of urbanization, proportion of the labour force in non-agricultural industries and per capita income, is indicated in table 4.2. Among the Asian countries with moderately high and very high fertility, however, it is not so easy to identify factors responsible for variations in the levels of their fertility. If differences in economic and social conditions play any part in bringing these variations about, their effects on fertility are not the same in different countries. For example, the relatively moderate present level of fertility in Hong Kong might be attributable partly to the fact that its population is predominantly urban, the economy is commercial and industrial rather than agricultural and the income per head is above the average for Asian countries (table 4.2). But Singapore, with much the same type of economy and a higher level of income per head, has higher fertility. Moreover, Iran and Iraq, which are above the

Table 4.2. Selected characteristics of Asian countries

Country	*Gross reproduction rate (latest available data)*	*Density of population per square kilometre, 1960*	*Percentage married, females aged 15-19* [a] *(1950-1960)*	*Percentage of literates among females 15 years and over* [b] *(1950-1960)*	*Percentage of population in localities of 20,000 and over* [c] *around 1950*	*Percentage of male labour force engaged in non-agricultural activities,* [a] *1950-1960*	Per caput *national income, U.S. dollars,* [d] *1957-1959*
Japan	1.0	252	1.3	97.5	46.1 [e]	74.0	200-299
Ryukyu Islands	1.6	402	2.0	68.0	15.9	62.3 [f]	100-199
Cyprus	1.7	61	11.0 [g]	66.0	14.0	73.6	300-399
Israel: Jewish population	1.7	102	10.8 [f h]	90.5 [i]	56.3 [h j]	86.8 [i]	600-699
Hong Kong	2.4	2,891	7.0	51.8 [f]	94.0	...	200-299
Ceylon	2.5	151	23.7	52.7	11.4	45.6	100-199
India	2.5	136	68.0 [k]	8.4	12.0 [j]	26.1	Under 100
Burma	2.6	30	34.8 [l]	37.2 [l]	10.0	34.0 [l]	Under 100
China (Taiwan)	2.7	295	11.4	57.6 [m]	10.0 [n]	45.8	Under 100
Nepal	2.7	67 [f]	67.6 [k]	0.6	4.4	8.1	Under 100
Singapore	2.8	2,813	19.7	29.4	72.5 [n]	95.2	300-399
Indonesia	2.8	62	...	26.1 [f]	9.1	26.7 [o]	Under 100
Federation of Malaya	2.9	53	34.7	26.5	20.8 [j]	46.9	200-299
Turkey	2.9	35	32.4	21.5	18.2 [j]	29.3	100-199
Iran	3.1	12	40.0	7.0	21.0	38.1	100-199
Korea, Republic of	3.1	250	2.5	66.7	18.6	24.3	100-199
Thailand	3.2	51	12.5	52.3	7.7	19.7	Under 100
Cambodia	3.3	29	...	5.3	10.0 [e]	29.7 [p]	Under 100
Iraq	3.3	16	33.2	2.4 [k q]	21.9	45.0 [q]	100-199
Pakistan	3.3	98	73.0	4.2 [f k]	7.8	20.7	Under 100
North Borneo	3.4	6	33.6	11.5	...	23.4	200-299 [r]
Sarawak	3.4	6	29.6	12.1	...	26.0	200-299 [r]
Philippines	3.5	93	11.6	72.1	12.7	30.0	100-199
China (mainland)	...	68 [s]	...	...	10.0	...	...
Mongolia	...	1	...	...	3.0	...	...
Viet-Nam	...	92	...	...	...	...	100-199

[a] Except as noted, figures are derived from a population census or sample survey taken during 1950-1960.

[b] Except as noted, figures are derived from a population census or sample survey taken during 1950-1960, or else are UNESCO estimates for dates around 1950.

[c] Except as noted, figures are unpublished estimates prepared by the Bureau of Applied Social Research (Columbia University) as part of a study of world urbanization trends.

[d] Estimates of the United Nations Statistical Office. In a few instances, the estimates relate to *per caput* national product.

[e] United Nations estimate for 1960.

[f] For 1961.

[g] For 1946.

[h] Figure relates to the total rather than to the Jewish population.

[i] For 1948.

[j] From United Nations *Demographic Yearbook* 1960.

[k] Estimated from data tabulated for a different age group.

[l] Figures for urban and rural sectors have been weighted in deriving these percentages.

[m] For 1961; figure relates to females 12 years of age and over.

[n] From "Population Trends and Related Problems of Economic Development in the ECAFE Region", *Economic Bulletin for Asia and the Far East* (United Nations Economic Commission for Asia and the Far East), vol. 10, June 1959, p. 18.

[o] Data relate to both sexes combined.

[p] Persons in households the heads of which are engaged in economic activity other than as farmers, as a percentage of total household population.

[q] For 1947.

[r] Data relate to Brunei, North Borneo and Sarawak combined.

[s] For 1957.

Asian average in degree of urbanization and development of non-agricultural industries, seem to have very high fertility. Likewise so far as literacy is concerned, the comparatively moderate level of fertility in Ceylon, for example, might possibly be explained partly by the fact that the majority of women in that country are able to read and write; and yet higher literacy rates are reported for the Philippines and the Republic of Korea, which appear to be among the countries of highest fertility in Asia. Nepal, one of the countries of only moderately high fertility according to the estimates,[2] is outstanding among the countries listed in table 4.2 for its extremely low percentage of literate women, very small extent of urbanization and overwhelmingly large proportion of the labour force engaged in agriculture. Of all countries in the region, the Philippines has the highest estimated gross reproduction rate, although the population is above average in female literacy and by no means at the bottom of the list in degree of urbanization, proportion of non-agricultural labour force, and income per head.

Studies of differences in fertility of social and economic population groups within countries of very high or moderately high fertility in Asia have generally failed to show any major differences among numerically important groups, such as might be grounds for expecting large changes in fertility to come about quickly as a result of advances in education, shifts in occupational composition of the labour force, rising levels of income, etc.[3]

Differences in population density also may have a bearing on the levels of fertility. High density might have been partly responsible for the relatively moderate level of Japanese fertility before the recent decline (see section B), and it is shown in another part of this report that some inverse association exists between population densities and levels of fertility in various parts of the world. Possibly high density and heavy pressure of population on land resources are pertinent to the explanation of the relatively moderate level of fertility indicated for large parts of India and Ceylon. However, only moderately high fertility is estimated also for Burma, which is among Asia's less densely populated countries, while Pakistan and the Republic of Korea, with a much higher density, have very high fertility according to the present estimates, admittedly uncertain in the case of Pakistan. Moreover, there are signs that East Pakistan, the most densely populated part of the country, may have higher fertility than West Pakistan.

Early and almost universal marriage of women contributes to the maintenance of at least moderately high fertility throughout most of Asia, as it does in Africa. There are important differences, however, in the frequency of very early marriage in different Asian countries, as shown in table 4.2 by the percentages of married women among the female population in the age group 15-19 years. The fact that comparatively few girls marry so young in Hong Kong, China (Taiwan), Singapore and Ceylon may be considered as one of the reasons for the only moderately high fertility levels indicated for these countries. But in this respect also, the data fail to bear out a consistent relationship. Infrequent marriage of girls before the age of 20 in the Philippines, the Republic of Korea and Thailand does not prevent the maintenance of exceedingly high fertility. India, with its relatively moderate level of fertility, has the highest percentage of females married in the age group 15-19.

Widowhood has a bearing on fertility when the widow is of child-bearing age and does not remarry promptly. This factor has been considered to be especially important in India because of the high mortality rates still prevailing and the traditional disapproval of widows' remarriage in Hindu society. Calculations have accordingly been made of the possible increase in fertility which might result in India as a consequence of decreased mortality of men and therefore less frequent widowhood. Data obtained in a survey in Mysore State showed that women 45 years of age and over whose marriages had not been broken before the end of their reproductive period had on average about six children, as compared with an actual average of about five children when all women, including numerous widows, are considered.[4] A difference of this magnitude, however, would occur only with the complete elimination of widowhood among women under 45 years of age. In another study, population models developed on the assumption of unchanging Indian marriage patterns and unchanging marital fertility showed that if life expectancy at birth were to rise from 30 to 50 years, less frequent widowhood could result in a 12 per cent increase in the gross reproduction rate, though the crude birth rate would be raised by only about 2 per cent, owing to the consequent modification in age structure.[5]

Other customs prevalent in India which have been cited as additional explanations for the relatively moderate level of fertility include prolonged lactation, segregation of the mother and avoidance of sexual relations with her for a more or less long period after childbirth, departure of the mother with a new-born child on a lengthy visit to the home of her parents, and religious restraints on sexual relations during certain periods. There is some evidence of delays in resumption of menstruation after pregnancy which may be related to the prolongation of lactation or to diet and health conditions.[6] Data from one of the rounds of the Indian National Sample Survey showed the average interval between births to be 34 months in urban areas and

[2] The fertility level of Nepal may be understated because of the method adopted in adjusting the data prior to publication. See the notes in section C.

[3] Some of the results of studies of differential fertility are summarized in chapter VIII of this report.

[4] *The Mysore Population Study*, A Co-operative Project of the United Nations and the Government of India (United Nations publication, Sales No.: 61.XIII.3), p. 113.

[5] K. G. Basavarajappa, " Effect of Declines in Mortality on the Birth Rate and Related Measures ", *Population Studies* (London), vol. 16, March 1963, pp. 237-256.

[6] C. Chandrasekaran, " Physiological Factors Affecting Fertility in India ". International Population Conference, 1961 (New York), paper No. 76 (processed), p. 5.

32 months in rural areas.[7] Not enough information is yet available on the variations of birth intervals and related factors in other parts of Asia to assess their importance as possible causes of the differences in fertility levels from country to country.

The belief that the Moslem religion inspires high fertility was mentioned in the discussion of differences of fertility among African countries. Iraq, Iran and Pakistan are Moslem countries for which very high fertility rates are estimated. Studies in India have shown the Moslems in that country to be more fertile than the Hindus.[8] Turkey and Indonesia are Moslem countries for which the estimates indicate high fertility, though perhaps not so high as for Iran, Iraq and Pakistan. Buddhism, with its emphasis on monastic celibacy, might be thought to have a lowering effect on fertility.[9] Possibly this influence helps to keep fertility from reaching a very high level in Burma and Ceylon, yet predominantly Buddhist Cambodia and Thailand appear to have extremely high fertility. The extraordinarily high fertility of the Philippines may possibly be related to the prevalence there of the Roman Catholic religion, but the Catholics in India, at least in Mysore State, have been found to have lower fertility than the Hindus.[10]

Ancestor worship has been cited as a mainstay of attitudes favouring high fertility among the Chinese. However, the questionable estimates of the birth rate in China (mainland) suggest that ancestor worship notwithstanding, the Chinese are not as fertile as many other Asian nations. The more trustworthy data for China (Taiwan) have the same implication.[11] In Mongolia, the relatively low fertility found in some early studies was attributed in part to the widespread custom of dedicating the eldest son of each family to monkhood, and in part to extremely widespread venereal disease.[12] Under the present Government there are fewer monks, conditions of health have improved and venereal disease has probably diminished, yet the officially recorded birth rates (of unknown degree of reliability) are still not very high.

In addition to Japan, the Governments of several other countries in Asia have recently adopted the policy of attempting to check population growth by promoting the practice of family planning.[13] One of the first to do so was the Government of India, which included provisions for family planning projects in its First Five-Year Plan (1950) and has progressively increased financial allotments for work in this field in the Second and Third Five-Year Plans. The task of educating the masses of India's population to the advantages and methods of birth control is a formidable one and it is not claimed that the programme has yet had a considerable effect on the birth rate. In Pakistan, Government-supported work in this field began more recently; it was initiated by the new Government which came into power in 1959, and the programme of activities for promotion of family planning is not yet as advanced as in India. The Government of China (mainland) undertook in 1955-1956 a programme of popular education and other activities in favour of family planning. These activities were abated during 1957-1961, but have again been intensified since 1962. Discouragement of early marriage is a part of the policy, as well as provisions for distribution of contraceptives and permission of abortion and sterilization. The Governments of China (Taiwan), the Republic of Korea and Singapore also have begun very recently to give full support to family planning movements. In other Asian countries, whatever efforts have been made to promote such movements have been privately sponsored, but in some cases the Governments have made financial and other contributions, as in Ceylon and the Federation of Malaya.

B. Trends

Although there is more information on past changes in fertility levels in Asia than in Africa, the majority of Asian countries are without any substantial data on this subject. As already mentioned, only nine countries in this region have fairly satisfactory current birth registration statistics (including Ceylon and the Ryukyu Islands, with their not quite complete records, as well as the seven countries for which the data are reported to be "complete" for recent years); and even these countries have no very long historical series of reliably recorded birth rates. Series of crude birth rates for eight of these countries are shown in table 4.3, covering the period since 1900 so far as the data are available; table 4.4 contains corresponding estimates of gross reproduction rates derived from the registration data for various periods. The ninth country, Hong Kong, is not included because the uncertainty of population estimates for the years between the 1931 and 1961 censuses makes it impossible to calculate a reliable series of birth rates. For Ceylon before the 1920's, and for Cyprus and Singapore before the 1930's, the rates were probably understated to a considerable extent as a result of omissions in birth registration. The rates for Japan before the 1920's are also relatively uncertain

[7] C. Chandrasekaran, "Indian Fertility in a Changing Economic and Social Setting" [1962] (processed). An average interval of about three years was found in a sample survey in rural Uttar Pradesh. G. B. Saxena, "Age at Marriage and Fertility — A sample study in the rural Uttar Pradesh", *Artha Vijñana* (Poona), vol. 4, March 1962, p. 57.

[8] Detailed comparisons of the Hindu and Moslem communities in regard to fertility and related characteristics were made in *The Mysore Population Study*, op. cit.

[9] Wilbur Zelinsky, "The Indochinese peninsula: a demographic anomaly", *Far Eastern Quarterly*, vol. 9, Feb. 1950, p. 144.

[10] *The Mysore Population Study*, op. cit.

[11] On Chinese customs tending toward high fertility, *see* George W. Barclay, *Colonial Development and Population in Taiwan*, Princeton, 1954.

[12] I. Kool-Estovend, "O dvizhenii naseleniya v Mongolii" (On population movements in Mongolia), *Viêstnik Azii*, Vol. III-IV, No. 35-36, Harbin, 1915. *A Japanese View of Outer Mongolia*, Institute of Pacific Relations, New York, 1942 (condensed translation by A. J. Grajdanzev of *The Outer Mongolian People's Republic*, by Yasuo Mishima and Tomio Goto, Ito Publishing Company, 1939).

[13] For a review of recent developments in family planning in ten Asian countries, see M. C. Balfour, "Family Planning in Asia", *Population Studies* (London), vol. 15, November 1961, pp. 102-109.

Table 4.3. Trends of crude birth rates in Asian countries with relatively good statistics: 1900-1960

(Births per 1,000 population)

Years	Ceylon	China (Taiwan)	Cyprus	Federation of Malaya	Israel: Jewish population	Japan [a]	Ryukyu Islands	Singapore
1900-1904	38.6 [b]	...	29.4 [c]	...	...	32.2	...	...
1905-1909	37.4 [b]	40.2 [d]	30.9	...	...	32.3	...	...
1910-1914	37.5 [b]	42.3	31.2	...	...	33.8	...	23.3
1915-1919	37.0 [b]	40.3	30.9	...	...	32.5	...	26.2
1920-1924	38.5	41.8	27.6	...	34.5 [e f]	35.1	...	28.9
1925-1929	40.6	44.0	27.4	...	24.3 [f]	34.1	...	33.2
1930-1934	37.8	45.5	29.7	35.4 [g h]	30.6 [f]	31.9	...	38.5
1935-1939	35.6	44.7	31.8	40.6 [h]	27.1 [f]	29.3	...	46.0
1940-1944	36.6	41.7 [i]	29.4	39.7 [h j]	25.1 [f]	30.1	...	44.9 [j]
1945-1949	38.2	40.2 [k]	31.2	40.6 [l]	29.0 [f]	30.1	36.1 [l]	46.4 [k]
1950-1954	38.5	45.9	27.9	44.1	30.8	23.7	35.5	45.5
1955-1959	36.6	42.8	25.9	44.4	25.6	18.2	26.1	42.8
1955	37.3	45.3	26.4	44.0	27.2	19.4	27.6	44.3
1956	36.4	44.8	26.4	46.7	26.7	18.5	27.9	44.4
1957	36.5	41.4	25.8	46.2	26.0	17.3	24.5	43.4
1958	35.8	41.7	25.6	43.3	24.0	18.1	25.9	42.0
1959	37.0	41.2	25.4	42.2	24.3	17.6	24.9	40.3
1960	36.6	39.5	25.3	40.9	23.9	17.2	23.1	38.7 [m]

Source: Rates are computed from registered births and official population estimates, except as indicated in the country notes in section C of this chapter.

[a] Rates relate to Japanese nationals in Japan.

[b] From N. K. Sarkar, *The Demography of Ceylon* (Colombo, 1957), p. 95.

[c] 1901-1904.

[d] 1907-1909.

[e] 1922-1924.

[f] Data for the years prior to 1948 refer to the Jewish population of Palestine.

[g] 1932-1934.

[h] Rates exclude Singapore and thus differ from those published in the United Nations *Demographic Yearbook*.

[i] 1940-1943.

[j] 1940-1941.

[k] 1947-1949.

[l] 1946-1949.

[m] For the sake of comparability with preceding years, rate includes births to non-locally domiciled population. It thus differs from the rate shown in table 4.1. Non-locally domiciled persons are excluded from the population estimates.

Table 4.4. Fertility trends in Asian countries with relatively good statistics

Country and years	Crude birth rate (births per 1,000 population)	Gross reproduction rate
Ceylon		
1909-1913	37.0	2.3
1919-1923	38.7	2.4
1946	37.5	2.4
1953	38.7	2.5
1955	37.3	2.5
1959	37.0	*2.6*
China (Taiwan)		
1913-1917	40.9	2.8
1918-1922	41.5	2.9
1923-1927	42.9	3.0
1928-1932	44.8	3.3
1933-1937	44.8	3.2
1938-1942	43.0	3.2
1950-1954	45.9	3.1
1955-1959	42.8	3.0
1947	38.3	2.6
1948	39.7	*2.7*
1949	42.4	*2.9*
1950	43.3	*3.0*
China (Taiwan) *(continued)*		
1951	50.0	3.4
1952	46.6	3.2
1953	45.2	3.2
1954	44.6	3.1
1955	45.3	3.2
1956	44.8	3.2
1957	41.4	2.9
1958	41.7	3.0
1959	41.2	2.9
1960	39.5	2.8
Cyprus		
1909-1913	30.6	2.1
1919-1923	27.9	1.9
1929-1933	29.9	1.9
1946-1947	32.9	2.2
1950-1954	27.9	1.8
1955-1959	25.9	1.7
1948	32.3	2.1
1949	27.8	1.8

Table 4.4. (*continued*)

Country and years	Crude birth rate (births per 1,000 population)	Gross reproduction rate
Cyprus *(continued)*		
1950	29.9	2.0
1951	29.3	1.9
1952	26.8	1.7
1953	26.6	1.7
1954	27.0	1.8
1955	26.4	1.7
1956	26.4	1.7
1957	25.8	1.7
1958	25.6	1.7
1959	25.4	1.7
1960	25.3	1.7
Federation of Malaya		
1932	35.0	2.3
1946-1949	42.0	2.9
1955-1959	44.6	3.1
1960	40.9	*2.9*
Israel: Jewish population [a]		
1930-1933	32.0	1.5
1938-1939	24.7	1.1
1940-1944	25.1	1.3
1945-1949	29.0	1.7
1950-1954	30.8	1.9
1955-1959	25.6	1.7
1948	26.8	1.5
1949	29.9	1.7
1950	33.0	1.9
1951	32.7	2.0
1952	31.6	1.9
1953	30.2	1.9
1954	27.4	1.8
1955	27.2	1.8
1956	26.7	1.8
1957	26.0	1.8
1958	24.0	1.7
1959	24.3	1.7
1960	23.9	1.7
Japan [b]		
1920 [c]	36.2	2.6
1925	35.0	2.5
1930	32.5	2.3
1937-1940	28.7	2.0
1947-1949	33.7	2.2
1950-1954	23.7	1.5
1955-1959	18.2	1.1

Country and years	Crude birth rate (births per 1,000 population)	Gross reproduction rate
Japan *(continued)*		
1947	34.3	2.2
1948	33.7	2.2
1949	32.8	2.1
1950	28.2	1.8
1951	25.4	1.6
1952	23.5	1.5
1953	21.5	1.3
1954	20.1	1.2
1955	19.4	1.2
1956	18.5	1.1
1957	17.3	1.0
1958	18.1	1.0
1959	17.6	1.0
1960	17.2	1.0
Ryukyu Islands		
1950	41.1	2.8
1953	32.5	2.2
1955	27.6	1.9
1956	27.9	1.9
1957	24.5	1.7
1958	25.9	1.7
1959	24.9	1.7
1960	23.1	1.6
Singapore		
1919-1923	27.9	2.2
1929-1933	37.3	2.7
1946-1949	45.9 [d]	3.2
1955-1959	42.7 [d]	3.2
1947	45.9	3.2
1948	46.3	*3.2*
1949	47.2	*3.3*
1950	45.4	*3.3*
1951	45.0	*3.3*
1952	45.4	*3.3*
1953	45.8	*3.3*
1954	45.7	*3.3*
1955	44.3	*3.2*
1956	44.4	*3.3*
1957	43.4	3.2
1958	42.0	*3.1*
1959	40.3	*3.0*
1960	38.7 [e]	*2.9*
1961	36.5 [e]	*2.7*

Source: In computing the fertility rates for periods longer than one year, the average annual number of registered births in the stated years have been related either to population data from a census taken during the middle of the period, or to an average of mid-year population estimates available for each year. Official census data or official population estimates were used in calculating all rates except those in italics, which are based on population estimates prepared by the United Nations.

[a] Data for years prior to 1948 refer to the Jewish population of Palestine.

[b] Data relate to Japanese nationals in Japan. Prior to 1947, data include Okinawa.

[c] Fertility rates computed on population base as of 1 October.

[d] Rates differ slightly from those shown in table 4.3 since they were obtained by relating the average annual number of births registered in the given years to the populations enumerated at the 1947 and 1957 censuses, respectively.

[e] For the sake of comparability with preceding years, rates for 1960 and 1961 include births to non-locally domiciled population. The rate for 1960 thus differs from the rate shown in table 4.1. Non-locally domiciled persons are excluded from the population estimates.

and not exactly comparable with those for the more recent period.

Estimates of past levels and changes of fertility in a few other Asian countries can be obtained from statistics of past censuses showing the classification of the population by age groups. Such estimates for India, Thailand and the Philippines are included in table 4.5. The table also shows some estimates based on data from past censuses for Ceylon, Cyprus, the Federation of Malaya and Singapore, which serve as a check on the rates derived from the registration statistics of early years. Turkey has a series of population statistics by age groups derived from the censuses taken at five-year intervals since 1935, but the data are too irregular to make a firm basis for estimates of changes in fertility. Temporary large depressions in the birth rate of Turkey because of mobilization and wars during 1914-1923 and again in the 1940's and their effect on numbers in the reproductive ages in later generations have contributed to this irregularity.

Table 4.5. Trends of registered and estimated crude birth rates for selected Asian countries

Country and years	Crude birth rate (births per 1,000 population)	
	Based on registration data	Estimated by "reverse-survival"
Ceylon		
1911-1916	37	46
1936-1941	36	38
1943-1948	38	41
Cyprus		
1901-1906	29	38
1911-1916	31	37
1921-1926	27	33
1936-1941	31	29
Federation of Malaya		
1921-1926	...	38
1937-1942	39	48
1947-1952	43	47
India [a]		
1901-1910	...	48
1911-1920	...	49
1921-1930	33 [b]	46
1931-1940	26 [b]	45
1941-1950	28 [c]	40
Philippines		
1929-1934	33 [d]	52
1938-1943	32 [d]	53
1947-1952	31 [d]	51
1950-1955	31 [d]	50
Singapore		
1911-1916	24	27
1921-1926	30	32
1937-1942	44	41
1947-1952	46	46
Thailand		
1927-1932	33	46
1937-1942	36	46
1946-1951	26	47
1950-1955	31	46

[a] Rates estimated from census data.
[b] For registration area.
[c] Data relate to 1941-1946; for registration area.
[d] Health Bureau statistics.

(1) *Trends in countries where fertility is now low.* In the four Asian countries where fertility is lowest at present — Cyprus, Israel, Japan and the Ryukyu Islands — the birth rates have fallen during recent decades from considerably higher levels.

In Cyprus, before the First World War, the crude birth rate was about 37-38 per 1,000 if the "reverse-survival" estimates derived from the census data are near the truth. It seems to have declined irregularly from that time until the early 1950's, a period also marked by far-reaching economic and social changes, including urbanization, a rising level of living and rising standard of education.[14] Since 1952 the birth rate seems to have been stabilized at about 27, although the trend and the recent level cannot be exactly determined in view of the deficiencies of registration.[15] On the whole, the apparent changes resemble the typical pattern of fertility trends in southern European countries during the last half-century. Indeed, Cyprus seems more European than Asiatic in its demographic characteristics; the Greek influence seems to prevail in this respect in spite of the presence of a sizable community of Turkish origin.

The crude birth rate of the Jewish population of Israel has decreased by nearly one-third from the level of 34 per 1,000 recorded as an average for the 1920's at the beginning of the statistical series. The decrease in this case was due to the changes in age-sex structure of the population resulting from immigration and the reproduction and aging of the immigrants. Fertility as measured by the gross reproduction rate was little, if any, higher in the 1920's than it is at present. Its trend during the interval was generally similar to the trends observed in Western European countries, the United States, etc.: declining in the 1930's, rising in the 1940's to a post-war peak in 1951, then falling off and becoming stabilized at a somewhat lower level since 1958.

The trends in Japan and the Ryukyu Islands are of major interest as the sole examples up to the present time of decisive decline to a low level of fertility in countries of truly Oriental culture. Fertility in Japan during the 1920's was at a moderately high level which seems to have been maintained for many previous decades. The gross reproduction rates show a slight decline during the 1930's which was temporarily accentuated during the war, and an early post-war rise which brought the rates for 1947-1949 up to a level somewhat below

[14] Irene B. Taeuber, "Cyprus: The Demography of a Strategic Island", *Population Index* (Princeton), vol. 21, January 1955, pp. 4-20.

[15] For recent years the rates shown in this study are official estimates which contain a correction for under-registration.

that of the 1920's. The decisive decline began in 1950 and continued until 1957, when the gross reproduction rate reached 1.0 — less than half of the 1947-1949 average. The rate of 1.0, which has been maintained since 1957, is one of the lowest in the world; only Hungary, Luxembourg and Sweden among the countries considered in the present study have lower rates for recent years. This gross reproduction rate is, of course, below the level required to replace the population in the long run. Japan's net reproduction rate in 1960 was 0.92.

It is pertinent to note that the Ryukyu Islands were a part of Japan (former Okinawa Prefecture) until the end of the Second World War. It is the cultural link with Japan that may be the most important determining factor of recent fertility trends. In the pre-war years the fertility level in the Ryukyu Islands differed little from that of the adjacent Japanese prefecture of Kagoshima.[16] The reduction of fertility in the Ryukyus appears to have begun, as it did in Japan, about 1950, and the extent of the reduction has apparently been as great in the Ryukyus as in Japan. In 1950 it is estimated that the gross reproduction rate of the Ryukyu Islands was about 2.8, which was considerably higher than the rate in Japan at that time, but lower than the rates estimated for a number of other Asian countries. By 1960 the estimated gross reproduction rate was reduced to 1.6 — still well above the level in Japan, but 44 per cent below the rate estimated for 1950 in the Ryukyus; and there was no sign of the down-trend yet having come to an end.

The factors associated with the recent decline of fertility in Japan and the Ryukyu Islands are of particular interest for their implications with regard to the possibilities of similar changes occurring in the near future elsewhere in Asia. The conditions of low fertility in Cyprus and Israel are less pertinent, as the cultural characteristics of these two countries are predominantly European.

Before and during the Second World War the Japanese Government had followed a pro-natalist policy, which was reversed in 1948. Since then, legislation and other measures adopted by the Government have undoubtedly played a part in bringing about the great reduction of fertility of the Japanese population between 1950 and 1956. Family planning clinics were established throughout the country, and the Government launched a vigorous campaign of popular education in the advantages and methods of birth control. While abortion was prohibited except under specified conditions, including health considerations, the initial reduction of the birth rate was in fact achieved mainly by this means. More recently, contraception has been gaining popularity, with the active encouragement of the Government.[17] An additional factor was rising age at marriage; the proportion of women at ages 20-24 who were single increased from 55 to 68 per cent between 1950 and 1960.

In addition to the Government's policy, the economic and social conditions of post-war Japan have been avourable to popularization of the small-family idea and the spread of knowledge and practice of birth limitation methods. Almost universal literacy, a high degree of urbanization, the growing preponderance of industrial and commercial wage-earning employment and a rising level of income per head were conducive to the adoption of such attitudes and practices. In these circumstances, it is quite possible that a substantial reduction of fertility might have occurred spontaneously without official encouragement and assistance. On the other hand, in less favourable economic and social circumstances, equally strong Government efforts to promote limitation of births might have brought much smaller results.

The traditions of Japanese culture should also be taken into account. The idea of limiting the number of children to be brought into the world is not new to the Japanese people. All available information implies that their fertility had been relatively moderate, in comparison with the levels prevailing in some other Asian countries, for at least a century and perhaps for many centuries before the drastic reduction began in the 1950's.[18] Traditional attitudes and behaviour in this respect may have been moulded in the course of centuries by the pressure of population in a crowded island country with severely restricted land resources.

The United States Administration of the Ryukyu Islands has adopted no policy and taken no measures in favour of birth limitation, and yet fertility appears to have decreased no less in the Ryukyus than in Japan since 1950. Rising age at marriage for women was a factor in the Ryukyu Islands, as it was in Japan; the percentage of single women among all women in the age group 20-24 years rose from 38.1 in 1950 to 68.5 per cent in 1960. Diminishing marital fertility, however, was a more important factor. The number of registered births per 1,000 married women of child-bearing ages dropped from 312 in 1950 to 183 in 1960. No doubt these changes were stimulated mainly by influences from Japan, for example through circulation of Japanese publications and exchange of medical personnel.

In economic and social development the Ryukyu Islands are somewhat ahead of the majority of Asian countries (as shown, for example, by the indicators in table 4.2), but they are considerably less advanced than Japan. Rather, they resemble certain prefectures

[16] Irene B. Taeuber, *Demographic Instabilities in Island Ecosystem.* Paper presented at the Tenth Pacific Science Congress, Hawaii, 1961.

[17] A review of information on methods of birth control used in Japan, as revealed by various surveys, is given in: R. Minami *et al.*, *Jinko-daijiten* [Population Encyclopaedia], Tokyo, 1957. On the recent increase in practice of contraception, see: *Family Planning News* (Quarterly Bulletin of the Family Planning Federation of Japan), No. 2, Oct. 1961; *Fifth Public Opinion Survey on Birth Control in Japan* (Population Problems Series No. 16 of the Population Problems Research Council, the Mainichi Newspapers, Tokyo, Japan, 1959). *An Outlook of Studies on Population Problems in Japan*, Japanese National Commission for UNESCO, Tokyo, 1962, pp. 67-75.

[18] In the latter half of the nineteenth century Japan's birth rate is estimated to have been in the low 30's. Yuzo Morita, " Estimated Birth and Death Rates in the Early Meiji Period of Japan ", *Population Studies* (London), vol. 17, July 1963, pp. 33-56.

of Japan which lag behind the rest of the country in this respect. The implication of the recent trend of fertility in the Ryukyus is plain: in a favourable cultural milieu, motivation for limiting births and knowledge and practice of methods for doing so can be popularized quickly even where the level of economic development is rather modest, and without any encouragement or assistance on the part of the Government.

(2) *Trends in countries of high fertility.* In most of the high-fertility Asian countries for which any data on levels of fertility in the past are available, it appears that no very great changes in the fertility level have occurred in the course of time. So far as one can judge on the basis of present evidence, fertility throughout most of Asia has remained for many decades, if not for centuries, more or less at the same high levels observed at present.

For Ceylon, quinquennial averages of registered crude birth rates since 1900 (table 4.3) have varied within the range of 35.6 to 40.6, and the corresponding averages for China (Taiwan) have varied in the range of 40.2 to 45.9, without any decided long-range trend being apparent in the figures for either country. Crude birth rates for former British India estimated from the results of successive censuses (table 4.5) show a decline from the level of 48-49 for 1901-1910 and 1911-1921 to 46 for 1921-1930 and 45 for 1931-1940. This apparent gradual downward trend might be due merely to errors of census enumeration or estimation of the birth rates. For the Indian Union, a similar estimate for the intercensal decade 1941-1950 indicates a rate of approximately 40, which is nearly the same as the estimates for 1958-1959 derived from the results of the recent sample surveys, but in both cases there are reasons for suspecting that the estimates may be too low. The higher level of the earlier estimates for British India might be explained partly by the inclusion of much of Pakistan, which seems to have higher fertility than India at present. For the Philippines, birth rates estimated by " reverse-survival " from the data of successive censuses are all at approximately the same high level of 50 to 53 for the periods 1929-1934, 1938-1943 and 1947-1952. Similar estimates for Thailand are at the level of 46-47 for each of four time-periods between 1927-1932 and 1950-1955. The birth rate of Burma seems to have fluctuated, with high and low rates occurring in a cycle of about 30 years, according to an analysis of census age distributions.[19]

There are indications of cyclical or other short-term variations of fertility having occurred at least in some of these countries during the last few decades. The registration statistics for Ceylon, China (Taiwan), the Federation of Malaya and Singapore indicate higher fertility during the late 1940's and early 1950's than during either the immediately preceding or following years. The same pattern appears in the incomplete registration statistics of Burma, the registration area in India, the Republic of Korea, the Philippines and Viet-Nam.[20] " Reverse-survival " estimates of birth rates based on numbers of children in different age groups enumerated in recent censuses of some Asian countries also conform to this pattern,[21] though the variations suggested by such estimates might be due to errors of estimation or differing degrees of underenumeration of children in the age groups considered. The implication of these observations is that the early post-war " baby boom " in many countries of Europe, the United States, etc. may have been duplicated on a smaller scale in much of Asia. Also, the dip of birth rates below the long-range trends during the 1930's, attributed to the economic depression in industrialized countries, appears on a smaller scale in the registration data for Ceylon, the Republic of Korea and the Philippines, as well as in the series for Japan, as mentioned above.

Singapore and the Federation of Malaya are exceptional in that the data for these areas indicate substantial increases of fertility prior to the 1940's. Singapore's registered crude birth rate (table 4.3) rose from an average of only 23.3 at the beginning of the series in 1910-1914 to 46.0 in 1935-1939 and remained near the latter level, with minor variations, until 1956, since when it has dropped to 36.5 in 1961. The series of birth registration statistics for the Federation of Malaya begins only in 1932, but when the registered rates are considered in connexion with the " reverse-survival " estimates going back to the period 1921-1926 (table 4.5), it appears that the trend in the Federation has been generally similar to the trend in Singapore since the early 1920's.

A correct understanding of the atypical fertility trends in these two areas requires consideration of the data for the major ethnic groups composing their population. The Malay, Chinese and Indian-Pakistani communities in Singapore and the Federation have exhibited different levels and trends of fertility. Some of the relevant data are summarized in section C, below. It may be noted here that one cause of the relatively low birth rates in the earlier years, especially in Singapore and to a lesser extent in the Federation of Malaya, was an unbalanced sex ratio due to large immigration of male workers. In Singapore at the 1911 census, there were 245 males per 100 females. The sex ratio improved during the 1920's and 1930's as the rate of immigration slackened and the proportion of female immigrants increased. Normalization of the population structure was a factor contributing to the rise of the birth rates both in Singapore and the Federation, but the rise could

[19] R. M. Sundrum, *Population Statistics of Burma.* Economic Research Project, Statistical Paper No. 3, December 1957. [Economics, Statistics and Commerce Departments, University of Rangoon.] Census data suggest that similar long-term fluctuations have occurred also in the generally high birth rates of the Philippines and Thailand, though the evidence is less clear than in the case of Burma.

[20] *Demographic Yearbook*, 1959 and 1961, United Nations publication, Sales No.: 59.XIII.1 and 62.XIII.1 respectively.

[21] Recent census data for Indonesia and Turkey, for example, suggest that there were pronounced birth deficits during the 1940's, followed by an increase in the birth rate in the 1950's. Abnormalities in the age structure resulting from such trends can cause later fluctuations in the crude birth rate even though the level of fertility remains unchanged.

not be explained entirely in these terms. The age-specific fertility rates of the female population were also increasing as shown, for example, by the rise of the estimated gross reproduction rate for Singapore from 2.2 in 1919-1923 to 3.2 in 1946-1949 and 3.3 in 1949-1956, and for the Federation from 2.3 in 1932 to 2.9 in 1946-1949 and 3.1 in 1955-1959 (table 4.4). The Federation of Malaya and Singapore in the mid-1950's were among the countries of highest fertility in Asia. If it develops that the recent down-turn of their fertility rates is the beginning of a continuous, decisive declining trend, they may be among the first Asian countries to experience a transition from a very high to a low fertility level.

A recent trend of increasing average age at marriage of women seems to have been an important factor in the decline of fertility during the late 1950's in Singapore and the Federation of Malaya, especially in the case of the Chinese element of the population. In Malaya as a whole, including Singapore and the Federation, the percentage of married women in the Chinese female population at ages 15-19 dropped from 18 per cent in 1947 to 12 per cent in 1957, while the corresponding figure for the age group 20-24 fell from 63 to 58 per cent.[22] A similar trend in Ceylon during recent years is indicated by the annual statistics of marriages.[23]

In the Republic of Viet-Nam, birth registration has approached completeness in some provinces in recent decades. For the 19 provinces that reported consistently from 1956 to 1961, the numbers of births recorded in these years are as follows : 205,000, 220,000, 229,000, 235,000, 211,000 and 183,000. When related to available corresponding population estimates, these data imply that the birth rate fluctuated between 38 and 40 per 1,000 during 1956-1959, and fell thereafter to the low 30's. It must be considered that this drop may have been due to a deterioration of registration. Such a deterioration might have been caused by local hostilities, but it would seem likely to affect the returns from some provinces more severely than others, whereas the apparent decline in birth rates was fairly uniform in the reporting provinces. Even though the reliability of the statistics is questionable, some actual decrease in fertility is indicated. Statistics on marriage, not necessarily representative of the country as a whole, indicate an average age at marriage of 23 to 24 years for women who married during 1955-1957 (a rather high average by comparison with that of most countries in Asia). Such a high age at marriage is fairly common in countries of low fertility and may be indicative of a predisposition to fertility control. Conditions may differ in other provinces, for which relevant statistics are less adequate. Although the interpretation of the fragmentary data is uncertain, it appears possible that a decline in fertility has begun in the Republic of Viet-Nam. No data are available on the trend in North Viet-Nam.

[22] J. C. Caldwell, " The Population of Malaya ", unpublished doctoral dissertation, Australian National University, Canberra, 1962. The author found evidence of only a slight decline of marital fertility but noted the possibility that the decline might have been understated as a result of improving registration of births among the Chinese.

[23] Some uncertainty is attached to this observation because many marriages are not registered.

The custom in India of marrying girls in adolescence or even in childhood is on the decline. Calculations based on the results of the censuses have shown that the average age of brides has been rising in that country at least since the beginning of the twentieth century, although it is still very low at present.[24] The effect on the trend of fertility is questionable in view of the finding that the girls who marry very young are not the ones who bear the largest number of children, on the average, in the course of their lives.[25] The average interval between consummation of marriage and the first birth has been found to be relatively long in the case of girls marrying at a very early age. Frequent adolescent sterility, linked with poor living conditions and ill health, has been suggested as an explanation; also Hindu customs which result in a young wife's being absent from her husband's house for considerable periods of time during the early years of marriage.[26]

Any tendency to reduce fertility which results from increases in average age at marriage may be offset more or less by the opposite effect of decreasing incidence of widowhood among women of potentially reproductive age, due to improving health conditions and falling mortality rates. The effect of expected progress in health and reduction of mortality rates in India during the years ahead, reducing the incidence of widowhood, would be to increase fertility considerably if other factors were to remain unchanged.[27] An increase in the remarriage rate of young widows, which seems to be under way in India, would also tend to raise fertility.[28]

There is also a possibility of health improvements bringing about a considerable increase of marital fertility through reduction of the frequency of pathological sterility. It has been suggested that the achievements in malaria control in Ceylon during the late 1940's and early 1950's might have been a major factor in the up-turn of the birth rate at that time,[29] but a similar rise of the birth rate also occurred in other Asian countries, as already mentioned.

The adoption of official policies in favour of limitation of births by an increasing number of Governments in this region signifies a trend of attitudes and thought, at least among the political leaders and educated élite, which may have a great effect on the birth rates of Asian nations in the future if it is transmitted to the general public. It is too early to see whether any of the others will respond as quickly and decisively as the Japanese

[24] S. N. Agarwala, " Mean Ages at Marriage and Widowhood in India ", International Population Conference, 1961 (New York), paper No. 21 (processed). The average age at first marriage for females was estimated at 15.4 years in 1941-1951.

[25] G. B. Saxena, op. cit., pp. 55-56.

[26] J. R. Rele, " Some Aspects of Family and Fertility in India ", *Population Studies* (London), vol. 15, March 1962, pp. 273-274.

[27] K. G. Basavarajappa, op. cit.

[28] The extent to which widows remarried in several rural communities has been examined in: Kumudini Dandekar, " Widow Remarriage in Six Rural Communities in Western India ", International Population Conference, 1961 (New York), paper No. 56 (processed).

[29] R. Raja Indra, " Fertility Trends in Ceylon ", *Proceedings of the World Population Conference, 1954*, Papers, Vol. I, (United Nations publication, Sales No.: 55.XIII.8 (Vol. I)), pp. 889-899.

have done. The down-turn of the birth rates during the last few years in the Federation of Malaya, Singapore and China (Taiwan) may represent the beginning of such a movement, though the record of previous fluctuations of the rates in these countries is a caution against any hasty inference.

C. Notes on fertility data and estimates for countries

1. *South West Asia*

Cyprus. The crude birth rates for Cyprus in 1955 and later years shown in the tables of this report are official estimates including adjustments for under-registration. The registered rates for the 1920's and earlier periods were probably considerably understated as a result of omissions in birth registration;[30] "reverse-survival" estimates from census data indicate substantially higher rates (see table 4.5). Thus, there was probably an appreciable decline of fertility in Cyprus prior to the 1930's which is not reflected in the registration statistics.

The age pattern of fertility in Cyprus has been appreciably altered during the period since the Second World War. Age-specific fertility rates for older women have decreased, while those for younger women have increased. As a result, the gross reproduction rate has decreased more during the 1950's than has the crude birth rate (table 4.4). Births by age of mother were not tabulated prior to 1948, and in calculating gross reproduction rates for early years, the age pattern of fertility was assumed to be the same as in 1948-1949.

Iran. The estimated crude birth rate of 48 per 1,000 for Iran in 1946-1951 and the corresponding gross reproduction rate of 3.1 shown in table 4.1 were obtained by the "reverse-survival" method from the number of children 5-9 years of age enumerated in the 1956 census. The estimates are not highly reliable as the accuracy of the census data by age groups is apparently relatively poor. In estimating the gross reproduction rate, the age pattern of fertility was assumed to be similar to the pattern shown by birth registration statistics for health bureau localities in the United Arab Republic.

In a national sample survey carried out after the 1956 census in forty towns and 311 villages, data were collected on births during a specified recent period of time, from which a crude birth rate of about 45 was derived. Birth registration statistics for 1959, admittedly incomplete, indicated a crude birth rate of 44.3. Earlier surveys indicated an average crude birth rate of 51 in selected rural villages for the period 1940-1950[31] and a rate between 40 and 45 for Teheran.[32]

Iraq. Birth registration in Iraq is greatly deficient, and the only data available from which estimates of the birth rate can be derived are the age distributions of the population provided by the censuses of 1947 and 1957. The estimated rates for the period 1947-1952 shown in table 4.1 were obtained by "reverse-survival" from the number of children enumerated in the age group 5-9 years at the census of 1957. For Iraq, as for Iran, the age pattern of fertility rates shown by the statistics of the United Arab Republic was assumed in calculating the gross reproduction rate. The reliability of the estimates is not high, as the quality of the 1957 census data on population by age groups appears to be relatively poor. The data of the 1947 census were apparently even more defective in this respect; however, application of the "reverse-survival" method to the 1947 figure for children 5-9 years old yielded estimates of fertility rates for 1937-1942 at approximately the same level as the estimates for 1947-1952.

Israel. The crude birth rate of 23.9 and gross reproduction rate of 1.7 shown for Israel in table 4.1 are derived from complete birth registration statistics. They relate to the Jewish population, which made up 89 per cent of Israel's total population in 1959. The comparable crude birth rate for the population as a whole in 1960 (also based on complete registration data) was 27.1. The historical series of rates shown in tables 4.3 and 4.4 have been obtained by using data for the Jewish population of the former territory of Palestine for the earlier years and of Israel for the period since the creation of the new state. Registration of births and deaths was made compulsory in Palestine in 1920, and registration was satisfactory after the first few years, at least for the Jewish population.[33]

While the trend of fertility of Israel's Jewish population since the 1920's has been broadly similar to that of industrialized countries in western Europe, the United States, etc., some differences in details are apparent, which have been attributed to conditions peculiar to this country. In western European countries the fertility decline generally reached a low point about the middle of the 1930's and an upward trend followed; but in Israel the decline continued through the late 1930's to a low point in 1941.[34] Relatively unfavourable economic conditions in Israel during the late 1930's and early 1940's have been considered as a likely explanation of this feature. A temporary reduction of marriage and birth rates occurred in 1948, at the outbreak of the Palestinian conflict. The subsequent rise of the birth rate to a peak in 1951 corresponds to the trend in various other countries; however, this also has been attributed to conditions peculiar to Israel, including the absence of alternative choices for income expenditures during the years of rationing and austerity following the establishment of the State of Israel, psychological factors such as the reaction to the annihilation of

[30] These rates have been computed from data in *Census of Population and Agriculture 1946* (Cyprus). London, 1949, p. 34.

[31] Mohammad B. Mashayekhi *et al.*, *Some Demographic Aspects of a Rural Area in Iran* (Milbank Memorial Fund, April 1953), p. 157.

[32] L[ouis] H[enry], "Trois enquêtes en Iran", comment on a thesis by Ehsan Naraghi; in "Notes et documents", *Population* (Paris), vol. 11, Oct.-Dec. 1956, p. 762.

[33] K. R. Gabriel, "The Fertility of the Jews in Palestine: A Review of Research", *Population Studies* (London), vol. 6, March 1953, p. 274.

[34] Roberto Bachi, "La population juive de l'Etat d'Israël", *Population* (Paris), vol. 7, July-Sept. 1952, p. 439.

Europe's Jews and to years of insecurity in Palestine, and immigration of married couples who anticipated births immediately upon their settlement in Israel.[35]

The Jewish population of Israel has experienced fluctuations in age structure, due to heavy immigration, which make it hazardous to interpret fertility trends on the basis of the crude birth rate alone. Table 4.4 shows that the post-war recovery of fertility, as measured by the gross reproduction rate, was much greater than suggested by the crude birth rate. Mass immigration of African and Asian Jews, accompanied by large numbers of children,[36] helped to create an age structure which tended to depress the crude birth rate. Similarly, the decline in fertility in more recent years appears much less pronounced when the sex-age structure of the population is taken into account.

Tabulations of births by age of mother are not available for years prior to the late 1930's, and in calculating the gross reproduction rate for 1930-1933 shown in table 4.4 the age pattern of fertility was assumed to be the same as in 1938-1942.

All of the birth rates shown for Israel are based on statistics tabulated by year of registration rather than year of occurrence.

Jordan. The crude birth rate estimate of 45 and gross reproduction rate of 3.4 shown in table 4.1 were derived by "reverse-survival" of age data from the 1961 census.[37] In computing the gross reproduction rate, the age pattern of fertility was assumed to be similar to that of health bureau localities in the United Arab Republic. The crude birth rate appears low in relation to the gross reproduction rate, owing to a high ratio of males to females at the ages of childhood and above 55 years.

Incomplete birth registration data for the period 1951-1960 show the annual crude birth rate fluctuating between 35 and 46 per 1,000. Except for registered Palestinian refugees, foreigners are excluded in computing the birth rates. Birth registration was estimated to be about 80 per cent complete in 1955; the recorded birth rate for that year was 40, implying that the real level may have been about 50.

Another indication of very high fertility is given by 1961 census data on the number of lifetime births to women, which show that women who had ever been married had borne an average of 7.8 children.

Lebanon. Birth registration is known to be deficient, and the registered crude birth rate has fluctuated between 24 and 45 during the past decade. As shown in table 4.1, the registered rate was 42 in 1961. Non-resident foreigners and registered Palestinian refugees are excluded in calculating the birth rates.

A survey carried out in several villages and in Beirut in 1958-1959 provided some indication of a high fertility level. The completed fertility of rural women married 30 years or more was about 7.5 for Moslems and 6.8 for Christians.[38]

Syria. Birth registration data are too deficient to provide any indication of the level of fertility. The registered rate was 25 in 1961, but the view has been expressed that the number of registered births does not exceed one half of actual births.[39] A census of population was taken in 1960, but data on age were not available at the time of preparation of the present report.

Turkey. Turkey has a long series of censuses, but no adequate vital statistics. In the most comprehensive analysis of the Turkish population yet published, no attempt was made to present an estimate of the birth rate.[40] The estimated crude birth rate of 43 shown in table 4.1 was derived from the number of children aged 5-9 years shown in a one per cent sample tabulation of 1960 census results. The estimates are dubious in view of the irregularities in age structure and sex ratio of the population shown by the Turkish censuses. These irregularities imply not only much misreporting of ages, but certain consistent features of the age distributions shown by successive censuses make it evident that sharp fluctuations in the birth rate were associated with the First World War, the period of political strife which followed it until the establishment of the Republic in 1923, and the prolonged military mobilization during the Second World War. Changes in age structure resulting from such causes may produce subsequent fluctuations in the crude birth rate even though the fertility level does not change. Early in the 1950's, for example, the population had a higher proportion of persons of child-bearing age than it has had in the most recent years. Hence the crude birth rate may have been higher a decade ago than at present merely because of this shift in age structure.

The intercensal annual growth rate of the population during 1950-1955 was 28 per 1,000. With a crude birth rate of 43, this would imply a crude death rate of 15 per 1,000 during this period, which, though not necessarily accurate, is plausible.

In calculating the gross reproduction rate of 2.9 shown in table 4.1 it was assumed that the age pattern of fertility was like that shown by birth registration statistics for the health bureau localities in the United Arab Republic.

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[35] K. R. Gabriel, "Nuptiality and Fertility of Origin Groups in Israel", *Jewish Journal of Sociology* (London), vol. 2, June 1960, p. 82; Roberto Bachi, op. cit., p. 440.

[36] Moshe Sicron, *Immigration into Israel* (Jerusalem, 1957), pp. 53-59. The author shows that the proportion of children in the population would have risen through natural growth, but that this rise was accentuated by immigration.

[37] The census data became available too late to permit the inclusion of fertility estimates for Jordan in regional summary tables presented in chapters I and II and in the correlation analysis in chapter IX.

[38] David Yaukey, *Fertility Differences in a Modernizing Country; A Survey of Lebanese Couples.* Princeton, 1961.

[39] E. El-Noss, *Population Conditions in the Arab World,* Institute of Advanced Arab Studies (Cairo, 1955), p. 227. Quoted by M. A. El-Badry, "Trends in the Components of Population Growth in the Arab Countries of the Middle East: A Survey of Present Information", paper prepared for the Conference on Demographic and Economic Trends in Developing Countries, New York, October 1963, p. 34.

[40] Irene B. Taeuber, "Population and Modernization in Turkey", *Population Index* (Princeton), vol. 24, April 1958, pp. 101-119.

2. *South Central Asia*

Ceylon. Tests of birth registration in Ceylon, conducted in connexion with the census of 1953, indicated that about 88 per cent of births were registered. If the percentage had not changed since that time, the crude birth rate for 1960 would be about 41 or 42 instead of the registered rate of 37 shown in table 4.1.

Uncertainty about changes in the degree of completeness of registration makes it impossible to draw precise conclusions with regard to trends in fertility from the historical series of birth registration statistics. The birth rates estimated by "reverse-survival" from the numbers of children enumerated at successive censuses (table 4.5) are higher than the registered rates, suggesting that there was a considerable amount of under-registration, particularly in the earlier years of the series. During the years 1921-1946, the understatement of the birth rates on this account is believed to have been partly offset by an upward bias due to under-estimation of the population totals used as the basis for calculation of the rates, this under-estimation being the result of a deficiency in the 1921 census enumeration.[41] When allowance is made for these errors, it still seems that the level of fertility in Ceylon has remained fairly constant during the last half-century, except for temporary fluctuations.

The registered crude birth rates since 1953 show a slight decline, which seems to have been due to a shift in the sex-age structure of the population, since no decline appears in the series of gross reproduction rates. The basis for the calculation of the latter rates is uncertain, however, as official estimates of the population by sex and age are lacking since 1955 and estimation of the age distribution for more recent dates is hazardous in view of apparent errors in age reporting at the 1953 census.

Tabulations of births by age of mother date only from 1953, and gross reproduction rates for earlier dates shown in table 4.4 have been based on the assumption that the age pattern of fertility was the same as in 1953.

Birth rates for Ceylon for all years are based on statistics tabulated by year of registration of the event.

India. There is a long record of vital statistics for India, referring to births and deaths recorded in a registration area which has varied in extent in past years but now covers most of the country.[42] The registration is very incomplete, however, and the corresponding rates are grossly understated.

The crude birth rate of 39 shown in table 4.1 for 1958-1959 was derived from reports on births during a twelve-month period collected in the fourteenth round of the Indian National Sample Survey.[43] These data refer to rural India. Fertility may be somewhat lower in the urban areas, but their share of the population is not very large. The rates are probably under-estimated to some extent, since reports on births collected in the Indian sample surveys have been found to be subject to omissions.[44] The crude birth rates indicated by the survey data for certain states were too low to be readily credible. For example, a rate of only about 21 per 1,000 population was reported for Jammu and Kashmir.

Estimates of birth rates derived from census statistics for the intercensal decades from 1901-1910 to 1941-1950 are shown in table 4.5. As already mentioned, the estimate shown here for the decade 1941-1950 is about the same as the estimate derived from the survey data for 1958-1959, but the 1941-1951 estimate also may be understated as a result of infant mortality having been estimated at too low a rate. Another estimate for the period just prior to 1951 was 43 per 1,000.[45] The latter figure, with a corresponding gross reproduction rate of 2.8, has been used in calculating fertility rates for the world's principal geographical regions shown in chapter I.

Both census and survey data suggest some variations in the birth rate in different regions of India, rates being generally highest in the North, North-west and Central regions, and somewhat lower in the East and South. Estimates worked out from 1951 census data placed the birth rate at about 41-42 in the West and North-west regions, 38-39 in the East, and 36-37 in the South.[46] National Sample Survey data on births during the preceding year confirmed the general findings of higher birth rates for the states of Rajasthan, Punjab, Delhi and Himachal Pradesh in the northern part of the country, and lower rates in the East and South.[47] The lower rates in the latter region may be due to higher age at marriage, which has been found for Madras and Travancore-Cochin (now Kerala) States.[48] On the other hand, marriage appears to be very early in the eastern States, which according to the survey results had the lowest birth rates of all.

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[41] N. K. Sarkar, *The Demography of Ceylon*, Colombo, Ceylon Government Press, 1957.

[42] M. A. El-Badry and C. Chandrasekaran, "Some Methods for Obtaining Vital Statistics in India", International Population Conference, 1961 (New York), paper No. 109 (processed).

[43] India, *The National Sample Survey*, No. 89, "Fertility and Mortality Rates in Rural India,", Fourteenth Round, July 1958-June 1959; Calcutta, 1961 (draft report, processed). From age-specific birth rates given in this report a gross reproduction rate of 2.53 was calculated, corresponding to a crude birth rate of 38.9. These data pertain to two of six sub-rounds. The average crude birth rate derived from all six sub-rounds for rural India was 38.3. *The National Sample Survey*, No. 48, "Preliminary Estimates of Birth and Death Rates and of the Rate of Growth of Population", Fourteenth Round, July 1958-July 1959 (Calcutta, 1961), p. 12.

[44] Similar data on births from the seventh round of the National Sample Survey gave a birth rate of only 34, but it was estimated that the figure corrected for recall lapse might have been about 41. Indian Statistical Institute, "The Use of the National Sample Survey in the Estimation of Current Birth and Death Rates in India", International Population Conference, 1961 (New York), paper No. 85 (processed), p. 2.

[45] Ansley J. Coale and Edgar M. Hoover, *Population Growth and Economic Development in Low-Income Countries*; a case study of India's prospects (Princeton, 1958), p. 33.

[46] *Census of India, 1951, Vol. I, India, Part I-B—Appendices to the Census Report* (New Delhi, 1955), pp. 114-118.

[47] India, *The National Sample Survey*, No. 48, op. cit., pp. 12, 40, 43.

[48] S. N. Agarwala, op. cit.

Other local surveys have yielded estimates of crude birth rates near 40 or slightly higher. In the Mysore population survey of 1950-1951, a crude birth rate of 39-40 was obtained for small towns, 40 for the Rural Plains and 44-45 for the Rural Hills.[49] A birth rate of about 40 has also been obtained in a continuing study in Singur (Bengal), a rural area in which households are visited every three months for the purpose of obtaining information on vital events.[50] A 1955 survey in Patna City showed a crude birth rate of 40.[51] Lower birth rates have been estimated for some large cities, including Bangalore and Bombay. The standardized birth rate for Bombay City, calculated on a sex-age structure of population corresponding to that of India as a whole, was found to be 27 in 1951.[52]

Detailed data on fertility of married couples collected in the National Sample Survey revealed that couples married in recent years had more births, at a given duration of marriage, than couples married in earlier years. For example, after 12 years of marriage, rural couples who married since 1930 were found to have had an average of 2.6 children, while the average was 2.2 for couples married before 1930. Similar differences were found at other marriage durations and in urban as well as rural areas. If they were not due merely to omissions in reporting of births — more frequent in the case of births of many years ago than of those having occurred more recently — these findings would imply a rising trend of marital fertility in India. An average of 6.0 live births was reported for women aged 42-46 years who had been married 32 or more years.[53]

Nepal. The crude birth rate of 45 for Nepal in 1944-1949 and the gross reproduction rate of 2.7 shown in table 4.1 were estimated by "reverse-survival" from the number of children 5-9 years old shown in the report of the 1952-1954 census. These estimates are of questionable reliability in view of the fact that the age distribution shown in the census report was the result of an adjustment of the distribution of reported ages. In making the adjustment for age groups under 5 and 5-9 years, the census officials assumed the total number of children reported under 10 years of age to be correct. If children under age 5 were under-enumerated, as they commonly are in censuses of developing countries, the adjusted figures for both age groups 0-4 and 5-9 may be too low, and hence the estimate of the birth rate may be understated. According to another estimate, based on the census data with adjustments for errors in age reporting and under-enumeration of children, the crude birth rate was 50.[54]

The estimate of the gross reproduction rate shown in table 4.1 was made by assuming the age pattern of fertility to be the same as the pattern shown by the incomplete registration statistics for Sarawak.

Pakistan. The detailed statistics of population by age groups provided by the 1961 census exhibit major irregularities. For example, 17.4 per cent of the population is reported as under age 5 and 17.7 per cent 5-9 years of age, but only 9.4 per cent 10-14 years old. An undercount of the 10-14 group is possibly related to the fact that numerous questions on the census schedule — for example, those relating to economic activity — were to have been asked of persons 10 years of age and over, but could be avoided for children reported to be of younger age. To obtain the fertility rates given in table 4.1, births obtained by "reverse-survival" of the numbers reported in age groups 0-4, 5-9 and 10-14 have been averaged and related to the appropriate population totals, also derived by "reverse-survival". This procedure has the effect of smoothing out some of the irregularities in the reporting of children's ages, but there is no certainty that the estimate thus derived gives a good approximation of the birth rate. It is possible that by including in the average the age-group 0-4, which in most censuses is under-enumerated, the birth rate is under-estimated.

The crude birth rates for different periods, estimated by the "reverse-survival" method from unadjusted census data, from an adjusted age distribution for East Pakistan, and from 1961 sample survey data for certain districts of East Pakistan, are shown in the following table:

	West Pakistan	*East Pakistan*		
	(unadjusted 1961 census)	*Unadjusted 1961 census*	*1961 census adjusted by W. Zaidi* [a]	*1961 sample survey* [b]
1956-1961 (0-4 group) ..	42	49	48	47
1951-1956 (5-9 group) ..	53	66	48	58
1946-1951 (10-14 group)	37	40	51	52

[a] Work undertaken at the Office of Population Research, Princeton University.

[b] Carried out in Dacca, Faridpur, and Comilla districts and in the southern part of Mymensingh, by the Department of Statistics, University of Dacca.

Age reporting appears to have been more accurate in the 1961 sample survey than in the census, but even in the survey there may have been some over-reporting of the 5-9 age group.

Based on the age distribution of the 1961 census, high birth rates of 58 for East Pakistan and 51 for West Pakistan were estimated by Krotki, with the help of stable population models.[55] Also through the use of

[49] *The Mysore Population Survey*, op. cit., p. 78.

[50] M. A. El-Badry and C. Chandrasekaran, op. cit.

[51] C. Chandrasekaran, "Indian Fertility in a Changing Economic and Social Setting" [1962] (processed).

[52] *Ibid.* This estimate was obtained from a study made by the Demographic Training and Research Centre, Chembur.

[53] India, *The National Sample Survey*, No. 7; "Couple Fertility", by Ajit Das Gupta *et al.*, Calcutta, 1955.

[54] Harsha Nath Thakur, *Population Projections for Nepal, 1955-1975*, Demographic Training and Research Centre, Chembur, Bombay (processed).

[55] Karol J. Krotki, "Population Size, Growth and Age Distribution: Fourth Release from the 1961 Census of Pakistan", *Pakistan Development Review* (Karachi), vol. 3, Summer 1963. A somewhat different application of the stable population models to 1951 census age data led a Pakistani demographer to conclude that the fertility level was much higher; his estimate of the birth rate for East Pakistan's Moslems was 62. See A. S. M. Mohiuddin Ahmed, "Vital Rates of East Pakistan's Muslims: An Estimate from Stable Population Model", paper presented to the International Population Union Conference, Ottawa, 1963. For Pakistan as a whole, he also estimated very high birth rates from the 1951 census data. *See* "The Population of Pakistan: Past and Present" (unpublished Ph.D. dissertation at Duke University, Durham, 1962).

such models, the United Nations obtained crude birth rate estimates of 45 and 50 for West and East Pakistan, respectively, from 1951 census age data.[56] In deriving these estimates the ratio of population reported in the age group 10-39 to the number reported in the group 40 years and over was compared with corresponding ratios in model stable populations at levels of mortality considered appropriate for Pakistan.

The results obtained by the various applications of stable population analysis do not merit great confidence mainly because the census age data are defective, and selection of different age group indices leads to different results. Furthermore, the age structure may have been disequilibrated by the population movements between Pakistan and India at the time of partition.

Sample surveys and other studies conducted in West Pakistan in recent years have indicated birth rates ranging from 41 to about 50. Birth rates near the upper end of this range were reported in a 1956-1957 survey in certain rural areas of Lahore District,[57] and in a more recent survey of Lulliani village in rural Punjab.[58] Two sample surveys of the rural population of Lahore Tehsil gave crude birth rates of 45-47, for 1961.[59] On the other hand, a birth rate as low as 41 for all West Pakistan in 1962 was obtained from the Population Growth Estimation Experiment currently being conducted throughout Pakistan.[60] Another estimate of West Pakistan's birth rate has been based on smallpox vaccination figures; the rates estimated on this basis — 44-49 — were thought to be minimum figures, since a small number of children were believed to have escaped vaccination.[61]

In East Pakistan, results from the Population Growth Estimation Experiment showed a crude birth rate of 46 for 1962.[62]

3. *South East Asia*

Burma. The estimated crude birth rate of 43 and gross reproduction rate of 2.6 for Burma, 1948-1954, shown in table 4.1 were made by " reverse-survival " from the number of children under age 5 enumerated in a multi-stage sample census carried out in 1953-1954.[63] Corresponding estimates for the period 1943-1949, based on the number of children aged 5-9 years enumerated in this census, were somewhat lower: crude birth rate, 39, and gross reproduction rate, 2.4. As in the case of some other Asian countries, an increase of fertility between the war and the early post-war periods is indicated if these estimates are at all representative of the fertility level.

Data from four decennial censuses of population taken from 1901 to 1931, and a sample census of Burma's rural population in 1954, show that the proportion of children under 15 years of age in the total population has remained remarkably stable, varying only between 36.3 and 37.8 per cent.[64] This finding implies a long-term stability of the fertility level, though other studies have suggested that the birth rate has at times fluctuated in response to economic conditions and other factors.[65]

Cambodia. The crude birth rate and gross reproduction rate estimates of 51 and 3.3, respectively, for 1948-1954, shown in table 4.1, are based on " reverse-survival " of the age group 5-9 years as enumerated in a sample survey of the population in 1958-1959.[66] This survey provided the first information on the age structure of Cambodia's population. Responses to a question on births in this survey indicated a crude birth rate of 41 for 1959.[67] A lower birth rate in 1959 than in 1948-1954 would be in line with the trend indicated by data for some other Asian countries, but the difference in this case is larger than might be expected, suggesting either that the 1959 estimate may be too low or the 1948-1954 estimate too high.

Cambodians are said to consider five as the ideal number of children for a family,[68] but with high infant mortality, a larger number of births would be required in order to ensure five surviving children.

Federation of Malaya and Singapore. The study of fertility levels and trends in the Federation of Malaya and Singapore is complicated by the effects on population structure of immigration into these areas which

[56] *The Population of Asia and the Far East, 1950-1980* (United Nations publication, Sales No.: 59.XIII.3), pp: 13-14.

[57] M. Ziaud-Din, " On the Relation between Fertility and Economic Conditions in West Pakistan ", International Population Conference, 1961 (New York), paper No. 9 (processed), p. 4.

[58] The birth rate was obtained from a registration system matched with repeated census surveys. John C. Cobb and John F. Kantner, " Some Problems of Demographic Measurement in Family Planning Research in the Punjab ", Paper presented to the Population Association of America, Philadelphia, April, 1963.

[59] S. M. Anwar and M. Afzal, " An Analysis of a Methodological Study to Estimate the Birth Rate and the Death Rate of Rural Population of Lahore Tehsil " [Board of Economic Enquiry, Lahore, 1963] (processed).

[60] Karol J. Krotki, " First Report on the Population Growth Estimation Experiment ", Paper presented to the International Population Union Conference, Ottawa, 1963.

[61] M. K. H. Khan, " Assessment of Birth Rate in West Pakistan from the Statistics of Primary Vaccination Against Smallpox ", *Population Growth and Economic Development with Special Reference to Pakistan*, Summary Report of a Seminar, September 8-13, 1959, pp. 288-296.

[62] Karol J. Krotki, " First Report on the Population Growth Estimation Experiment ", op. cit.

[63] In calculating the gross reproduction rate, the age pattern of fertility was assumed to be the same as that of the Federation of Malaya.

[64] United Nations, *The Population of Asia and the Far East, 1950-1980*, p. 47.

[65] Bernardelli's analysis of Burmese census data suggested that there were fluctuations of the birth rate of the order of 5 per cent of more. R. M. Sundrum, op. cit.

[66] In estimating the gross reproduction rate, the age pattern of fertility was assumed to be the same as that shown by the survey reports of births in 1959.

[67] In the district of Snuol, Kratie Province, a crude birth rate of 49 was derived from a demographic investigation in 1955-1957, but the area covered is not necessarily representative of the entire country. *The Population of Asia and the Far East, 1950-1980*, op. cit., p. 63.

[68] David J. Steinberg *et al., Cambodia; its people, its society, its culture;* revised for 1959 by Herbert H. Vreeland (New Haven, HRAF Press, 1959), p. 77. The authors comment that " Unlike the Chinese or Vietnamese, the Cambodian does not want unlimited offspring, although he accepts with genuine pleasure those that come ". It is not apparent, however, that the Cambodians have lower fertility than the Chinese.

occurred on an especially large scale during the 1920's and earlier decades. As a result of unbalanced sex ratios and abnormal age distributions, the crude birth rates give a distorted picture of fertility and its changes, particularly in the earlier years of the series. Attention should be focused primarily on the gross reproduction rates shown in tables 4.1 and 4.4.[69]

For Singapore, it is shown that the doubling of the crude birth rate between 1910-1914 and 1935-1939 was due partly to normalization of the sex-age structure of the population. Even the gross reproduction rates may exaggerate the rise of fertility, as there may have been an improvement in the functioning of the registration system. The rates estimated by " reverse-survival " from census data (table 4.5) show increases of about the same magnitude as those shown by the registration data; however, such estimates from census data are not very reliable where, as in Singapore, the population structure has been greatly affected by migration. In the case of the Federation of Malaya, the " reverse-survival " estimates give a more definite indication of understatement of the rates based on registration statistics for the earlier years; but here, too, the measures of changes in fertility derived from the " reverse-survival " estimates may be biased as a result of migration.

The increasing proportion of Chinese in the population may have been a cause of rising fertility prior to the 1940's, since the fertility of the Chinese exceeded that of the Malaysians at least until a recent time. Between 1931 and 1947, the proportion of Chinese in the female population increased from 27 to 37 per cent in the Federation and from 77 to 81 per cent in Singapore. It is plausible also that the fertility of the immigrant groups would have increased as they became more settled in the country.[70]

The recent changes in the fertility rates for Singapore and the Federation have been the net results of opposite trends among the Chinese and the Malaysians.[71] The fertility of the Chinese decreased somewhat between 1947 and 1957 while that of the Malaysians increased considerably in the Federation and remained about the same in Singapore according to the registration statistics. The changes in the gross reproduction rates were as follows:[72]

	1947-48	*1956-58*
Federation of Malaya:		
Malaysians	2.4	3.0
Chinese	3.6	3.4
Singapore:		
Malaysians	3.0	3.0
Chinese	3.3	3.1

The decline in fertility of the Chinese during this period appears to have been principally a result of the increasing age of Chinese women at marriage, noted in section B above. Age at marriage also increased among the Malaysian women, but in their case the effect was outweighed by a reduction in the proportion of widows and divorcees, so that the proportion of married women in the Malaysian population increased, contributing somewhat to the rise of their fertility rates.[73] For the Malaysian population in the Federation, however, the pronounced increase of the gross reproduction rate between 1947 and 1957 seems to have been due at least partly to improving registration. The greatest increase occurred in the States of Perlis, Trengganu and Kelantan, where the registered birth rates were relatively low in 1947.[74]

The decrease in fertility of all ethnic groups combined in Singapore since 1957 seems to have occurred mainly in the age-specific fertility rates for women under 30 years of age.[75] This observation suggests that the main factor may have been increasing average age at marriage during this period, as in the preceding decade. Among the Chinese, in view of the proportion of unmarried women in the female population of child-bearing ages, it is apparent that marital fertility rates must still be exceedingly high, in spite of the recent development of family-planning activities.

The Governments of both the Federation and Singapore have given a modest measure of support to local family-planning associations in recent years. Family-planning clinics have operated in Singapore since 1949, and since 1955 they have been aided by a Government grant. The Singapore clinic is said to have had an atten-

[69] In calculating these rates for the Federation, the age pattern of fertility for all periods was assumed to be like that of 1956-1958, the only dates for which tabulations of births by age of mother are available. The assumption of unchanging age patterns of fertility may not be valid, in view of the changing ethnic composition of the population and variations in the level of fertility.

[70] Some hint of rising fertility is also given by the data on the numbers of children born to women as reported in the population censuses. For Chinese women, the reported average size of family declined successively with increasing age of the women after age 45. From these findings, Caldwell has argued that many of the older Chinese women who came to Malaya as migrants had had their child-bearing interfered with by long years of separation from their husbands. J. C. Caldwell, op. cit. See particularly table 81 and following text. On the other hand, Smith regarded these findings principally as evidence of memory failure on the part of older women, and concluded that the data were unusable. T. E. Smith, *Population Growth in Malaya* (London, Royal Institute of International Affairs, 1952), p. 72.

[71] The Indian-Pakistanis are numerically a much smaller group than the Chinese and Malaysians. Their fertility rates appear to be exceedingly high. *See*: You Poh Seng, " Fertility and the Increase of Population in Singapore ", *Proceedings of the World Population Conference, 1954*, Papers; Vol. I (United Nations publication, Sales No.: 55.XIII.8 (Vol. I)), pp. 989-998. In 1956-1958, the gross reproduction rate of the Indian-Pakistanis in both Singapore and the Federation of Malaya was calculated in the range of 3.7-3.9.

[72] The rates for 1947 are computed from the average annual number of registered births in the years 1947 and 1948 related to the numbers of females of child-bearing age enumerated at the census of 23 September 1947; 1957 rates are based on an average of births in the years 1956-1958 related to the census data of June 1957. For the Federation of Malaya, tabulations of births by age of mother were available only for the latter of the two periods, and in calculating the gross reproduction rate for 1947-1948 it was assumed that the age pattern of fertility for each of the ethnic groups was like that around 1957.

[73] J. C. Caldwell, op. cit., chapter 8.

[74] *Ibid.*, chapter 7, pp. 226-27; T. E. Smith, op. cit.

[75] Official population estimates by age groups are not available beyond 1957, and estimates for recent years prepared by the United Nations have been used in computing age-specific birth rates.

dance of 28,000 in 1958, a figure amounting to about 9 per cent of the female population of child-bearing age.[76] The rate of attendance has been somewhat higher among the Chinese than among other segments of the population. Clinics have also operated in the Federation since 1954, but not on so large a scale. No doubt the high illiteracy rate has been one impediment to the family-planning movement.

Indonesia. From a one per cent sample tabulation of 1961 census age data a crude birth rate of 52 was estimated for the period 1951-1956 by the method of " reverse-survival ". This is the first census taken in Indonesia since 1930, and the only one which has provided detailed information on the sex and age structure of the population. The Second World War and the struggle for independence which followed left their marks on the population's age composition.[77] Conditions of war resulted not only in depletion of the population but in a substantial birth deficit. During this period, fertility appears to have been much below the estimated pre-war level, but by the 1950's the level was probably regained and may have been surpassed. Infant mortality may also have been unusually high during the war. Because of consequent effects on age composition of the population, the number of births would give an abnormally high crude rate relative to the gross reproduction rate. Early in the 1950's, children made up an unusually small proportion of the population because of the depressed birth rate of the previous decade, while the cohorts of reproductive ages constituted a correspondingly enlarged proportion.[78] On the other hand, the estimated gross reproduction rate of 2.8 for this period, shown in table 4.1, is unaffected by distortion in the age structure of the female population aged 15-49 years.[79]

A lower estimate of fertility has been derived for the period 1956-1960, based on 1961 census data on the numbers of young children, corrected for biases in age reporting.[80] The crude birth rate was estimated at 43, implying a gross reproduction rate of about 2.4. These estimates may be too low, since it is believed that the childhood mortality assumptions applied in deriving the number of births may have underestimated the mortality level.[81] Moreover, the estimates were based on the assumption that under-enumeration of small children was negligible.

The 1961 census data on age structure of the population of the different provinces confirm a lower fertility in Java than in the other islands. Corresponding to an average crude birth rate of 43 for all Indonesia, birth rates of 42 for Java and Madura and 45 for the other islands have been estimated.[82] A registered birth rate of about 40 per 1,000 was estimated during the period 1953-1957 for two cities and eleven regencies of Central Java where birth registration is believed to be good,[83] but this estimate was later deemed to err slightly on the conservative side.

North Borneo. The estimated crude birth rate of 53 and gross reproduction rate of 3.4 shown in table 4.1 for North Borneo were derived by the " reverse-survival " method from data on the age distribution of the population enumerated at the 1960 census.[84] " Reverse-survival " estimates derived from age data of the 1951 census gave a crude birth rate of 46. These estimates are not highly reliable, as the accuracy of the census data by age groups is questionable. It may be that fertility was lower during the years of the war and Japanese occupation, or the difference between the estimates may be due wholly or partly to errors of estimation or defects in the census data. One source of error which may be important is the lack of information on the conditions of mortality during the war and occupation periods.

Philippines. Despite the inadequacy of vital statistics, the high level of fertility in the Philippines has been clearly established through special surveys and analyses of population trends. The crude birth rate of 50 and gross reproduction rate of 3.5 for 1950-1955 shown in table 4.1 were estimated by " reverse-survival " from the number of children aged 5-9 years enumerated in the 1960 census.[85] This high level of fertility is confirmed by data on the number of children ever born to women, collected in the Philippine Statistical Survey of Households (May 1956), which showed an average of 7.1 births for women who had ever been married and who had completed their child-bearing years.[86] This result is consistent with a crude birth rate of about 48, but it would be surprising if there were not some omissions in these data, particularly of children who died in infancy.

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[76] J. C. Caldwell, op. cit., chapter 9. Since the majority of women visiting the clinic are over 35 years old, a fall in the fertility of this age group might be taken as evidence of the programme's effectiveness. Thus far, however, the decline in the birth rate seems to have been largely confined to younger women.

[77] *The Population of Asia and the Far East, 1950-1980*, particularly p. 65.

[78] Later changes in age structure would have tended to bring down the crude birth rate, without any change in the real fertility level, as the small birth cohorts of the 1940's began to move into the child-bearing ages.

[79] The pattern of fertility by age of mother was assumed to be like that shown by birth registration data in certain areas of Java where birth registration is believed to be good.

[80] Vaino Kannisto, *Population Increase in Indonesia*, Statistical Research and Development Centre, Central Bureau of Statistics, Djakarta, July 1963 (processed). The author believes that, owing to the Moslem and Chinese customs of counting ages, there was an upward bias of from 0.5 to 1.5 years in the reporting of ages of children.

[81] In calculating the number of births by the " reverse-survival " method, Kannisto used model life tables, implying a life expectancy at birth of between 55 and 60 years.

[82] Vaino Kannisto, op. cit.

[83] Hilde Wander, *Trends and Characteristics of Population Growth in Indonesia.* Report to the Government of Indonesia of a United Nations technical assistance mission (processed); Djakarta, July 1959.

[84] In estimating the gross reproduction rates, the age pattern of fertility was assumed to be the same as indicated by the incomplete birth registration statistics for Sarawak.

[85] In estimating the gross reproduction rate, the incomplete birth registration statistics for the Philippines were used as the source of information on the age pattern of fertility.

[86] For more details regarding the estimated fertility level of the Philippines, see United Nations and Government of the Philippines, *Population Growth and Manpower in the Philippines*, United Nations publication, Sales No.: 61.XIII.2.

An intrinsic birth rate of 51 was calculated for a quasi-stable population having an age structure similar to that of the Philippines in 1957.[87]

Crude birth rates calculated by the "reverse-survival" method from a series of census and survey data indicate the probability that the extremely high level of fertility in the Philippines has not changed much over a number of decades (see table 4.5).

Sarawak. The crude birth rate estimate of 54 and gross reproduction rate of 3.4 shown in table 4.1 were derived by the "reverse-survival" method from 1960 census data on age groups. Vital registration is incomplete in Sarawak, but the age pattern of fertility shown by these data was used in deriving the gross reproduction rate.

An earlier estimate of fertility in Sarawak, obtained by the same method from 1947 census data, was considerably lower. A crude birth rate of 47 was estimated for the period 1937-1942. Age data from both the 1947 and 1960 censuses appeared to be of relatively poor quality, and therefore the fertility estimates derived from them may be in error. Moreover, little is known about mortality levels in Sarawak. The suggested rise in fertility, however, conforms to the pattern indicated for several other Asian countries, where birth rates were higher in the early post-war than in the war years.

Thailand. The estimated crude birth rate of 46 and gross reproduction rate of 3.2 for Thailand in 1950-1955 shown in table 4.1 were obtained by "reverse-survival" from the number of children aged 5-9 enumerated in the 1960 census. Age reporting in this census appeared to be fairly accurate. The gross reproduction rate was estimated on the assumption that the age pattern of fertility shown by Thailand's incomplete birth registration statistics was approximately correct.

Other recent estimates of the crude birth rate have been in the middle or high 40's.[88] Women aged 45-49 at the time of the 1960 census reported having borne 5.9 children on the average during their reproductive years. In an analysis of these data, an adjustment was made for omissions, which brought the average number of births per woman to 6.55.[89] This figure corresponds to a gross reproduction rate of 3.2, which agrees with the estimate shown in table 4.1.

Birth rates estimated by "reverse-survival" of age data from several censuses and a recent sample survey indicate that fertility has remained at a high level over several decades, even though there is evidence that age at marriage has increased a little, and that illiteracy has been greatly reduced. Moreover, urban fertility seems to be lower than rural fertility (see chapter VIII), but the proportion of population living in urban areas is small and has risen only slowly. As shown in table 4.5, crude birth rates of 46-47 were calculated for four periods between the late 1920's and the early 1950's.

Viet-Nam. There appears to be no reliable basis for estimating the birth rate of either North Viet-Nam or the Republic of Viet-Nam. For North Viet-Nam an abbreviated age distribution of the population from the 1960 census enumeration is the only known source of data from which an indication of the birth rate can be derived. According to the number of children under one year of age enumerated in 1960, it appears that the birth rate may have been about 47 in 1959-1960.[90] This may well be a minimum figure, since infants under one year of age are generally undercounted in most censuses and surveys. The proportion in the age group 1-6 years corresponds to that of a model stable population with a gross reproduction rate slightly in excess of 3 (assuming a moderate mortality level).

The suggested level of fertility in North Viet-Nam, based on 1960 age data, is higher than that previously estimated for Cochin-China, an area now part of the Republic of Viet-Nam. A crude birth rate of 39 was derived from registration data for Cochin-China in 1946, and it is believed that fertility declined during the fighting of 1945-1955. Registration data for the same area, known to be complete, show a return in 1956 to the pre-war fertility level, but for that year and succeeding years, coverage varied and at no time included the entire country. As mentioned in a preceding section of this chapter, of the twenty-four provinces comprising South Viet-Nam, data from the nineteen that have consistently reported indicate a birth rate in recent years having dropped to between 30 and 35; but even if the indicated downward trend is correct, the level may be understated.

4. *East Asia*

China (mainland). The following crude birth rates have been published as official estimates for China (mainland) for years since 1952: [91]

1952	37	1955	35
1953	37	1956	32
1954	38	1957	34

Measures were taken in and around 1953 to establish a national vital statistics system. The estimate of the birth rate for 1952 was said to be based on the results of sample investigations in twenty-six representative cities and six representative *hsien.*[92] A total sample of over 30 million persons was reported to be the basis

[87] Mercedes B. Concepción. "Fertility Levels and Trends in the Philippines", unpublished Ph.D. thesis to be submitted to the University of Chicago.

[88] Thailand, Central Statistical Office and Office of the National Economic Development Board, *Final Report of the Demographic and Economic Survey of Thailand, 1954*, vol. 2, "Demographic and Economic Features", New York, 1960 (processed); Jean Bourgeois-Pichat, "An Attempt to Appraise the Accuracy of Demographic Statistics for an Under-developed Country: Thailand", paper presented at the United Nations Seminar on Evaluation and Utilization of Population Census Data in Asia and the Far East, 20 June-8 July 1960, Bombay (United Nations, E/CN.9/CONF.2/L.13, 18 April 1960).

[89] Ajit Das Gupta and others, "Population Perspective of Thailand", Bangkok, 1963 (processed).

[90] It was assumed that mortality conditions were similar to those reported for Cambodia in a 1958-1959 survey.

[91] S. Chandrasekhar, *China's Population; Census and Vital Statistics* (Hong Kong, Hong Kong University Press, 1959), p. 50.

[92] *Ibid.*

for the 1953 estimate.[93] Official estimates of crude death rates and annual estimates of total population have also been published for the years 1952-1957. There are apparent discrepancies between the population increases implied by the estimates of the vital rates and those shown by the population estimates.[94]

A crude birth rate of 41.6 was estimated by a Chinese demographer from results of surveys carried out during 1951-1954 in sixteen *hsien* located in several different provinces.[95] The rates indicated by the data for the various *hsien* ranged from 26 to 53. Wide variations of birth rates within China have also been indicated by results of local surveys carried out during the 1920's and 1930's and by estimates derived from more a less questionable statistics of population by age groups for various provinces compiled during the 1940's.[96]

Data on the age structure of the population reported to be derived from the 1953 census exhibit irregularities which make their value as a basis for estimating the birth rate appear dubious.[97] However, the census proportions of children aged 5-14 years in the total population aged 5 years and over are very similar to those of a major field study of farm households in 1929-1933 and to enumerations in a number of provinces during 1942-1947.[98] In each of the three sets of data, the proportion of children aged 5-14 was higher in the male population than in the female population, and thus birth rates calculated from age data for males exceed those calculated from the data for females.[99]

On the basis of the farm household survey data, covering eight large regions, birth rates ranging from 36 to 45, with an average of 40, were calculated from the age distributions of the male population; the corresponding rates estimated from the 1942-1947 provincial data (nine provinces included) range from 36 to 44, with 41 per 1,000 as the average. Calculated from the age data for females, birth rates based on the farm household survey average 38, and those based on provincial investigations, 37.[100] If there was a tendency for some boys liable to military recruitment to be reported as younger than they were, birth rates calculated from the male population structure may be exaggerated. On the other hand, the data suggest some omissions of females at all ages, which may or may not affect birth rates calculated from the age structure.

Based on the analysis of the data just described, a crude birth rate within the range of 37-40 per 1,000 seems most probable for China.[101] The data used in estimating this range are not representative of the entire country, as they omit areas where the birth rates are known to be comparatively high[102] and others where they may be presumed to be comparatively low.

China (Taiwan). Although birth registration in China (Taiwan) is reported as "complete" for recent years, it may not have been equally so in the earlier years of the historical series of registration statistics (tables 4.3 and 4.4). The rise of the registered crude birth rate from 40.2 in 1907-1909 to 44.0 in 1925-1929 was probably due partly to improvement of registration.[103] However, it is apparent, particularly in the series of gross reproduction rates shown in table 4.4, that the fertility of the Taiwanese in the late 1920's and 1930's was no lower, but if anything a little higher than it had been at the beginning of the Japanese administration early in the twentieth century. This was true in spite of a moderate increase in average age of women at marriage, some increase in urbanization and development of non-agricultural industries and some advance in education. A study carried out in the early 1950's led to the conclusion that to bring about a decline of fertility through such economic and social developments, or by other means, it would be necessary to overcome strong Chinese traditions favouring the maintenance of moderately high fertility — traditions reinforced by the organization of economic enterprises in small family units where child labour could be used readily and with profit, and by such practices as the early schooling of children within the home.[104] However, the birth registration statistics since 1956 have shown a declining trend of the birth rate, which may be the beginning of a transition to low fertility. This decline was general throughout all administrative units of the island, and

[93] John S. Aird, "Population, Planning, and Economic Development in Mainland China in a Decade of Crisis", *Population Bulletin* (Washington), vol. 19, August 1963, pp. 123, 124.

[94] John S. Aird, "The Present and Prospective Population of Mainland China", *Population Trends in Eastern Europe, the USSR and Mainland China*, Proceedings of the Thirty-Sixth Annual Conference of the Milbank Memorial Fund, November 4-5, 1959 (New York, 1960), p. 122.

[95] Ta Chen, "New China's Population Census of 1953 and Its Relations to National Reconstruction and Demographic Research", *Bulletin de l'Institut International de Statistique*, vol. 36, part 2 (Stockholm, 1958), pp. 266-267. A large proportion of the population to which the data refer is in the province of Szechwan; for these areas the birth rate averaged 48 per 1,000. The data for areas not situated in Szechwan Province imply an average birth rate of 36 per 1,000.

[96] *The Population of Asia and the Far East, 1950-1980*, pp. 81-82.

[97] *Ibid.*, pp. 79-80.

[98] Irene B. Taeuber, "The Conundrum of the Chinese Birth Rate", Paper prepared for the International Population Union Conference, Ottawa, 1963.

[99] *Ibid.*

[100] In deriving the birth rate estimates a method developed by Bourgeois-Pichat was used. *See* Jean Bourgeois-Pichat, "Utilisation de la notion de population stable pour mesurer la mortalité et la fécondité des populations des pays sous-développés", *Bulletin de l'Institut International de Statistique*, vol. 36, part 2 (Stockholm, 1958), pp. 94-121.

[101] In calculations of population projections for China to be published in another United Nations study an estimate of 38 per 1,000 has been used to represent the initial level of the birth rate.

[102] Irene B. Taeuber and Karl E. Taeuber, "The Fertility of the Chinese in Northeast China", *International Population Conference, Vienna, 1959*, International Union for the Scientific Study of Population (Vienna, 1959), pp. 348-354.

[103] The rates estimated from numbers of children enumerated in the censuses show a smaller increase. *See* George W. Barclay, *Colonial Development and Population in Taiwan*, op. cit., p. 243. Barclay's calculations were based only on the data for the Taiwanese population, whereas all nationality groups are included in the data used for calculating rates in the present study. The Taiwanese constituted 98 per cent of the population in 1905 and 94 per cent in 1940.

[104] George W. Barclay, *A Report on Taiwan's Population to the Joint Commission on Rural Reconstruction* (Princeton, 1954), particularly pp. 3-40.

it was most pronounced among women in the older reproductive age groups.[105]

The dip in the birth rate during the war and the post-war rise to a peak in the early 1950's, observed in the statistics for other Asian countries, are also found in the series for China (Taiwan). The registration statistics for the years immediately after the war are believed to be unreliable, however, as it took some time to restore the registration system to good working order after the Japanese left in 1944.[106] It may be for this reason that the average crude birth rate for 1947-1949 is a little lower than the 1940-1943 average, contrary to the pattern of other countries.

Hong Kong. Although birth registration in Hong Kong is believed to have been nearly complete for many years, only the fertility indices derived from the registration statistics for the census year 1961 are considered in this study. For earlier years, the rates were exaggerated is a result of underestimation of the population, which had increased more than was known by immigration since the date of the previous census, 1931.

The 1961 census showed a surprisingly large deficit of young persons in the age groups 15-19 and 20-24. Because of the relatively low proportion of females in the young child-bearing ages and the generally high ratio of males to females in the population, resulting from heavy immigration, the crude birth rate of 34 tends to understate the level of fertility. The gross reproduction rate in 1961 was estimated at 2.4 on the assumption that the age-specific fertility rates conformed to a "late fertility" pattern similar to that of China (Taiwan).

Japan. The Japanese vital statistics for the years since 1920 are highly accurate. The birth rates shown in table 4.3 for the period 1900-1919 may be slightly too low as a result of under-registration.[107]

For the period 1950-1957, the decrease of Japan's crude birth rate understates the decline of fertility, as the proportion of women of child-bearing age in the population was increasing during this period. For this reason the decrease of the gross reproduction rate was proportionately greater than that of the crude birth rate. At present the proportion of women of child-bearing age is larger in Japan's population than in that of most low-fertility countries elsewhere in the world, and therefore the crude birth rate, low though it now is, exaggerates Japan's fertility level in comparison with that of other countries. When comparisons are made in terms of the gross reproduction rate, Japan's rate of 1.0 for years since 1957 is seen to be below the rates of nearly all other countries in the low-fertility regions of the world (see chapter VI).

Republic of Korea. The crude birth rate of 45 and gross reproduction rate of 3.1 shown in table 4.1 for the Republic of Korea were derived by "reverse-survival" from the number of 5-9-year-olds shown in a sample tabulation of 1960 census data. The accuracy of these rates is uncertain, however, since the quality of age reporting at the census appeared to be relatively poor. Age data from the 1955 census, which, according to tests, seemed to be more satisfactory, yielded a crude birth rate of just about 40 for 1945-1950.[108] In some other Asian countries higher birth rates were recorded during the early 1950's than in the immediate post-war years, but Korea was involved in civil war during the early 1950's which might have depressed the birth rate. Hence the difference between the estimates for the two periods may be due primarily to errors in the age data, or in the mortality assumptions.

The incomplete birth registration statistics of 1960 were used to determine the age pattern of fertility in estimating the gross reproduction rate. Korean women marry later than those in most Asian countries, and the age pattern of fertility is therefore characterized by relatively low fertility rates at the younger child-bearing ages and relatively high rates at the older ages, somewhat like the Chinese pattern. It has been shown that, given such a pattern, the gross reproduction rate is high in relation to other fertility measures.[109]

Mongolia. The crude birth rate of the Mongolian People's Republic was officially reported as 39 per 1,000 population in 1958, but as there is no indication of the completeness of vital registration the country is listed in table 4.1 as having no satisfactory basis for an estimate of the fertility level. A survey of Mongolian women in Manchuria carried out under the supervision of a Japanese public health expert in 1941 revealed a general fertility rate of 148,[110] which corresponds to a somewhat lower level of fertility than is implied by the crude birth rate of 39, unless women of child-bearing age constitute a larger proportion of total population in Mongolia than they do in most developing countries. Of course the fertility of Mongolians living in Manchuria in 1941 would not necessarily have been the same as that of the population of Mongolia in 1958.

Ryukyu Islands. Birth registration was estimated to be 88 per cent complete in the Ryukyu Islands in 1956. The fertility rates shown in tables 4.1, 4.3 and 4.4 have been derived from the unadjusted registration statistics.

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[105] R. Freedman *et al.*, "Fertility Trends in Taiwan: Tradition and Change", *Population Studies*, vol. 16, March 1963, pp. 219-236.

[106] George W. Barclay, *A Report on Taiwan's Population . . .*, op cit.

[107] For a comprehensive analysis of Japanese demographic statistics, see: Irene B. Taeuber, *The Population of Japan*, Princeton, 1960.

[108] At both the 1955 and 1960 censuses rather high sex ratios — 109 and 107 males per 100 females, respectively — were observed in the age group 5-9 from which the estimates of births in 1945-1950 and 1950-1955 were obtained. If there was either over-enumeration of males or under-enumeration of females at these ages the error would, of course, be reflected in the birth rate estimate.

[109] Ansley J. Coale and C. Y. Tye, "The Significance of Age-Patterns of Fertility in High Fertility Populations", *Milbank Memorial Fund Quarterly* (New York), vol. 39, October 1961, pp. 631-646.

[110] Unichi Miura and Fusaji Shinozuka, "Population Ecology of the Mongolians in Manchuria", *Archives of the Population Association of Japan*, 1952, pp. 37-46. The sample of settled Mongolians comprised 918 households, and that of nomadic Mongolians, 143.

The recorded crude birth rate dropped from 41 in 1950 to 28 in 1955 and 23 in 1960. With allowance for under-registration, it is estimated that the actual crude birth rate fell from about 32 in 1955 to 27 in 1960.[111]

The fall of the crude birth rate and that of the gross reproduction rate seem to have been equally great. The 1960 values for both of these fertility measures were only 56 per cent of 1950 levels.

The birth rate in 1950 was higher than it had been during the war. Crude birth rates for Okinawa Prefecture of 38 for 1920 and 36 for 1930 and 1935 have been quoted;[112] the rates at those dates may have been depressed by emigration of young adults.

[111] The balance of births, deaths and migration for this period falls considerably short of the intercensal increase. Death registration is considered to be nearly complete. In deriving the adjusted figures it has been assumed that the total amount of the discrepancy was due to under-registration of births.

[112] Irene B. Taeuber, " The Population of the Ryukyu Islands ", *Population Index* (Princeton), vol. 21, October 1955, p. 253.

Chapter V

LEVELS AND TRENDS OF FERTILITY IN MIDDLE AND SOUTH AMERICA

A. Present levels

Table 5.1 presents data on fertility levels for the principal countries of Middle and South America. For about half of the countries in this region, vital registration is considered to be complete, or nearly complete; in these cases, the rates shown in the table are based on statistics of registered births without adjustment. For the countries with incomplete vital statistics, the fertility level has been estimated in most cases by the method of "reverse-survival" from census age data. In the majority of cases, the age data of the recent censuses in this region appear to be fairly accurate, providing a satisfactory basis for such estimates. The estimated levels of the crude birth rates and gross reproduction rates as of the dates of most recent available information are mapped in figures 5.1-5.4.

Two major zones of very high fertility are found in this part of the world, one in the Middle American

Table 5.1. Estimated fertility levels in Latin American countries

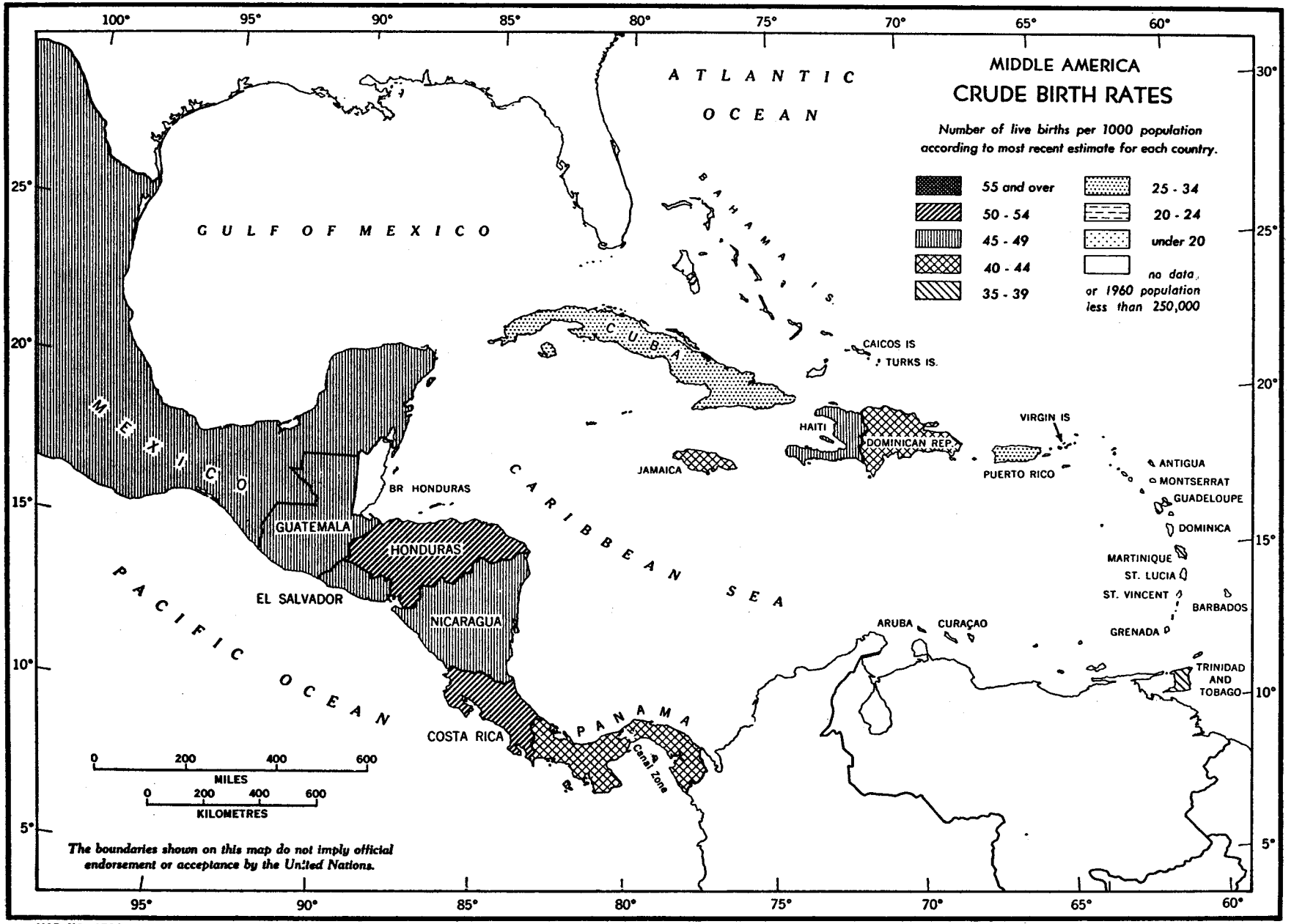
Region and country	*Year*	*Basis (see note below)*	*Crude birth rate (births per 1,000 population)*	*Gross reproduction rate*
Middle America:				
Costa Rica	1960	A	50.2	3.5
Cuba	1943-1948	C(1)	34	2.1
Dominican Republic	1950-1955	C(2)	44	3.2
El Salvador	1961	A	*49.6*	*3.3*
Guadeloupe	1960	A	38.8	2.8
Guatemala	1960	A	49.5	*3.4*
Haiti	1935-1940	C(2)	45	2.8
Honduras	1951-1956	C(1)	54	3.6
Jamaica	1960	A	42.7	2.7
Martinique	1960	A	38.5	2.8
Mexico	1960	A	46.0	3.1
Nicaragua	1940-1945	C(1)	49	3.1
Panama [a]	1960	A	41.0	2.7
Puerto Rico	1960	A	32.3	2.3
Trinidad and Tobago	1960	A	39.5	2.7
South America				
Argentina	1961	A	22.3	1.4
Bolivia	1940-1945	C(1)	43	2.9
Brazil	1940-1945	C(1)	43	3.0
British Guiana [b]	1960	A	42.9	3.0
Chile	1960	A	35.5	2.2
Colombia	1941-1946	C(1)	44	2.9
Ecuador	1940-1945	C(1)	47	3.2
Paraguay	1940-1945	C(1)	43	2.9
Peru	1930-1935	C(1)	46	3.1
Surinam [c]	1961	A	44.5	...
Uruguay	1957	D	22.1	1.3
Venezuela	1960	A	*45.1*	*3.1*

Basis for rates: A — "Complete" birth registration statistics (rates are based on official population estimates except that italicized rates have been calculated on population estimates prepared by the United Nations); C — "Reverse-survival" estimates: (1) Based on relatively satisfactory data on population by age groups; (2) Based on age data of relatively poor or uncertain reliability; D — Other estimates.

[a] Excluding tribal Indian population (except in provinces of Bocas del Toro and Darién) and data for Canal Zone.

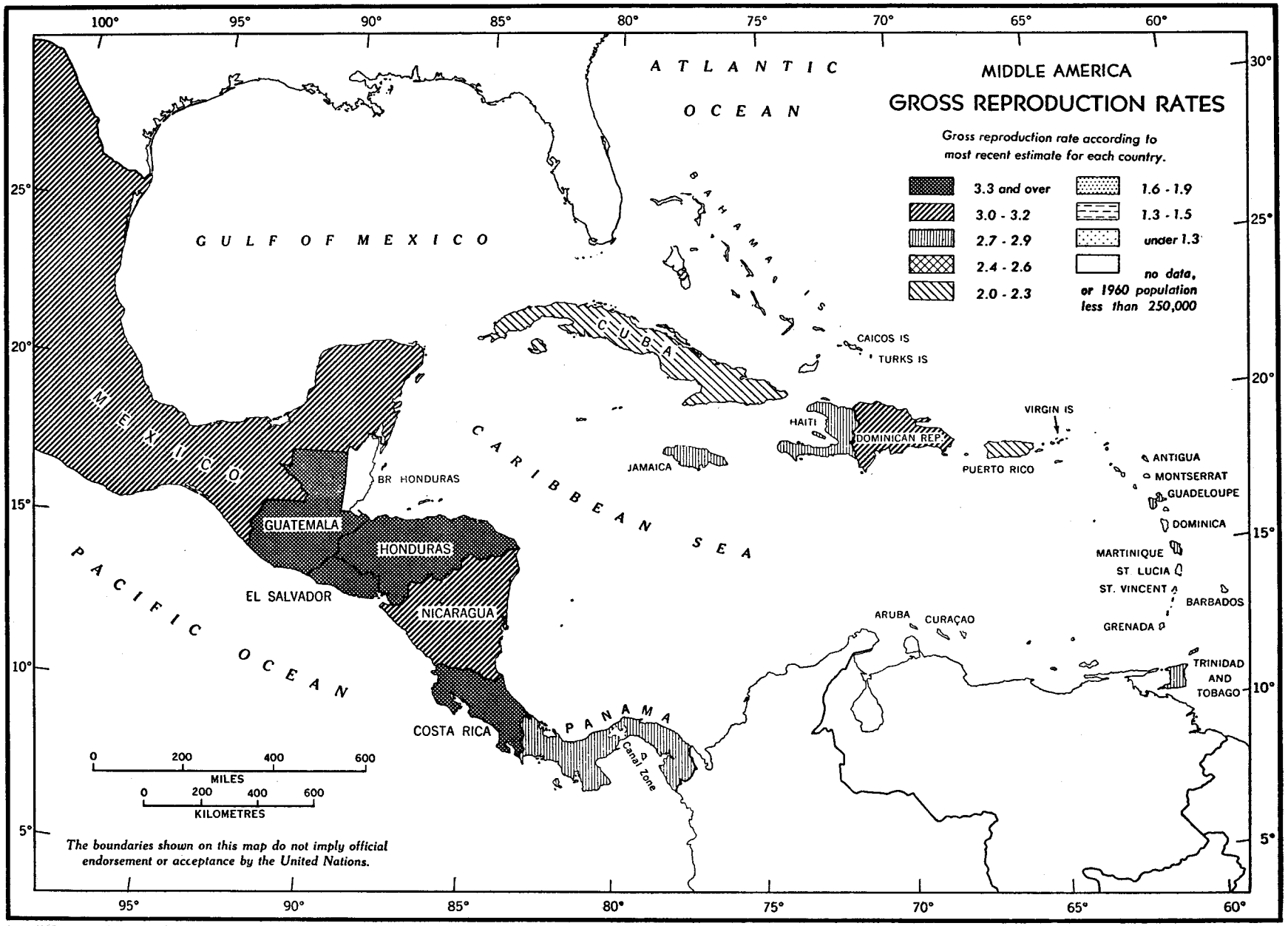
[b] Excluding Amerindians.

[c] Excluding Indian and Negro population living in tribes, numbering about 38,000 in 1959.



MAP NO. 1534
AUGUST 1963
UNITED NATIONS

Figure 5.1



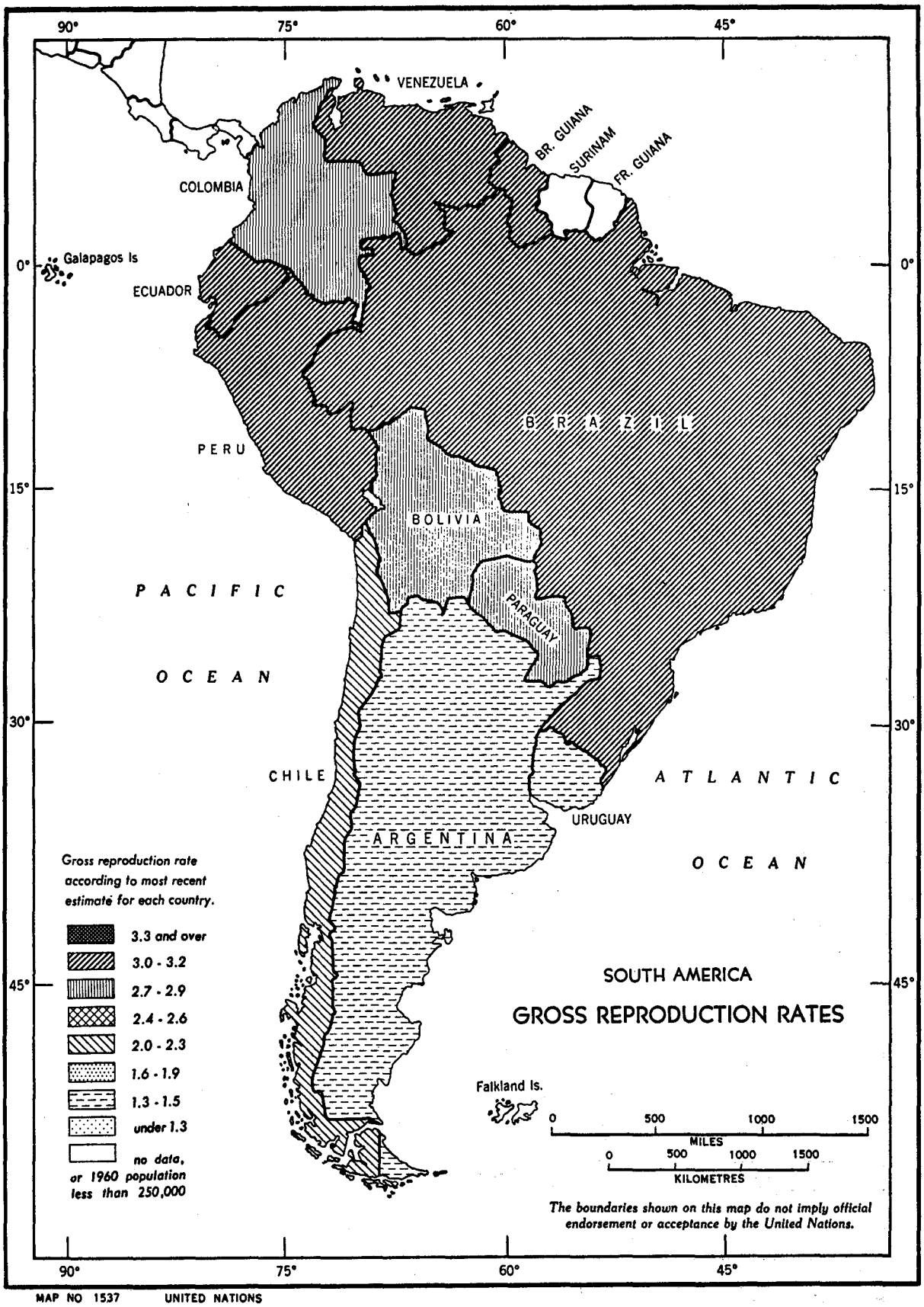
MAP NO 1535
AUGUST 1963
UNITED NATIONS

Figure 5.2

Figure 5.3

MAP NO. 1536 UNITED NATIONS
AUGUST 1963

Figure 5.4


90°
75°
60°
45°
0°
15°
30°
45°
VENEZUELA
BR. GUIANA
SURINAM
FR. GUIANA
COLOMBIA
Galapagos Is
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
PACIFIC
OCEAN
CHILE
ATLANTIC
OCEAN
URUGUAY
ARGENTINA
Gross reproduction rate according to most recent estimate for each country.
3.3 and over
3.0 - 3.2
2.7 - 2.9
2.4 - 2.6
2.0 - 2.3
1.6 - 1.9
1.3 - 1.5
under 1.3
no data, or 1960 population less than 250,000
SOUTH AMERICA
GROSS REPRODUCTION RATES
Falkland Is.
0 500 1000 1500
MILES
0 500 1000 1500
KILOMETRES
The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.
MAP NO 1537 UNITED NATIONS
AUGUST 1963

mainland and the other in tropical South America. Gross reproduction rates of nearly 3.0 or higher are estimated for all countries in these two zones except Panama, which has a somewhat more moderate rate of 2.7.[1] Paraguay, with an estimated rate of 2.9, has the high fertility typical of tropical South America, although geographically it is considered to be within the temperate zone. This country also resembles tropical South American countries with respect to the level of economic and social development. Fertility seems to be higher, on the whole, in Central America than in tropical South America. Guatemala and Costa Rica stand out, with estimated gross reproduction rates at the exceedingly high levels of 3.4 and 3.5, respectively. The estimated rates of 3.1 for Mexico and 3.0 for Brazil are especially noteworthy as these two countries contain about one-half of the total population of Middle and South America.

The Caribbean Islands included in this study, with the apparent exception of the Dominican Republic, form a zone of relatively moderate fertility. Gross reproduction rates in the range of 2.7 to 2.8 are estimated for Guadeloupe, Haiti, Jamaica, Martinique, and Trinidad and Tobago, while the estimate for Puerto Rico is 2.3 and for Cuba 2.1. (The Cuban data refer to the period 1943-1948 and it is possible that fertility has declined since that time in Cuba, as it has in Puerto Rico.) For the Dominican Republic in 1950-1955, the estimated gross reproduction rate of 3.2 is on a par with the rates indicated for the Central American mainland, but the data on age composition at the 1960 census, on which the estimate for the Dominican Republic is based, are of dubious accuracy. This reservation applies even more strongly to the estimate for Haiti.

Among the islands of the Lesser Antilles, for which data are not included in the table in view of the small numbers of their inhabitants, birth registration statistics, considered in most cases to be of good quality, show large differences in fertility levels. Crude birth rates in the range of 30 to 40 (corresponding to those of Puerto Rico, Cuba, Guadeloupe, Martinique and Trinidad and Tobago) are recorded as of 1960 for Antigua, the Bahamas, Barbados, Cayman Islands, Netherlands Antilles and Virgin Islands, and a slightly lower rate (29.4) is shown for Montserrat. On the other hand, rates of 40 to 50 are recorded for Dominica, Grenada, St. Kitts-Nevis and Anguilla, St. Lucia, St. Vincent and Turks and Caicos Islands; these correspond to the range estimated for the Central American countries.

Argentina and Uruguay are the two Latin American countries of low fertility. Argentina's gross reproduction rate, estimated at 1.4 for 1961, is near the average for European countries. The Argentine fertility pattern resembles that of Spain in that late marriage is an important factor in the low birth rate. There appears also to be a considerable degree of family limitation within marriage. The level of fertility in Uruguay is less certain because until October 1963 no census had been taken for many decades,[2] but the birth registration statistics, considered together with the best available estimate of population, imply that the level of fertility in Uruguay is not very different from that of Argentina. Chile's fertility is distinctly higher, but not nearly as high as the prevailing level in tropical South America. So temperate South America (with the exception of Paraguay, already mentioned) appears as a zone of low to moderate fertility.

Low fertility in Argentina and Uruguay is associated with a relatively high level of economic and social development, comparable to the levels of some southern European countries and far above the typical levels of countries in Latin America. For example, Argentina stands first among the countries of Middle and South America in the female literacy rate and degree of urbanization, below only Trinidad and Tobago in relative size of the non-agricultural segment of the labour force, and below only Puerto Rico, Trinidad and Tobago and Venezuela in income per head (see table 5.2). Although data for Uruguay are incomplete, this country appears to be not far behind Argentina in economic and social development.

The three Latin American countries with gross reproduction rates in the range of 2.1 to 2.4, namely Chile, Cuba and Puerto Rico, are also above the regional average in values of indicators of economic and social development. There is reason to believe that the past gains of these countries in education, urbanization, industrialization, and income per head have been important factors contributing to the reduction of their fertility to the present relatively moderate level. Cultural influence from the United States, especially through the interchange of migrants, has undoubtedly been an important additional factor in Puerto Rico and perhaps also to a lesser extent in Cuba. In Puerto Rico, almost alone among the countries of Middle and South America, couples wishing to limit the size of their families have access to well-developed family planning services. The development of these services in Puerto Rico, with government support, has been a factor of unknown importance in the recent reduction of the fertility level.[3]

Among the remainder of countries in the region, little relationship can be seen between the levels of fertility and economic and social development. It is particularly worth noting that fertility is distinctly higher in Jamaica and Trinidad and Tobago than in Chile, Cuba and Puerto Rico, although the former countries appear to be hardly less advanced, on the whole, in economic and social development. In fact, Trinidad and Tobago are at the head of the list of Middle and South American countries in the percentage of male labour force engaged in non-agricultural work, and rank above Argentina and Uruguay in income per head; yet the gross reproduction rate of 2.7 for Trinidad and

[1] For Surinam, where data for calculation of the gross reproduction rate are lacking, the crude birth rate indicates a level of fertility near that of neighbouring South American countries.

[2] Results of the 1963 census were of course unavailable at the time of preparation of the present study.

[3] For a summary of the early development of family planning services in Puerto Rico, beginning in 1935, see Christopher Tietze, "Human Fertility in Puerto Rico", *American Journal of Sociology* (Chicago), vol. 53, July 1947, pp. 38-40.

Table 5.2. Selected characteristics of countries in Middle and South America

Country	Gross reproduction rate (latest available data)	Density of population per square kilometre, 1960	Percentage of literates among females 15 years and over,[a] 1950-1960	Percentage of population in localities of 20,000 and over,[b] around 1950	Percentage of male labour force engaged in non-agricultural activities, 1950-1960	Per caput national income, U.S. dollars,[c] 1957-1959
Uruguay	1.3	15	82.5[d]	36.2	...	400-499
Argentina	1.4	7	87.5[d]	48.2	68.4	400-499
Cuba	2.1	59	80.0	33.0	52.9	300-399
Chile	2.2	10	78.7	46.3[e]	61.0	300-399
Puerto Rico	2.3	265	69.6	28.0[f]	67.0	500-599
Jamaica	2.7	142	85.8	25.1[f]	...	300-399
Panama	2.7	14	69.0	33.1[f]	41.4	300-399
Trinidad and Tobago	2.7	165	77.5[d]	33.6	77.2	500-599
Guadeloupe	2.8	152	64.7	15.4	50.9	300-399
Haiti	2.8	126	8.6	5.4	11.3	Under 100
Martinique	2.8	251	74.9	16.9[g]	47.9	300-399
Bolivia	2.9	3	22.8	14.0	30.2	Under 100
Colombia	2.9	12	59.8	21.5	34.3	200-299
Paraguay	2.9	4	57.1	12.0	35.1	100-199
Brazil	3.0	8	44.3	20.3	37.2	100-199
British Guiana	3.0	3	77.5[d]	19.6	59.6	200-299
Mexico	3.1	18	60.8	24.0	35.0[h]	200-299
Nicaragua	3.1	10	38.7	15.2	23.1	100-199
Peru	3.1	8	30.7	21.0	32.3	100-199
Venezuela	3.1	8	48.5	47.2[i]	47.9	600-699
Dominican Republic	3.2	61	41.1	11.2	23.6	200-299
Ecuador	3.2	16	49.7	17.8	35.4	100-199
El Salvador	3.3	117[j]	37.4	13.0	24.4	100-199
Guatemala	3.4	35	24.4	11.2	23.6	100-199
Costa Rica	3.5	23	78.6	10.9	35.1	300-399
Honduras	3.6	17[j]	41.2[i]	7.6	20.6	100-199
Surinam	...	2	72.5[d]	35.6	...	200-299

... Data not available.

[a] Except as noted, figures are derived from a population or sample survey taken during 1950-1960, or else are UNESCO estimates for dates around 1950.

[b] Except as noted, figures are unpublished estimates prepared by the Bureau of Applied Social Research (Columbia University) as part of a study of world urbanization trends.

[c] Estimates of the United Nations Statistical Office. In a few instances, the estimates relate to *per caput* national product.

[d] Figure relates to both sexes.

[e] Official estimate for 1959.

[f] Data from the 1960 census of population.

[g] Data from the 1954 census of population.

[h] Estimated. Tabulations for 1950 relate to both sexes combined.

[i] Data from the 1961 census of population.

[j] For 1961.

Tobago in 1960 can scarcely be considered a low figure. Costa Rica, with its extraordinarily high gross reproduction rate, rivals Chile and Cuba in literacy and income per head, though not in urbanization and development of non-agricultural industries. On the other hand, Haiti, with its more moderate fertility level (unreliably estimated, it must be admitted), seems to be the least advanced in economic and social development of all the countries listed in table 5.2.

The inverse association between fertility and density of population, mentioned in chapter I, holds true in a general way among Middle and South American countries having gross reproduction rates of 2.5 or higher (see table 5.2). The association is not perfect, however. Notable exceptions are the Dominican Republic and El Salvador, with very high estimated gross reproduction rates in spite of high density, and, on the other hand, Panama, with low density and only moderately high fertility.

Ethnic composition and cultural heritage of the people need to be considered in studying causes of the differing fertility levels among countries in this region. For example, if it is true, as the estimates indicate, that fertility is much higher in Guatemala than in Bolivia, Ecuador or Peru, the difference may well be explained wholly or partly in terms of traditional cultural traits of the aboriginal peoples who constitute large majorities of the inhabitants of these countries. In other countries, where there has been more mingling and cultural assimilation of aboriginal and immigrant stocks, traits of aboriginal as well as imported European or African culture may also have persistent effects on the levels of fertility.

Descendants of former slaves of African origin constitute a majority of the inhabitants of a number of areas in the Caribbean and Northern South America, including British Guiana, Guadeloupe, Haiti, Jamaica, Martinique, and Trinidad and Tobago, among the countries listed in the tables. Some features of the behaviour of these peoples relevant to fertility may be consequences of conditions to which they were subjected during the time of slavery, if not survivals of their diverse African cultural heritage. There is evidence to show that the prevalence of relatively unstable forms of marital unions is an important factor tending to depress fertility of the population of African extraction, at least in British Guiana, Jamaica and Trinidad and Tobago. In these countries, the fertility of " common law " marriages has been shown to be less than that of formal marriages, and still less fertile are the " visiting " unions which are prevalent in these areas (i.e., unions in which the partners do not cohabit regularly).[4] The relative instability of " common law " and " visiting " unions may depress fertility in several ways: by shortening the average span of effectively married life within a woman's or a man's potentially fertile years, by increasing the risk of venereal infection and consequent sterility or foetal mortality, and by undermining the woman's sense of security and thus inhibiting her desire for children.

East Indians are also an important element in the population of British Guiana and Trinidad and Tobago, where large numbers of contract labourers were brought in from India after the abolition of slavery in the nineteenth century. The East Indians have distinctly higher fertility than the population of African origin in these areas; they marry young, maintain stable unions, and have high marital fertility rates. For example, according to the returns of the 1946 census in British Guiana, the lifetime average numbers of births reported by women having completed their child-bearing years were 5.0 for the women of East Indian and 4.0 for those of African extraction. The difference was due mainly to a larger proportion of African women reported as having borne no children.[5]

Consensual unions are prevalent throughout most of Latin America, and these are doubtless not so stable, in general, as marriages sanctioned by law and the church. The data available for most Latin American countries are not sufficient, however, to assess the relationship between the prevalence of consensual unions and the level of fertility. The effects on fertility of variations in age at marriage, widowhood, and remarriage of widows are also difficult to estimate under the conditions prevailing in Latin America. The pertinent census classifications of persons by marital status are confused by the difficulty of drawing hard and fast distinctions between " single " and " consensually married " persons, and corresponding distinctions between former members of consensual unions dissolved by death of the partner and persons having remained single all their lives. Because of these difficulties, the percentages of females 15-19 years of age reported as married in the censuses of Latin American countries are not shown in table 5.2, as has been done in the corresponding tables for Africa and Asia.

[4] George W. Roberts, *The Population of Jamaica* (Cambridge, 1957), p. 297; George W. Roberts and Lloyd Braithwaite, " Fertility differentials by Family Type in Trinidad ", *Culture, Society and Health; Annals of the New York Academy of Sciences*, vol. 84, art. 17, 8 Dec. 1960, pp. 963-980; George W. Roberts, " Some Observations on the Population of British Guiana ", *Population Studies* (London), vol. 2, September 1948, pp. 185-218; Irene B. Taeuber, " British Guiana: Some Demographic Aspects of Economic Development ", *Population Index* (Princeton), vol. 18, January 1952, pp. 3-19.

[5] Irene B. Taeuber, op. cit. See also the works of Roberts and Braithwaite on British Guiana and Trinidad, cited above.

B. Trends

Reliable measures or estimates of changes in the levels of fertility during various periods in the recent past can be obtained for 18 of the 27 countries in Middle and South America which have a population of 250,000 or more. Fifteen countries in these regions have series of birth registration statistics considered to be " complete " at least in recent years, and estimates by the " reverse-survival " method have been made from census data for three additional countries (Brazil, Colombia and Cuba), referring to two or more time periods.

Crude birth rates based on registration statistics for the countries where these statistics are reported as " complete " are presented in table 5.3, from 1900 to date, so far as the data are available. It should be emphasized that for some of these countries only the most recent statistics are reliable. One would be led astray in these cases by accepting the whole series without reservations. Estimates by the " reverse-survival " method are presented in table 5.5, not only for Brazil, Colombia and Cuba, but also for several countries included in table 5.3. For the latter countries, the " reverse-survival " estimates provide a check on the reliability of the registration data for earlier periods. In addition, estimated gross reproduction rates are given in table 5.4 for periods for which the requisite data on sex-age structure of the population are available.

1. *Cases of decreasing fertility*

Substantial decreases of fertility having occurred at one time or another during the last half century are indicated by the data for six countries in these two regions, namely, Argentina, Chile, Cuba, Jamaica, Puerto Rico and Trinidad and Tobago. Uruguay has also undoubtedly experienced a large decrease of fertility since 1900, although the Uruguayan statistics do not provide an exact measure of it, for the reasons already mentioned. It is likely that the trend in Uruguay has been rather similar to that in Argentina.

In Argentina (and probably Uruguay), the trend of fertility has followed approximately the same pattern observed in many European countries since the early years of the twentieth century: the birth rate declining steadily until the 1930's, rising temporarily in the years shortly following the Second World War, then again falling and apparently stabilized at a relatively low level during the most recent years. The causes of this

Table 5.3. Trends of crude birth rates in Latin American countries with relatively good statistics: 1900-1960

(Births per 1,000 population)

Year	*Middle America*					Year	*Middle America* (continued)					Year	*South America*				
	Costa Rica	*El Salvador*	*Guadeloupe*	*Guatemala*	*Jamaica*		*Martinique*	*Mexico*	*Panama*	*Puerto Rico*	*Trinidad and Tobago*		*Argentina*	*British Guiana*	*Chile*	*Surinam*	*Venezuela*
1900-1904 ..	38.5 [a]	...	...	...	38.6	1900-1904 ..	...	34.1 [d]	...	...	35.5	1900-1904 ..	...	32.9	...	...	...
1905-1909 ..	44.0	45.4	...	...	38.4	1905-1909 ..	...	33.6	...	...	34.6	1905-1909 ..	37.2 [i]	30.3	...	...	...
1910-1914 ..	47.5	49.0 [b]	...	...	38.6	1910-1914 ..	...	32.1 [e]	...	...	33.4	1910-1914 ..	37.4 [b]	32.1	46.0 [j]	...	29.8 [b]
1915-1919 ..	45.2	...	...	...	35.3	1915-1919 ..	...	...	...	...	31.7 [f]	1915-1919 ..	33.5	27.2	43.0 [j]	...	...
1920-1924 ..	43.4	45.9	...	62.6	37.6	1920-1924 ..	...	31.4 [g]	37.4	...	32.5	1920-1924 ..	32.0	31.7	42.4	...	29.9
1925-1929 ..	46.6	44.7	...	58.7	35.6	1925-1929 ..	...	33.3	38.4	...	31.5	1925-1929 ..	29.9	32.3	41.9	...	31.4
1930-1934 ..	45.7	43.3	...	51.6	33.6	1930-1934 ..	...	44.5	36.5	40.6	30.3	1930-1934 ..	26.8	32.3	40.5	...	28.2
1935-1939 ..	45.0	42.7	...	47.7	32.2	1935-1939 ..	...	43.5	36.4	39.1	32.4	1935-1939 ..	24.0	32.4	36.6	...	32.7
1940-1944 ..	44.9	43.3	...	47.2	32.0	1940-1944 ..	...	44.2	37.5 [h]	39.6	36.2	1940-1944 ..	24.1	34.5	36.4	...	35.7
1945-1949 ..	45.1	44.4	37.3 [c]	50.6	31.7	1945-1949 ..	35.3 [c]	44.4	36.0	40.8	38.7	1945-1949 ..	25.1	40.3 [c]	35.7	36.6	38.6
1950-1954 ..	49.2	49.4	38.8	51.4	35.0	1950-1954 ..	39.0	44.9	35.9	36.6	37.7	1950-1954 ..	25.1	42.9	33.8	42.1	45.3
1955-1959 ..	50.0	50.0	38.5	49.1	39.3	1955-1959 ..	39.6	45.9	39.9	33.7	38.3	1955-1959 ..	24.0	44.0	36.0	44.8	45.2
1955	51.0	49.9	40.1	48.8	37.5	1955	39.6	45.9	39.4	34.6	41.9	1955	24.3	43.2	35.1	43.7	45.3
1956	50.4	49.3	39.5	48.8	38.6	1956	40.1	46.1	39.3	34.8	37.0	1956	24.5	43.1	36.0	44.5	45.2
1957	49.3	51.6	37.4	49.4	39.7	1957	40.7	46.6	40.5	33.7	37.7	1957	24.2	44.5	36.9	44.3	45.2
1958	49.6	50.2	38.4	48.7	39.8	1958	39.0	44.0	39.3	33.2	37.6	1958	23.7	44.5	36.0	45.9	45.2
1959	49.8	49.0	37.2	49.8	40.7	1959	38.5	46.9	40.8	32.3	37.4	1959	23.3	44.5	35.8	45.5	45.1
1960	50.2	49.9	38.8	49.5	42.7	1960	38.5	46.0	41.0	32.3	39.5	1960	22.5	42.9	35.5	...	45.1

... Data not available.

Source: Rates are computed from registered births and official population estimates, except as indicated in the country notes in section C of this chapter.

[a] For 1902-1904.

[b] For 1911-1913.

[c] For 1946-1949.

[d] For 1901-1904.

[e] For 1910.

[f] Births partly estimated for 1915.

[g] For 1922-1924.

[h] For 1941-1944.

[i] For 1906-1909.

[j] Estimates prepared by the United Nations.

Table 5.4. Fertility trends in Latin American countries with relatively good statistics

Region, country and year	*Crude birth rate (births per 1,000 population)*	*Gross reproduction rate*
Middle America		
Costa Rica		
1925-1929	46.6	3.0
1948-1952	46.8	3.0
1953-1957	50.7	3.3
1960	50.2	3.5
El Salvador		
1948-1952	48.1	2.9
1953-1957	50.1	*3.2*
1960	49.9	3.3
Guadeloupe		
1954	39.0	2.7
1955	40.1	2.8
1956	39.5	2.8
1957	37.4	2.6
1958	38.4	2.7
1959	37.2	2.7
1960	38.8	2.8
Guatemala		
1948-1952	51.6	3.3
1953-1957	49.8	*3.3*
1960	49.5	*3.4*
Jamaica		
1909-1913	38.7	2.2
1919-1923	37.7	2.0
1941-1944	32.2	1.8
1946-1948	*31.9*	*1.8*
1949-1951	*33.8*	*2.0*
1952-1954	*35.5*	*2.1*
1956	*38.6*	*2.4*
1960	42.7	2.7
Martinique		
1954	40.0	2.7
1955	39.6	2.7
1956	40.1	2.8
1957	40.7	2.8
1958	39.0	2.7
1959	38.5	2.7
1960	38.5	2.8
Mexico		
1931-1934	43.4	2.6
1938-1942	44.7	2.8
1950-1954	44.9	*2.9*
1955-1959	45.9	*3.0*
1950	45.5	2.9
1951	44.5	*2.9*
1952	43.6	*2.8*
1953	44.7	*2.9*
1954	46.0	*2.9*
1955	45.9	*3.0*
1956	46.1	*3.0*
1957	46.6	*3.0*
1958	44.0	*2.9*
1959	46.9	*3.2*
1960	46.0	3.1

Regions, country and year	*Crude birth rate (births per 1,000 population)*	*Gross reproduction rate*
Panama		
1941-1945	37.6	*2.3*
1949-1952	33.9	2.1
1953-1957	39.3	*2.5*
1960	41.0	2.7
Puerto Rico		
1933-1937	38.8	2.4
1938-1942	39.3	2.4
1943-1947	40.6	2.6
1948-1952	38.2	2.5
1953-1957	34.5	2.4
1950	38.8	2.6
1951	37.6	2.5
1952	36.1	2.4
1953	35.3	2.4
1954	35.2	2.4
1955	34.6	2.4
1956	34.8	2.4
1957	33.7	2.3
1958	33.2	2.3
1959	32.3	2.3
1960	32.3	2.3
Trinidad and Tobago		
1899-1903	35.9	2.0
1909-1913	34.9	1.9
1919-1923	32.7	1.8
1929-1933	30.5	1.6
1944-1948	39.6	2.3
1949	37.2	2.3
1950	37.5	2.3
1951	36.7	2.3
1952	34.6	2.2
1953	37.7	2.4
1954	41.9	2.8
1955	41.9	2.8
1956	37.0	2.5
1957	37.7	2.6
1958	37.6	2.6
1959	37.4	2.6
1960	39.5	2.7
South America		
Argentina		
1912-1916	36.0	2.3
1945-1949	25.2	1.5
1950-1954	25.1	1.5
1955-1958	24.2	1.5
1948	25.3	1.5
1949	25.1	1.5
1950	25.6	1.5
1951	25.3	1.5
1952	24.9	1.5
1953	25.2	1.5
1954	24.6	1.5
1955	24.3	1.5
1956	24.5	1.5
1957	24.2	1.5
1958	23.7	1.5

Table 5.4. Fertility trends in Latin American countries with relatively good statistics (*continued*)

Region, country and year	Crude birth rate (births per 1,000 population)	Gross reproduction rate
British Guiana		
1909-1913	31.2	1.7
1919-1923	30.5	1.7
1929-1933	33.0	*1.9*
1944-1948	36.5	2.2
1949	42.3	2.7
1950	40.4	2.6
1951	42.5	2.7
1952	44.3	2.9
1953	44.1	2.9
1954	42.9	2.8
1955	43.2	2.9
1956	43.1	2.9
1957	44.5	3.1
1958	44.5	3.1
1959	44.5	*3.1*
1960	42.9	*3.0*
Chile		
1918-1922	41.9	2.7
1928-1932	41.6	2.6
1938-1942	36.2	2.2
1950-1954	33.8	2.1
1955-1959	36.0	2.2
1960	35.5	2.2
Venezuela		
1935-1938	32.1	1.8
1940-1943	35.9	2.1
1949-1952	43.0	2.7
1954-1956	*45.2*	*3.1*
1958	*45.2*	*3.1*
1960	*45.1*	*3.1*

Source: In computing the fertility rates for periods longer than one year, the average annual number of registered births in the stated years have been related either to population data from a census taken during the middle of the period, or to an average of mid-year population estimates available for each year. Official census data or official population estimates were used in calculating all rates except those underlined, which are based on population estimates prepared by the United Nations.

trend are undoubtedly related to the comparatively high levels of industrialization, urbanization, popular education, etc., attained in Argentina and Uruguay by the beginning of this century, and their continuing leadership in economic and social development among Latin American countries since that time. For example, Argentina at the beginning of the century already had about 60 per cent of her labour force in non-agricultural industries and was deriving 21 per cent of her aggregate national product from manufacturing, mining and construction; these percentages rose to about 73 per cent of the labour force in 1947 and 28 per cent of the national product in 1940-1944.[6] Probably the large-scale influx into these countries of European immigrants among whom the small family idea was already firmly established was an additional factor of importance in bringing down the birth rate.

Chile's birth rate appears to have followed a trend parallel to that of Argentina, but at a considerably higher level. Between 1910-1914 and 1935-1939, while Argentina's crude birth rate dropped from about 37 to 24, that of Chile came down from about 46 to 36, and the level has not changed much in either country since the latter date. Fertility as measured by the gross reproduction rate appears to have decreased in a somewhat smaller proportion in Chile. Industrialization, urbanization, and related economic and social changes have progressed in Chile, with some temporary setbacks, during the more recent period of stabilized fertility as well as the earlier period of falling fertility. The proportion of the Chilean male labour force working in non-agricultural industries rose from 52 per cent in 1920 to 61 per cent in 1952. At the same time, the proportion of total population in places with 20,000 or more inhabitants rose from 28 per cent to 42 per cent. The proportion of persons unable to read and write declined from 37 per cent in 1920 to 24 per cent in 1930; progress in this respect has continued at a slower pace since 1930.

It has been suggested that the failure of fertility in Chile to decline below the level reached in the 1930's, which was still fairly high, might be due to the persistence of conditions conducive to the maintenance of high fertility among certain segments of the Chilean population that have not fully participated in the recent economic and social advances. Present birth rates in most rural areas of Chile are much above the urban level. A similar persistence of high fertility is evident also in some outlying areas of Argentina, but the inhabitants of such areas make up a comparatively small fraction of Argentina's population.[7]

Cuba's birth rate, according to rough estimates derived from the data of successive censuses, dropped sharply from a very high level of around 50 per 1,000 in the early decades of this century to about 34 in 1943-1948 (table 5.5). The trend in Cuba up to the period 1943-1948 appears rather similar to that of Chile. The basis of the Cuban estimates is relatively weak, however, and information on the trend since 1953 is lacking. In Cuba, as in Chile, the decline of the birth rate up to the 1930's went with increasing urbanization, industrialization, advances in education, etc., although the Cuban censuses do not provide readily comparable data for measurement of these economic and social

[6] Raul Prebisch, "The Structural Crisis in Argentina and its Prospects of Solution". *Economic Growth: Rationale, Problems, Cases*, Eastin Nelson, *ed.* (Austin, Texas, 1960), pp. 105-106.

[7] *Future Population Estimates by Sex and Age, Report II: The Population of South America, 1950-1980* (United Nations publication, Sales No.: 55.XIII.4), p. 11.

Table 5.5. Trends of registered and estimated crude birth rates for selected Latin American countries

Region, country and years	Crude birth rate (births per 1,000 population)	
	Based on registration data	Estimated by "reverse-survival"
Middle America		
Costa Rica		
1917-1922 ...	43 [a]	43
1940-1945 ...	44	42
Cuba		
1909-1914 ...	...	50
1921-1926 ...	...	40
1933-1938 ...	21	35
1943-1948 ...	25 [b]	34
Mexico		
1920-1925 ...	31 [c]	49
1930-1935 ...	44	47
1940-1945 ...	44	45
1950-1955 ...	45	47
Panama		
1930-1935 ...	36	40
1940-1945 ...	38 [d]	42
1950-1955 ...	36	41
Puerto Rico		
1900-1905 ...	29	44
1910-1915 ...	36	48
1920-1925 ...	38	44
1930-1935 ...	39	40
1940-1945 ...	40	37
South America		
Brazil		
1930-1935 ...	...	45
1940-1945 ...	...	43
Colombia		
1928-1933 ...	30	46
1941-1946 ...	33	44
Venezuela		
1926-1931 ...	30	44
1931-1936 ...	29	44
1940-1945 ...	36	42
1951-1956 ...	44	45

... Data not available.
[a] For 1921-1922.
[b] For 1944-1948.
[c] For 1922-1924.
[d] For 1941-1945.

changes. It is in Havana and the highly urbanized neighbouring areas that the birth rate has declined most. The birth rate for Havana Province is estimated to have dropped from about 45 in 1907-1919 to 19 in 1943-1953. A considerable decrease appears to have occurred also in the rural areas, though the level of rural birth rates was still apparently rather high in 1943-1953, particularly in the more remote parts of the island. Estimates for Oriente Province, one of the most rural regions, indicate a decline from a rate above 60 in 1907-1919 to the high 40's in 1943-1953.[8]

In the case of Puerto Rico, it is not clear when the decline of fertility began. Some estimates indicate a nearly constant level of the birth rate up to 1950.[9] On the other hand, "reverse-survival" estimates of the birth rates for periods prior to the 1930's (when the birth registration statistics were unreliable) suggest the possibility of a gradual downward trend since the early years of the century (see table 5.5).[10] Since 1950, the registration statistics show a steady, though rather slow, decline of the birth rate (see table 5.3). The crude birth rates exaggerate the decline, as large numbers of women in the most fertile age groups have emigrated in recent years. Moreover, when changes in marital status are taken into account, it is not certain that the decline in fertility during the recent decade was more rapid than that which occurred earlier in the century.[11]

Puerto Rico had already made considerable strides in economic and social development before the Second World War, and progress in this domain continued at a relatively rapid rate in the post-war period. At the beginning of the century, Puerto Rico was little urbanized, its labour force was mainly agricultural, and the great majority of its population was illiterate. Since that time, the proportion of the population living in urban areas has increased from 15 to 44 per cent, with the most rapid urban growth occurring in the 1940-1950 decade.[12] As late as 1930, two-thirds of all active males were engaged in agriculture, but this figure had fallen to a little less than half by 1950 and to a little less than one-third by 1960. *Per caput* net income, expressed in terms of dollars of constant purchasing power, increased 47 per cent during 1940-1950, and 43 per cent during 1950-1960.[13] Progress has also been made in

[8] United Nations, Economic Commission for Latin America, "Proyección de la población urbana y rural de Cuba", April 1960 (processed).

[9] Revised birth rates published by the Puerto Rican Department of Labor are 40.5 for the period 1899-1910, 40.4 for 1910-1920 and 39.3 for 1920-1930. Puerto Rico, Department of Labor, Migration Division, *A Summary in Facts and Figures* (New York, March 1956), p. 3. See also José L. Janer, "Population Growth in Puerto Rico and Its Relation to Time Changes in Vital Statistics", *Human Biology* (Baltimore), vol. 17, December 1945, pp. 267-313; Jerry W. Combs, Jr. and Kingsley Davis, "The Pattern of Puerto Rican Fertility", *Population Studies* (London), vol. 4, March 1951, pp. 364-379.

[10] Other studies also presented evidence of a long-term decline in the birth rate. Jerry W. Combs, Jr., *Human Fertility in Puerto Rico;* unpublished Ph.D. thesis, Columbia University; New York, 1954. José L. Vázquez, *Puerto Rico's Demographic Evolution and Its Transfer Value for Other Under-developed Areas* (unpublished Ph.D. thesis to be submitted to the University of Chicago).

[11] Owing to selective out-migration, the number of married women aged 15-29 years with spouse present was reduced by 12 per cent during 1950-1960, at the same time the total population was increasing 6 per cent. (*Report on the World Social Situation*, United Nations publication, Sales No.: 63.IV.4, p. 18.) Vázquez estimated that nearly two-thirds of the apparent 1950-1960 decline in the birth rate could be accounted for by changes in sex-age composition and marital status. José L. Vázquez, op. cit.

[12] Urbanization was slower in the 1950-1960 decade, owing to the emigration to the mainland of many city residents.

[13] Puerto Rico, Planning Board, *Puerto Rico Income and Product, 1959*, table 19, p. 40.

reducing illiteracy and increasing school attendance. The proportion of population 10 years and over classified as unable to read and write declined from over 70 per cent in 1910 to 18 per cent in 1960.[14]

Jamaica and Trinidad and Tobago, like Chile, experienced a decline of birth rates during the early decades of the twentieth century, which was arrested in the 1930's before a low level of fertility was reached. Instead of becoming stabilized, as in Chile, the trend in Jamaica and Trinidad and Tobago subsequently turned decidedly upward. The birth rates of these countries at the beginning of the century were already distinctly below the level prevailing in most of Middle and South America. Jamaica's rate, averaging about 38 from 1900 to 1914, was only slightly above the level of Argentina at that time, and the birth rate in Trinidad and Tobago was lower. In Jamaica, the rate fell slowly to an average of about 32 for 1935-1939, remained nearly constant at the latter level through 1945-1949, and rose sharply during the 1950's, so that the level reached in 1960 was considerably above the 1900-1914 average. In Trinidad and Tobago, the turning point was reached during 1930-1934, when the birth rate averaged approximately 30, and the trend has continued irregularly upward since that time.

The falling birth rate in Jamaica and Trinidad and Tobago up to the 1930's was accompanied, as it was in Argentina, Chile and Cuba, by expansion of non-agricultural employment and movement of population to the cities, although Jamaica and Trinidad and Tobago were less advanced in industrialization and urbanization than the other three countries. In Jamaica, although there is no evidence of any considerable change before 1921 in the relative numbers of agricultural and non-agricultural workers, the census statistics for 1921 and 1943 show an increase from 29 to 43 per cent of the male active population engaged in non-agricultural activities, and an appreciable migration from rural to urban areas occurred during this interval.

2. *Cases of increasing fertility*

In considering factors which may have been responsible for the recent increase of birth rates in Jamaica and Trinidad and Tobago, it is also pertinent to take account of developments in British Guiana, where the records of vital statistics show an upward trend of the birth rate since 1915-1919. At that time, British Guiana had a lower birth rate (27.2) than either Jamaica or Trinidad and Tobago, whereas British Guiana at present has the highest rate of the three (42.9 according to provisional statistics for 1960).

If it is true, as has been suggested,[15] that progress in economic and social development was causally related to the decline of fertility in Jamaica and Trinidad and Tobago up to the 1930's, it seems that the converse relationship did not hold in the subsequent period of rising fertility in these countries. There was no reversal or cessation of the trends of urbanization and non-agricultural development. In Trinidad, for instance, the proportion of non-agricultural workers in the male labour force increased between 1931 and 1946 from less than one-half to more than two-thirds. Gross domestic product per head rose between 1953 and 1956 by 32 per cent in Trinidad and Tobago and 41 per cent in Jamaica, largely as a result of expansion in oil drilling and refining in Trinidad and bauxite mining in Jamaica.[16] Likewise, in British Guiana during the interval between the censuses of 1911 and 1946, while fertility rose, the proportion of the male labour force engaged in activities other than agriculture increased from about one-third to one-half, urbanization progressed, and the average level of popular education was raised. No doubt these trends have also continued in British Guiana since 1946.

One factor in the uptrend of birth rates in these areas may have been improving stability of marital unions. The percentages of formally married women have been increasing, and the prevalence of the less stable and less fertile "common law" or "visiting" unions has diminished. In Trinidad and Tobago between 1931 and 1946, the percentage of legally married women among all women in the age group 20-29 years increased from 22 to 32 per cent, and slight increases were also recorded for other age groups. Among non-East Indian women in British Guiana in the age group 15 years and over, the percentage of legally married women rose from 31-32 per cent at the censuses of 1921 and 1931 to 36 per cent in 1946.[17] In Jamaica between 1943 and 1953, the percentage of women reported as having ever been formally married rose, in the age group 30-34 years, from 34.5 to 40.8 per cent, and in the group 35-39 years, from 41.5 to 47.2 per cent. As changes in the corresponding percentages for other age groups in Jamaica were slight, the figures can be interpreted as evidence of a shift in the average age at which women entered into formal marriage. Instead of waiting until age 40 or later to formalize their "common law" or "visiting" unions, it appears that women did so to an increasing extent at ages in their 30's.[18] Another indica-

[14] U.S. Bureau of the Census, *U. S. Census of Population, 1960, General Social and Economic Characteristics, Puerto Rico*, Final Report PC (1)-53C, Washington, 1962.

[15] George W. Roberts, *The Population of Jamaica*, op. cit., pp. 312-314.

[16] Jack Harewood, "Overpopulation and Underemployment in the West Indies", *International Labour Review* (Geneva), vol. 82, August 1960, pp. 103-137.

[17] In this case, diminishing incidence of widowhood due to improving mortality conditions may have been an important contributing factor.

[18] This evidence of such a trend in Jamaica, derived from a comparison of 1943 census and 1953 demographic sample survey returns, is not supported by the marriage registration statistics. According to the latter data (Jamaica, *Annual Report of the Registrar General's Department*), the crude marriage rate increased slightly in the post-war period, reaching about 6 per 1,000 in the middle 1950's, but it has since declined to a level of 4-5 per 1,000, such as prevailed during most of the first half of the century. Moreover, the statistics on registered marriages show a steady rise in the average age at which women married, from 28.9 in 1944 to 30.8 years a decade later. The apparent contradiction might be explained by an increasing disposition of women not legally married to consider themselves as married and report themselves as such to the census or survey enumerators. Such a change of attitude might be hardly less important in its effect on marital stability and fertility than a change in the prevalence of legal marriages.

tion of the change in pattern of behaviour with regard to marriage is seen in a rising ratio of legitimate to illegitimate births recorded in all three countries under discussion. In Trinidad and Tobago, for instance, this ratio rose from 626 legitimate per 1,000 illegitimate births in 1921-1925 to 1,020 per 1,000 in 1941-1945.

In addition to the change in relative numbers of unions of the different types, it is possible that there has been a tendency of increasing stability in " common law " and " visiting " unions, which would also be favourable to rising fertility. The importance of marital stability or instability as a factor affecting fertility in Jamaica has been strongly emphasized in a recent report, which contains the statement:

> " Other things being equal, were lower-class Jamaica sexual associations relatively stable, the island's fertility would be significantly, even spectacularly, higher than it now is — probably over 30 per cent higher." [19]

Improving efficacy of venereal disease control measures may also have been important in minimizing the losses of fecundity and fertility due to marital instability.

It is noteworthy that the rising trend of fertility in British Guiana and Trinidad and Tobago appears not only in the statistics for the population of African or mixed descent, but also in those for the East Indians. In British Guiana, the birth rate of the East Indians has been rising since 1910-1920, while that of the African-Mixed population followed a gradually declining trend until 1938. The recent increase has been equally great for both groups; between 1945-1949 and 1950-1954, the East Indian birth rate rose from 46.4 to 48.8, while the rate for the remainder of the population rose from 34.9 to 37.5. In Trinidad and Tobago between 1929-1933 and 1944-1948, the birth rate of the East Indians rose 22 per cent and that of non-East Indians 31 per cent.

The possible explanation of rising fertility in terms of increasing stability of marital unions does not apply to the East Indians; as already mentioned, early, almost universal and stable marriage are characteristic of them. The observation that their fertility has increased as much or almost as much as that of the African-Mixed population suggests that factors not related to marital stability may have played an important part in both cases. Among the possible factors would be improving conditions of health and diet, tending to increase fecundity; decreasing incidence of widowhood, owing to falling mortality rates; and a more willing disposition to have numerous children, owing to improving economic circumstances.

An increase of birth rates during the 1950's above the levels of preceding decades is also apparent in the statistics of a number of Latin countries on the Middle American mainland and the northern coast of South America, including Costa Rica, El Salvador, Panama, Venezuela, and, to a lesser extent, Mexico. The initial rise in the early years of the decade might appear as an occurrence in these countries of the same temporary post-war " baby boom " observed in many industrialized countries and also, as noted above, in some Asian countries which are little industrialized. In the group of Latin American countries now under discussion, however, the rise of birth rates does not appear to have been temporary; the rates continued at the new, higher levels throughout the 1950's, in some cases rising still a little higher in the most recent years. This trend may be due, in most cases, primarily to improving birth registration, but the possibility that it also reflects some real increase in fertility cannot be dismissed.[20] In these cases also, possible explanations might include improving health conditions, diminishing incidence of widowhood, increasing stability of marriages, and positive reaction of fertility to improving economic circumstances.

C. Notes on fertility data and estimates for countries

1. *Middle America*

Costa Rica. The crude birth rate of Costa Rica for 1960 is officially estimated at 50.2 per 1,000 population, as shown in table 5.1.[21] The precise birth rate for any given year cannot be stated with any certainty, despite the fact that registration is fairly complete, because births are frequently registered long after the event. Hence the statistics tabulated by year of occurrence are incomplete for recent years. The provisional birth rate for 1960, for example, based on births reported as having occurred in that year, is only 42.9. The estimated rate of 50.2 is based on a series of official estimates of the number of births having occurred in each year from 1950 to 1961.

These estimates correspond very closely to the number of births actually registered in the given years, after allowance is made for abnormally high numbers of registrations recorded in certain years for special reasons.[22] Therefore, no great distortion of trend is likely to be produced by comparing the estimates with data for earlier years tabulated by date of registration as is done in table 5.3. As the table shows, the registered birth rate remained relatively stable at a level in the middle 40's for some 45 years prior to 1950, and then rose to an average of 49 for 1950-1954 and to 50 for 1955-1959.

Because of the recent changes in the system of registering and tabulating births, there is no certainty that

[19] Judith Blake, *Family Structure in Jamaica* (Glencoe [Ill.], 1961), p. 249.

[20] Jean Bourgeois-Pichat, " Recent Trends of Fertility in Underdeveloped Areas " (paper presented to the Conference on Demographic and Economic Trends in the Developing Countries, New York, October 1963) presents evidence derived from an analysis of census statistics of Panama since 1930 which tends to confirm that an increase of fertility has occurred in this country.

[21] Costa Rica, Dirección General de Estadística y Censos, *Principales Hechos Vitales Ocurridos en Costa Rica*, No. 25, 1961, p. 23.

[22] For example, a very large number of births was registered in 1959 owing to a change in legislation initiated to facilitate prompt registration of births occurring in hospitals. An official estimate has been made of the number of births registered in that year solely because of the new legislation. *Ibid.*, No. 21, 1959, pp. 5-6.

this recent increase in the recorded birth rate represents a real rise in fertility. It is possible that the number of births for the decade of the 1950's is over-estimated owing to insufficient account having been taken of duplicate registration.[23] On the other hand, the trend of the crude marriage rate, which rose in the early 1950's and dropped again in the latter part of the decade, gives some support to the belief that a real increase in fertility may have taken place.

In calculating the gross reproduction rate of 3.5 shown in table 5.1, the distribution of births registered in the year 1960 by age of mother was adjusted to the official estimate of the number of births having occurred in that year. The gross reproduction rate is shown to have risen more than the crude birth rate in recent years (table 5.4), but this result may be due to errors in the estimation of the population's age distribution.[24] The estimated gross reproduction rates for 1925-1929 and 1948-1952 shown in table 5.4 were calculated on the assumption that the pattern of fertility by age of mother was the same as in 1955.

That the birth registration data are satisfactory for assessing the general trend of fertility over a long period (although perhaps not the recent changes) is demonstrated by the birth rates estimated by the method of " reverse-survival " from census data (see table 5.5). The crude birth rates estimated on this basis are approximately the same as the rates computed from registration data. In fact, tests of birth registration, the results of which are summarized in table 5.6, suggest that registration may have been nearly complete as early as 1917-1922.

Cuba. Data collected at the 1943 census revealed that only 66 per cent of the children under 5 years of age enumerated in the census had had their births registered, while the corresponding figure for persons 30 years of age and over was 94 per cent. It is believed that birth registration is often delayed until a time in life when the individual requires proof of his birth for identification purposes.[25] In view of the serious shortcomings of the registration data, the fertility measures shown in table 5.1 for Cuba in 1943-1948 have been estimated from census age data by the method of " reverse-survival ". In calculating the gross reproduction rate, the pattern of fertility by age of mother was assumed to be like that of Puerto Rico.

Estimates derived from the age distributions of successive censuses indicate that the crude birth rate declined from about 50 early in the century to about 34 during 1943-1948 (table 5.5).

The decline of the birth rate began earliest and has proceeded farthest in the region around Havana.[26] Havana Province, which is very highly urbanized, had the lowest birth rate during the early part of the century (about 45 during 1913-1923) and experienced the greatest decline (to about 19 during 1943-1953). There is some indication that the decline in this province has now been halted. Oriente Province, one of the most rural regions, had initially the highest birth rate (estimated at about 62 in 1913-1923), and saw the least decline. In 1943-1953 the birth rate of Oriente Province was estimated in the high 40's.

Dominican Republic. The registered birth rate in the Dominican Republic during the early 1950's was about 39, but the records are admittedly incomplete. On the basis of provisional tabulations of the 1960 census, an estimate of 44 was derived for the crude birth rate in 1950-1955 by " reverse-survival ". This figure is a little lower than the corresponding estimate of 48 for 1940-1945 derived by " reverse-survival " of 1950 census age data. However, the accuracy of the age data from both censuses appears to be relatively poor, and the estimates must be treated with reserve. It is therefore not possible to infer from the above results that a decline in fertility in the Dominican Republic has taken place in recent decades.

In calculating the gross reproduction rate of 3.2 for 1950-1955, the pattern of fertility by age of mother was assumed to be the same as that shown by incomplete birth registration data.

El Salvador. The rates for El Salvador shown in table 5.1 are based on registration statistics considered to be complete.[27] An estimate of the number of births during 1940-1945, derived from the number of children enumerated at ages 5-9 in the 1950 census, does not suggest that there was any significant under-registration of births (see table 5.6).

The registered crude birth rate has remained relatively stable at a level in the middle 40's throughout most of the present century (table 5.3).[28] Only fragmentary rates have been located for the period before 1920, but such data as are available indicate that the crude birth rate was about 45 in 1905-1909. With some slight fluctuations, this level seems to have been maintained,

[23] It is believed that many of the registrations delayed for a number of years are, in fact, repeated registrations. Taking this view, demographers of the United Nations Economic Commission for Latin America have estimated the crude birth rate in the range of 44-48 during the period 1953-1957. *Economic Bulletin for Latin America*, vol. 6, October 1961, United Nations publication, Sales No.: 61.II.G.5. The assumption underlying this estimate is that the closest approximation to the true birth rate in a given year is obtained from births registered in and stated as having occurred in the given year, plus births registered in the following year which were stated to have occurred in the given year. The birth rate of 1960, estimated on this basis, amounts to 47.5.

[24] Gross reproduction rates for years after 1950 — the last census year — have been computed from official population estimates by sex and age, which were calculated according to methods recommended in the United Nations study, *Methods of estimating population, Manual III: Methods for Population Projections by Sex and Age*, Sales No.: 56.XIII.3. The estimates made according to this method are subject to age biases, the net effect of which may be to somewhat exaggerate the gross reproduction rate.

[25] United Nations, Economic Commission for Latin America, " Proyección de la población urbana y rural de Cuba ", April 1960 (processed), p. 16.

[26] *Ibid.*

[27] Results of the 1961 census of population showed that population estimates had been overstated for the 1950-1961 intercensal period. Rates shown for this period are based on United Nations population estimates, which are in accord with the 1961 census total.

[28] Prior to 1951, rates are based on births tabulated by year of registration rather than by year of occurrence.

Table 5.6. Tests of birth registration for selected Latin American countries

Country and years [a]	*Estimated births* [b]	*Registered births*	*Excess of estimated births over registered*	*Per cent of under-registration*
Middle America:				
Costa Rica				
1917-1922	92,948	90,387	2,561	2.8
1940-1945	141,840	147,756	− 5,916	—
El Salvador				
1922-1925	171,069 [c]	167,617	3,452	2.0
1940-1945	330,313	362,582	− 32,269	—
Puerto Rico				
1900-1905	42,571	28,895	13,676	32.1
1910-1915	54,198	41,638	12,560	23.2
1920-1925	59,962	51,495	8,467	14.1
1930-1935	64,636	62,791	1,845	2.9
1940-1945	74,657	77,580	− 2,923	—
Trinidad and Tobago				
1921-1926	60,442	62,342	− 1,900	—
1936-1941	78,719	75,560	3,159	4.0
South America:				
British Guiana [d]				
1901-1910 [e]	8,974	9,331	− 357	—
1911-1920	8,524	8,858	− 334	—
1921-1930	9,736	9,447	289	3.0
Chile				
1911-1915	789,704	682,513	107,191	13.6
1921-1925	825,636	841,186 [f]	− 15,550	—
1931-1935	900,468	905,494 [f]	− 5,026	—
1942-1947	995,913	995,464 [f]	449	0.04
Venezuela				
1932-1936	643,779	465,267	178,512	27.7
1941-1945	822,479	720,611	101,868	12.4

[a] Data relate to five-year periods for all countries except British Guiana (10 years) and El Salvador 1922-1925 (3 years). In cases where the census was taken at a date other than end of year, vital statistics covering four full calendar years plus portions of two other calendar years were involved.

[b] Unless otherwise specified, enumerated population 5-9 years of age at the census plus registered deaths attributable to cohort.

[c] Enumerated population 5-7 years of age at 1930 census plus registered deaths attributable to cohort.

[d] Data from George W. Roberts, " Some Observations on the Population of British Guiana ", *Population Studies* (London), vol. 2, September 1948, p. 193.

[e] Includes returns for aborigines.

[f] Figures officially corrected for under-registration.

at least until recently. The apparent slight rise in the crude birth rate, and a somewhat greater rise in the gross reproduction rate, may be due to improved registration, although the tests of registration carried out for two earlier periods did not suggest any significant omissions.[29] On the basis of these tests, registration appeared to be about 98 per cent complete as early as 1922-1925 (table 5.6). These tests, of course, are themselves subject to errors and are far from conclusive. For one thing, the assumption is made that death registration is complete. To the extent that it is not, the degree of under-registration of births will be understated.

Preliminary age data from the 1961 census, adjusted to a United Nations estimate of total population at mid-year 1961, were used in calculating the gross reproduction rate of 3.3 shown for that year.

Guadeloupe. Birth registration is reported to have become complete in recent years. Data on registered births exist only for the period following the Second World War, and there is no indication of any significant change in the level of the crude birth rate during this period (table 5.3). A slight increase during the early years might easily be attributable to improved registration.

[29] There is also the possibility of more repeated registrations such as are believed to have occurred in Costa Rica.

Guatemala. The fertility measures in table 5.1, based on registration statistics which are believed to be nearly accurate, show that Guatemala has one of the highest fertility levels in the region. An outstanding feature of the Guatemalan population is its ethnic composition, more than half the population being of Indian descent.

Although a long historical series of crude birth rates is available, it is difficult to draw any conclusions about the trend of fertility. At present, registration is considered to be complete, but the quality of the birth data for earlier years is not known, and the population estimates have been inaccurate.[30] Table 5.3 shows a fall in the crude birth rate from the high level of 62.6 in the early 1920's to a level around 50 in recent years.

Owing to the unavailability of satisfactory data on age distribution of the population before 1950, refined fertility rates can be computed only for recent years. Although the crude birth rate has dropped a little since 1950, the gross reproduction rate has risen slightly.[31]

Haiti. No very reliable data exist for estimating fertility measures for Haiti. There are no systematic compilations of vital statistics covering the whole country, and there are indications of considerable inaccuracies in census age reporting. The estimates presented in table 5.1 for the period 1935-1940 have been made by " reverse-survival " on the basis of the number of children aged 10-14 enumerated in the 1950 census. The gross reproduction rate of 2.8 was calculated on the assumption that the pattern of fertility by age of mother is like that of Jamaica. These estimates must be considered as rough approximations only. It appears that children aged 5-9 years, as well as those under 5, were under-enumerated in the Haitian census; " reverse-survival " applied to the 10-14 age group is believed to yield a better estimate of the birth rate. Little is known about mortality in the country, and the assumptions in this respect used in deriving the fertility estimates may be considerably in error.

A Haitian statistician has estimated the crude birth rate at 45.6 on the basis of adjusted 1950 census data which added 9 per cent to the census count, a substantial part of the addition being in the age group under 5.[32] This estimate of the birth rate is not very different from the figure shown in table 5.1.

It has been estimated that only about 20 per cent of births occur in legal marriages. This figure indicates the prevalence of informal unions perhaps of the kind found in some other Caribbean islands.

Honduras. The estimated crude birth rate of 54 for 1951-1956 and the gross reproduction rate of 3.6 cited in table 5.1 were estimated by " reverse-survival " from the number of children in the age group 5-9 years shown in a sample tabulation of 1961 census data. In estimating the gross reproduction rate, the incomplete birth registration statistics were used to determine the age pattern of fertility rates.

Considerably lower fertility estimates were obtained by " reverse-survival " of 1950 census age data. A crude birth rate of 43 and a gross reproduction rate of 2.9 were estimated for 1940-1945. Tests of age accuracy applied to both the 1950 and 1961 census data suggest that the data are fairly reliable. It is nevertheless possible that there was some over-enumeration of the 5-9 age group in 1961, or some under-enumeration of this group in 1950.

The trend of the registered crude birth rate since 1940 has been as follows:

1940-1944	36.7	1955-1959	44.6
1945-1949	38.6	1960	44.7
1950-1954	42.6	1961	45.3

A test of birth registration in 1956 indicated about 86 per cent completeness. If the same degree of completeness of registration characterized the early 1950's, this would mean that the birth rate was about 50 at that time.

The rise in the registered birth rate between the early 1940's and the early 1950's might be due to improved registration, or if the " reverse-survival " estimates are at all representative of the trend, there may have been an appreciable rise in the fertility level.

Another indicator of high fertility in Honduras is the average annual rate of population growth, which amounted to 3.2 per cent during 1950-1961.

Jamaica. Birth registration in Jamaica has been complete or nearly complete for many years.[33] Effective civil registration of births began in the 1870's and had probably reached a reasonable degree of completeness before the end of the century.[34]

The crude birth rate of 42.7 shown in table 5.1 for 1960 was obtained by relating the number of registered births to the official estimate of mid-year population, which is in accord with the results of the census taken in April 1960. In calculating the gross reproduction rate of 2.7 for 1960, the pattern of fertility by age of mother was assumed to be the same as in 1956, the last year for which statistics on births by age of mother were available.

Official population estimates for the intercensal period 1943-1960 were shown to be too high in the light of the 1960 census enumeration. Revised population figures for each of the intercensal years have not yet been issued by the Government, and the series of

[30] Estimates for years between 1920 and 1950 were arrived at by subtracting from the 1950 census totals the sum of natural increase and the migration balance.

[31] The rates for years after 1950 are based on estimated age distributions obtained by bringing forward the cohorts enumerated at the 1950 census.

[32] Unpublished study prepared by Jacques Saint-Surin at the Latin American Demographic Centre, Santiago, Chile. Another, somewhat lower, estimate of the birth rate (42.5), also based on adjusted 1950 age data, was published in *Bulletin Trimestriel de Statistique* (Haiti), No. 21, June 1956.

[33] Birth rates shown in the present report are based on data tabulated by year of registration. For the period 1947-1952 an alternative series of rates based on tabulations of births by year of occurrence is also available and has been published in some other sources, such as the United Nations *Demographic Yearbook.*

[34] George W. Roberts, *The Population of Jamaica,* op. cit., pp. 261, 269-270.

crude birth rates shown for Jamaica in table 5.3 have been computed on population estimates prepared by the United Nations to accord with the 1960 census results. The estimated gross reproduction rates shown for this intercensal period in table 5.4 were calculated from the number of registered births tabulated by age of mother, and official population estimates by age which were adjusted to the United Nations estimates of total population. For the years prior to 1946, for which tabulations of births by age of mother were lacking, the age pattern of birth rates was assumed to be the same as in 1946-1948.

Crude birth rates for the years before 1916 have been calculated from birth statistics for calendar years and interpolations of published mean population estimates for twelve-month periods from 1 April to 31 March.[35]

Martinique. Birth registration statistics for Martinique, as for Guadeloupe, date only from 1946 and are said to be complete only for the most recent years. A rise of the registered crude birth rate from 35 per 1,000 during 1946-1949 to a level near 40 during the 1950's might have been due to improved registration.

Mexico. With its population of 34.6 million in 1960, Mexico is by far the most populous country in the Middle American region, and its fertility level dominates the average for the region as a whole. Birth registration is considered to be satisfactory at present.[36] The high fertility rates for 1960 shown in table 5.1 are derived from the registration data without adjustment. Rates are based on birth statistics tabulated by year of registration.

Registration statistics for the years before 1930 are believed to have been seriously understated. The trend of the registered crude birth rate presented in table 5.3 shows fluctuations from 1900 to 1929 around a level in the low 30's, then an abrupt rise to a level in the mid-40's, and continuation more or less at the latter level until the present. The increase after 1929 can almost certainly be ascribed to an improvement in registration which has been attributed to a campaign undertaken by the Department of Statistics. The true level of the crude birth rate during the period 1900-1930 is estimated by one statistician to have been in the low 40's.[37] " Reverse-survival " estimates for 1920-1925 shown in table 5.5 place the level of the crude birth rate in the upper 40's.

Gross reproduction rates, unlike the crude birth rates, suggest a considerable rise in fertility since the early 1930's (table 5.4). Each successive census during this period has shown a decline in the proportion of females in the child-bearing ages; from 51.8 per cent in 1930, this proportion fell to 45.6 per cent by 1960.

It seems doubtful that birth registration during the early 1930's was as nearly complete as it has been in recent years; thus improved registration may account for some of the apparent increase of fertility. As a check on the trend of fertility shown by registered births, birth rates have been estimated by the method of " reverse-survival " from census data. These estimates (table 5.5) show a slight decline between the early 1920's and the early 1940's, followed by a slight rise in the early 1950's. However, the variations are too slight to permit an inference as to trend. Thus, while there is a possibility of some real increase in Mexican fertility having occurred in recent decades, it is by no means certain.

The gross reproduction rate of 3.1 shown for 1960 was calculated from registered births and population age data derived from the 1960 census. For intercensal years, population estimates by age prepared by the United Nations were used in calculating the gross reproduction rates shown in table 5.4. Statistics of confinements, though not of all live births, were tabulated by age of mother for most recent years. In calculating the gross reproduction rates, these distributions were pro-rated to the total number of live births. For years prior to 1952, data on confinements or live births by age of mother were not regularly available; in computing gross reproduction rates for these years, the pattern of fertility by age of mother was assumed to be the same as that for some other period for which the needed tabulations were available.

Nicaragua. The registered crude birth rate in 1960 was 43 per 1,000 population, but birth registration is not complete. The crude birth rate of 49 and the gross reproduction rate of 3.1 for 1940-1945 shown in table 5.1 were obtained by " reverse-survival " from the census age data for 1950, judged to be fairly reliable. In 1940-1944 the registered crude birth rate averaged 38.8. If the " reverse-survival " estimate of the birth rate for this period is nearly correct, registration must have been only about 80 per cent complete. There is no way of knowing whether the rise in the registered birth rate since that time has been due only to improving registration, or whether the level of fertility may also have risen.

Panama. Birth registration has only recently become complete in Panama. The crude birth rate, computed from registration data, was 41.0 in 1960, and the gross reproduction rate 2.7, as shown in table 5.1. The country has a sizeable tribal Indian population, not all of which is included in the statistics from which vital rates are computed.[38] Data for the Canal Zone are not included in the statistics for Panama.

Between 1920 and 1955 the registered crude birth rate fluctuated between 36 and 38 per 1,000 in each

[35] Jamaica, *Annual Report of the Registrar General's Department for the Year Ended 31st December 1945*, Kingston, 1947.

[36] Gilberto Loyo, *Esquema Demográfico de México* (México, Secretaría de Economía, Dirección General de Estadística, Mexico City, 1948), p. 25. However, late registration of births continues to be a problem in Mexico as in some other Latin American countries. For example, of the total number of births registered in 1950, only 57 per cent were registered before the child reached one month of age, and an additional 36 per cent before one year of age had been reached. Nearly 4 per cent of the total births registered in that year were for persons aged 10 years and over.

[37] J. Durán Ochoa, *Población*, Mexico City, Fondo de Cultura Económica, 1955.

[38] Data for years prior to 1952 exclude all Indian tribal population. In 1952 and later years tribal Indian population in the provinces of Bocas del Toro and Darién are included.

quinquennium (table 5.3).[39] It has risen to about 40 since 1955, as birth registration has become complete. Around 1950, birth registration was estimated to be about 90 per cent complete, on the basis of tests carried out in connexion with the census.[40] If this percentage of completeness was applicable to the 1950-1954 quinquennium, when the registered birth rate averaged 36, the actual birth rate would have been 40.

Stability of the birth rate is also suggested by the results of applying the method of "reverse-survival" to the numbers of children 5-9 years of age enumerated at the 1940, 1950 and 1960 censuses. The crude birth rates calculated on this basis were 40 for 1930-1935, 42 for 1940-1945, and 41 for 1950-1955. These rates imply that birth registration was close to 90 per cent complete during these periods. This estimate does not differ much from the official estimate that birth registration was 86 per cent complete in 1940.

Birth statistics by age of mother were not tabulated prior to 1943. The estimated gross reproduction rate shown for 1941-1945 in table 5.4 was obtained by assuming that the pattern of fertility by age of mother was the same as in 1943.

Puerto Rico. One of the most industrialized of the Caribbean islands, Puerto Rico also has the lowest crude birth rate at present. The rate of 32.3 shown in table 5.1 for 1960 is based on registration data believed to be nearly complete.[41] Owing to large-scale emigration in the past decade, the population has relatively few persons in the most fertile age groups. Thus, when refined rates are considered, the fertility levels appear somewhat higher. Foe example, the gross reproduction rate was 2.3 in 1960.

Before 1932, birth registration in Puerto Rico was unreliable. Registered birth rates for the past three decades are shown in table 5.3.[42] The high rate of 42 recorded in 1947 no doubt reflects a post-war boom in marriages. Beginning in 1950, the registered rate declined steadily, reaching 32.3 by 1960, a decline of 17 per cent from the 1950 level. Provisional figures for 1961 and 1962 show a further small decline. Changes in the sex-age composition of the population, with emigration of large numbers of women in the most fertile age groups, have caused the crude birth rate to exaggerate the fertility decline since 1950. The gross reproduction rate shows only about a 9 per cent decline from 1950 to 1960 (table 5.4).

During the first half of the century there was an upward trend in the proportion of married women in the population, but this trend seems to have been reversed during the recent decade.[43] It has been estimated that over the period from 1899 to 1940 a decline of 20-25 per cent may have taken place in marital fertility, but that this was balanced by an increased proportion of married women.[44]

Tabulations of births by age of mother are not available for Puerto Rico before 1943, and in calculating the gross reproduction rates for earlier years shown in table 5.4 it was assumed that the age pattern of fertility was like that of 1943.

Puerto Rico is one of the few areas in the Latin American region where couples who wished to limit the size of their families could be aided in doing so by Government and private family-planning services.[45] As early as 1935, a contraceptive programme was included in the scope of government social services, and in 1937, legislation was enacted which empowered the Commissioner of Health to establish contraceptive clinics in public health units and hospitals. Among the reasons for which contraceptive instructions could be given, "economic poverty and bad social conditions" were included initially, but this provision was later rescinded, and reasons of health alone were considered to meet the requirements of the law. The Government's role with respect to operation of the clinics has been primarily the passive one of dispensing birth control information to those who seek it; relatively little has been done to attract patients to the clinics.[46] In addition to contraception, voluntary sterilization has been practised to a considerable extent, although statistics on the subject are scanty.[47]

Trinidad and Tobago. Birth registration in Trinidad and Tobago is complete, and the fertility measures given in table 5.1 are based on registered births and mid-year

[39] Rates for years prior to 1943 are based on birth statistics tabulated by year of registration; for 1943 and later years rates are based on birth data tabulated by year of occurrence.

[40] Carmen A. Miró, "Principales características demográficas de la República de Panamá", *Bulletin de l'Institut International de Statistique* (Rio de Janeiro), vol. 35, part 3, 1957, pp. 421-435.

[41] Birth recording was centralized in 1931, and after that date a marked improvement was noted. In 1943, Puerto Rico was admitted to the birth registration area of the United States. By 1950, according to tests of the accuracy of the birth statistics, registration was found to be 96 per cent complete. According to an estimate based on the number of infants enumerated in the 1960 census, with allowance for deaths and emigration, birth registration at that time was 96.3 per cent complete. This assumes no under-registration of infants in the census, though it is known that infants are under-reported in most censuses. Hence, under-registration may have been greater than this test suggests. José L. Vázquez, op. cit.

[42] For the 1950-1960 decade, the rates have been revised to be in accord with a new series of population estimates prepared by the Government after the 1960 census results became available.

[43] In particular, there was a significant decline in the proportion of young women married with spouse present, owing to the emigration of large numbers of males to the mainland. Vázquez, op. cit., concluded that when changes in marital status are taken into account, the decline in fertility during the recent decade was no more rapid than that which occurred during the earlier years of the century.

[44] Christopher Tietze, "Human Fertility in Puerto Rico", op. cit.

[45] The summary given here is taken mainly from: Christopher Tietze, "Human Fertility in Puerto Rico", op. cit. The author acknowledges his indebtedness to an unpublished manuscript by Mrs. Carmen Rivera de Alvarado.

[46] J. Mayone Stycos, *Family and Fertility in Puerto Rico.* Columbia University Press, 1955.

[47] A survey conducted in 1947 showed that 8.5 per cent of women married between 1920 and 1947 had been sterilized. *See* Paul K. Hatt, *Backgrounds of Human Fertility in Puerto Rico; A Sociological Survey.* Princeton University Press, 1952. It is reported that during 1944-1946 in a group of seven hospitals about 1,200 sterilizations were performed annually. Christopher Tietze, "Human Fertility in Puerto Rico", op. cit.

population estimates which are in accord with the 1960 census results.

The trend of fertility in Trinidad and Tobago can be traced over a long period, owing to the existence of reliable vital statistics and a series of population censuses providing data on age structure and other characteristics of the population.[48] There is no indication that substantial numbers of births escaped registration even during the early decades of the century (see table 5.6).

Official population estimates prepared just before the 1960 census results became available were shown not to be fully in accord with the census count, but since the magnitude of error was small, no revision has been made in the pre-1960 estimates on this account. For example, the 1960 crude birth rate computed on an unrevised population base, built up from the preceding census, is 38.9, compared with 39.5 when computed on a population base in accord with 1960 census results.

The gross reproduction rates and other refined measures show a trend similar to that of the crude birth rate up to 1945-1949. Since that date, the refined indices show a continuing rise of fertility which is not perceptible in the crude birth rate, owing to changes in the age structure of the population. Fertility measured by the gross reproduction rate was about one-third higher in 1960 than at the beginning of the century. In calculating the gross reproduction rates for early years, the age pattern of fertility was assumed to be the same as that of 1954, the first year for which tabulations of births by age of mother are available.

Although vital statistics reports by ethnic group are not entirely satisfactory,[49] they bring out the different fertility of the East Indians, on the one hand, and the remainder of the population, which consists mainly of persons of African descent. During post-war years, the crude birth rate for East Indians has typically been in the high 40's, while that of the rest of the population was only in the middle 30's. These differences are even more pronounced if the structure of the two population groups is taken into account, since the East Indian population has a larger proportion of children and a smaller proportion of women of child-bearing age.

Not much of the recent rise in fertility seems to be attributable to the rising proportion of East Indians in the population. Between 1931 and 1946, for example, the proportion of East Indian women among all women aged 15-49 years increased from 29 to 31 per cent. Despite the much higher fertility of the Indian group, it is estimated that only about 3 per cent of the 1931-1946 increase in the general fertility rate was accounted for by the increased proportion of East Indians in the total.

2. *South America*

Argentina. The 1961 fertility measures given in table 5.1 are based on birth registration statistics and official population estimates. Birth registration is considered to have been about 97 per cent complete in recent years, and a fairly satisfactory level of completeness seems to have been maintained for some time. Age data from the 1960 census had not yet become available at the time of preparation of this report, and in computing refined fertility measures such as the gross reproduction rate, official estimates of population by age groups, brought forward from the 1947 census, were used as a base.

Bolivia. Birth registration is defective in Bolivia and is apparently subject to considerable delays. Rates computed from registered births give no indication of the fertility level. The estimated crude birth rate of 43 for 1940-1945 is based on " reverse-survival " of children 5-9 years old enumerated in the 1950 census. Using a somewhat higher mortality assumption than the one adopted for the present study, demographers at the United Nations Latin American Demographic Centre estimated the birth rate at 45 by the " reverse-survival " method. Based on the method of stable population analysis, a Bolivian demographer obtained an estimate of 43 for the birth rate.[50]

In calculating the gross reproduction rate of 2.9 shown in table 5.1 the pattern of fertility by age of mother was assumed to be the same as that shown by incomplete registration data.

Brazil. The largest country in the Latin American region, with a population of about 73 million in 1961, Brazil has no adequate vital statistics system. On the other hand, the 1940 and 1950 censuses of population have furnished a variety of data from which fairly reliable estimates of the fertility level can be derived. The estimates for 1940-1945 shown in table 5.1 were obtained by " reverse-survival " from the number of children 5-9 years of age reported in the 1950 census. Age data from the 1960 census of population were not yet available at the time of preparation of this report. According to another estimate, based on 1950 census data on numbers of children ever born to women, the crude birth rate was in the range of 43-44 per 1,000 population;[51] this is in close accord with the " reverse-survival " estimates. Also in close agreement is the result of another study of the 1940 and 1950 census data complemented by information from other sources, which yielded an estimate of 43 per 1,000 for the birth

[48] Prior to 1954, rates are based on birth data tabulated by year of registration; for 1954 and later years the data have been tabulated by year of occurrence.

[49] The classification of persons as " East Indian " is made on the basis of name, so that births to Indians with non-Indian names are very likely allocated to the non-East Indian group. Despite any such errors in classification which would tend to over-state the birth rate of non-East Indians, the data show a markedly higher birth rate among the East Indians. R. R. Kuczynski, *Demographic Survey of the British Colonial Empire.* Vol. III, *West Indian and American Territories.* London, Oxford University Press, 1953.

[50] Benjamín Franco, *Estimación de Tasas de Natalidad, de Crecimiento y de Mortalidad en la República de Bolivia, alrededor de 1950.* Study prepared at the United Nations Latin American Demographic Centre, Santiago, Chile, 1962 (processed).

[51] Giorgio Mortara, " Quelques données sur la fécondité de la femme au Brésil ", *International Population Conference, Vienna 1959,* International Union for the Scientific Study of Population (Vienna, 1959), pp. 287-296.

rate.[52] Birth rates for all but three of the twenty-six political units of the country were estimated in this study to lie in the range of 44-48. The lowest rate, 25, was found for the almost completely urbanized Federal District, where marriage is later and there is a higher proportion of single women. Some measure of family limitation is probably also practised in the Federal District, mainly by contraception among the well-to-do and by induced abortion among the poorer classes.[53]

The States of Rio Grande do Sul, on the southern border adjacent to Uruguay, and Sao Paulo, also in the south, have estimated birth rates of about 38 — below the national average. Sao Paulo is noteworthy for its spectacular economic development in recent years. As compared with other areas of the country, the southern region as a whole is more advanced industrially, and its population has achieved a higher educational level.

The Brazilian population is an ethnically diverse one, but fertility differences among the various ethnic groups do not appear very great. For the intercensal period 1940-1950, general fertility rates have been estimated at 196 for mulattos, 171 for whites and 167 for Negro women.[54] The comparatively low rate for Negro women is believed to be due partly to some restriction of their opportunities for marriage and to high mortality among the Negroes, which causes a comparatively high incidence of widowhood.

Very high fertility within marriage and relatively high fertility of women not legally married are factors which combine to produce the high birth rate in Brazil.[55] A large percentage of women classified as " single " in the census live in consensual unions.

It is stated that the fall of birth and death rates which has been typical of most Western countries has only begun in Brazil. Estimates for the past 100 years placed the birth rate at 47-48 per 1,000 for the second half of the nineteenth century and at 44-45 during the first half of the present century.[56]

Crude birth rates computed by the method of " reverse-survival " from 1940 and 1950 census data (table 5.5) give no indication of any significant recent change in fertility; the difference between the rates estimated from the data of the two censuses is too small to be significant in view of the possibilities of error in such estimates.

In calculating the gross reproduction rate of 3.0 for Brazil for 1940-1945, the pattern of fertility by age of mother was taken from estimates prepared by Giorgio Mortara.[57]

[52] Alceu Vicente W. de Carvalho, *A População Brasileira* (Rio de Janeiro, Concelho Nacional de Estatística, I. B. G. E., 1960), pp. 15-54.

[53] *Culture and Human Fertility*, Frank Lorimer, *et al.*, *ed.* (Paris, UNESCO, 1954), p. 499.

[54] Alceu Vicente W. de Carvalho, op. cit., p. 24.

[55] Giorgio Mortara, " Quelques données sur la fécondité . . .", op. cit., pp. 291-293.

[56] Giorgio Mortara, " The Development and Structure of Brazil's Population ", *Population Studies* (London), vol. 8, November 1954, pp. 121-139.

[57] *Ibid.*, p. 130.

British Guiana. British Guiana is one of the few high-fertility countries of South America which has relatively good vital statistics. The crude birth rate of 42.9 for 1960 shown in table 5.1 is based on the provisional number of registered births and an official estimate of mid-year population in accord with the 1960 census count. Tabulations of births by age of mother are not available for recent years, and in calculating the gross reproduction rate of 3.0 for 1960 it was assumed that the age pattern of fertility was the same as that existing before 1957. The age distribution from the 1960 census pro-rated to the official mid-year population estimate was used in computing refined fertility measures for 1960.

The birth rates are based on year of registration rather than year of occurrence. The treatment of the Amerindian population is a source of some confusion in calculating the vital rates. Since 1946 all Amerindians have been excluded both from the birth statistics and from the population base used for calculating birth rates. Previously, Amerindians living in settled areas were included, while those living in remote areas were excluded, in calculating vital rates. This change in procedure cannot account for any of the rise in the birth rate, since Amerindians are a numerically small group, constituting about 4.5 per cent of total population in 1946. Moreover, their birth rate in 1957 was estimated at 47.6 as compared with 44.5 for the rest of the population.

Birth registration in British Guiana appears to have been fairly satisfactory since the beginning of the present century (see table 5.6). It is doubtful that much of the post-war increase in the recorded birth rate was due to improved registration.

Although it did not show up in the crude birth rate until after the Second World War, fertility as measured by more refined rates appears to have been climbing upward in British Guiana since early in the century (table 5.4). By 1960, the gross reproduction rate was about 75 per cent higher than it had been a half century earlier, whereas the crude birth rate rose only about 40 per cent during the same period. Women of childbearing age have constituted a sharply declining proportion of total population during recent decades.

East Indians, who have substantially higher fertility than the population of African descent, made up about 48 per cent of the total population at the 1960 census. Their birth rate has been near 50 during recent years. The East Indians are more rural and more dependent on agriculture than the Negro or " Mixed " ethnic groups, which constitute the bulk of the remainder of the population.[58] It has been demonstrated, however, that the higher fertility of the East Indians is not merely a consequence of their predominantly rural residence, since within rural areas, child-woman ratios for East Indians are substantially higher than those for the Negro-Mixed groups. There is also evidence of higher

[58] At the 1946 census 39 per cent of the population was classified as " Negro " and 10 per cent as " Mixed ", the latter being basically of Negro strain.

fertility among East Indians than among other racial groups in urban areas.[59]

The upward trend of fertility since 1940 has occurred in both major ethnic groups. Earlier in the century the birth rate trends for the East Indians and the Negro-Mixed group were rather diverse. Their birth rate levels were about the same during 1910-1920, but the East Indian birth rate rose thereafter, while the Negro-Mixed fertility trend was slightly downward until 1938. The recent rise has been equally great for both groups; the East Indian rate increased from 46.4 in 1945-1949 to 48.8 in 1950-1954, while the rate for the rest of the population rose from 34.9 to 37.5 during this period.

Chile. The crude birth rate of 35.5 shown in table 5.1 is based on provisional registration data for 1960 to which an adjustment has been made for under-registration. The corresponding gross reproduction rate is 2.2, calculated on official population estimates by age which have not yet been revised to accord with 1960 census age tabulations.

Chile has a long series of satisfactory statistics which substantiate a significant fall in fertility during the first half of the twentieth century. Birth registration data for the period 1917-1954 have been officially corrected for under-registration.[60] Additional tests of Chilean birth statistics carried out for the present study confirm the accuracy of the officially revised series (see table 5.6).[61] For the period 1910-1917, unofficial revised figures have been calculated on the assumption that birth registration was about 85 per cent complete.[62]

Tabulations of births by age of mother, first available in 1930, have been pro-rated to the corrected birth totals for purposes of calculating the gross reproduction rates shown in table 5.4. In computing such rates for years prior to 1930, it was assumed that the age pattern of fertility was the same as that of 1930-1932.

Colombia. The crude birth rate of 44 shown for Colombia, 1941-1946, in table 5.1 was estimated by " reverse-survival " from 1951 census data. Official birth statistics for this country refer to baptisms recorded in church registers. These statistics are reported to be incomplete; they show a crude birth rate of 42.4 per 1,000 for 1960, slightly lower than the " reverse-survival " estimate for 1941-1946. Other estimates have placed the birth rate in the range of 46-49 for the period 1938 to 1951.[63]

The age structure of the population changed little between the 1938 and 1951 censuses, thus suggesting that there was no drastic change in the level of fertility. " Reverse-survival " of the 5-9 age group as enumerated in the 1938 census resulted in an estimated crude birth rate of 46 for the period 1928-1933.

In calculating the gross reproduction rate, the pattern of fertility by age of mother was assumed to be the same as that of the official birth statistics.

Ecuador. The estimated fertility rates for Ecuador shown in table 5.1 referring to the period 1940-1945 were derived from 1950 census data by the " reverse-survival " method. The level of fertility indicated by these estimates agrees approximately with the level of the registered crude birth rate, which averaged 46.2 for 1940-1944. Although birth registration in Ecuador is officially reported to be incomplete, various tests have indicated that the number of omissions is not great.[64] In fact, it seems probable that registration has been fairly satisfactory for a number of decades. For 1959 the registered birth rate was 45.8, and since 1920 it has averaged between 46 and 51. Birth rates appear to be higher in the coastal provinces of Ecuador than in the Sierra provinces.

In calculating the gross reproduction rate of 3.2 for 1940-1945, the pattern of fertility by age of mother was assumed to be the same as that shown in birth registration data.

Paraguay. Birth registration is reported to be incomplete. Estimates derived from registration data in municipalities believed to have complete registration show a birth rate of 46.6 in 1950. The crude birth rate of 43 for 1940-1945 and the gross reproduction rate of 2.9 shown in table 5.1 were made by " reverse-survival " from 1950 census data, considered to be of fairly satisfactory quality. The pattern of fertility by age of mother shown in the registration data was used in computing the gross reproduction rate.

Peru. Birth registration is incomplete, and age data from the 1961 census had not yet become available at the time the present report was prepared. From 1940 census age data it was estimated, by the " reverse-survival " method, that the crude birth rate was about 46 in the period 1930-1935, as shown in table 5.1. This places the Peruvian fertility level, unless it has changed during the last 30 years, about on a par with that of the other countries of tropical South America. The gross reproduction rate of 3.1 was calculated on the assumption that the pattern of fertility by age of mother was like that shown by the incomplete registration data.

Surinam. Birth registration in recent years is considered to have been complete, and in 1961 the registered

[59] George W. Roberts, " Some Observations on the Population of British Guiana ", op. cit.

[60] On the methods used in correcting the data, see O. Cabello *et al.*, *Tablas de Vida Para Chile*, Santiago, 1953; Servicio Nacional de Estadística y Censos, *Informe del primer seminario nacional sobre calculos de población*, Santiago, 1954.

[61] Findings of other studies, however, have indicated a somewhat greater amount of under-registration. For example, gross reproduction rates of 2.35 for 1939-1941, 2.24 for 1949-1951, and 2.4. for 1960 have been estimated by Johannes L. Sadie in " Población y mano de obra en Chile, 1930-1975 ", United Nations Latin American Demographic Centre, Santiago, Chile, 1962 (processed).

[62] This is the degree of completeness estimated for 1911-1915 by " reverse-survival " from the number of children aged 5-9 enumerated at the 1920 census.

[63] Jean Bourgeois-Pichat, " Utilisation de la notion de population stable pour mesurer la mortalité et la fécondité des populations des pays sous-développés ", *Bulletin de l'Institut International de Statistique*, vol. 36, part 2, Actes de la 30e session de l'Institut International de Statistique (Stockholm, 1958); United Nations Economic Commission for Latin America, *Proyección de la Población Urbana, Población Rural y Fuerza Trabajadora de Colombia* (processed).

[64] For example, in studies carried out by the United Nations Economic Commission for Latin America, it was found that provincial birth rates estimated from census age data by " reverse-survival " for the most part confirmed the registered birth rates.

crude birth rate was 44.5, as shown in table 5.1. No population census has been taken since 1950, and the accuracy of the current population estimates which serve as a base for computing the crude birth rates is not known. Table 5.3 shows a rising trend in the birth rate during the period since 1945, when registration data first became available. This may reflect no more than improvements of registration, however, since birth registration was reported to be incomplete, as late as 1958.

No recent estimates of the age distribution of the population, which would permit the calculation of refined fertility measures, are available.

Uruguay. Uruguay is in the peculiar position of having fairly complete birth registration, but lacking reliable population estimates for calculating the birth rate. Birth registration was estimated to be 90-95 per cent complete during the decade of the 1950's, but the last census was taken in 1908. The estimated crude birth rate of 22 and gross reproduction rate of 1.3 shown in table 5.1 are based on statistics of registered births, adjusted to refer to the year of occurrence and including a small allowance for under-registration, and population estimates derived from a national register of population carried out in September 1957.[65] The sex-age distribution of the population was obtained from a sample of persons enumerated in the register.

Venezuela. Birth registration appears to have been fairly satisfactory in recent years in Venezuela, but the official birth rates computed from registration data are in error because of an underestimation of the population. The provisional crude birth rate reported for 1960 was 49.6. This rate is overstated, since official annual population estimates for the 1950-1961 intercensal interval were too low by a considerable margin. Unofficial estimates prepared by the United Nations Latin American Demographic Centre (Santiago) place the crude birth rate in 1960 at 45.1. This rate and the corresponding gross reproduction rate of 3.1 are used to represent the level of Venezuelan fertility in table 5.1. In calculating the gross reproduction rate, the population base was obtained by pro-rating the age distribution at the 1961 census to the unofficial estimate of mid-year population. The age pattern of fertility was assumed to be the same as in 1958, the latest year for which data on births by age of mother were available.

Table 5.3 shows a rising trend in the registered crude birth rate in Venezuela from the early years of the present century until 1950, after which time the rates have levelled off. The suggestion of increasing fertility prior to 1950 is probably more apparent than real, since birth registration was also improving during the period. Various tests carried out for the present study indicate a progressive improvement in the degree of completeness of birth registration (see table 5.6). As late as 1940-1944 registration may have been only about 88 per cent complete, according to these findings. Birth rates calculated from age data of several population censuses by the method of " reverse-survival " do not substantiate the rising trend shown by the registered rates (see table 5.5).

Gross reproduction rates shown for years prior to 1949 in table 5.4 were calculated on the assumption that the pattern of fertility by age of mother was the same as in 1949-1952.

[65] Alberto Cataldi Durante, *Estudio Económico del Uruguay — Análisis demográfico*, Serie B, Estudios Sectoriales, CIDE, Montevideo, August, 1963.

Chapter VI

LEVELS AND TRENDS OF FERTILITY IN EUROPE, NORTHERN AMERICA, OCEANIA AND THE SOVIET UNION

Europe, Northern America, Oceania, and the Soviet Union are grouped together for the purpose of the present survey as regions of generally low fertility and a relatively high degree of industrialization. Oceania, it is true, is not homogeneous in this respect, as the areas of Oceania outside Australia and New Zealand are little industrialized and, with some exceptions, have high fertility. However, as Australia and New Zealand account for three fourths of Oceania's population, the region as a whole is included in the category of low-fertility, industrially-advanced regions.

Within certain European countries and in parts of Northern America, there are some areas relatively little advanced industrially and with comparatively high levels of fertility, but Europe and Northern America on the whole are highly industrialized regions marked by low fertility. Albania is distinct among European countries for its very high birth rate. On the other hand, as noted in previous chapters, a few countries in other regions, such as Argentina, Israel, Japan, and Uruguay, have low fertility and are to a considerable extent industrialized.

Table 6.1. Fertility levels in Europe, Northern America, Oceania and the Union of Soviet Socialist Republics

Region and country	*Year*	*Crude birth rate (births per 1,000 population)*	*Gross reproduction rate*
Northern and Western Europe:			
Belgium	1960	16.9	1.2
Denmark [a]	1960	16.6	1.2
Finland	1960	18.5	1.3
France	1960	17.9	1.3
Ireland	1959	21.1	1.8
Luxembourg	1960	16.0	1.1
Netherlands	1960	20.8	1.5
Norway	1960	17.3	1.4
Sweden	1960	13.7	1.1
United Kingdom:			
England and Wales	1960	17.2	1.3
Nothern Ireland	1960 †	22.5	1.7 [b]
Scotland	1960 †	19.6	1.4
Central Europe:			
Austria	1960	17.8	*1.3*
Czechoslovakia	1960	15.9	1.2
Germany:			
Eastern Germany, including East Berlin	1960	17.0	1.2
Federal Republic of Germany	1960	17.8	1.2
West Berlin	1960	9.8	0.7
Hungary	1960	14.7	1.0
Poland	1960	22.3 [c]	1.4
Switzerland	1960	17.6	1.1
Southern Europe:			
Albania	1960	43.4	*3.4*
Bulgaria	1960	17.8	1.1
Greece	1951-1956	19.6	1.2 [d]
Italy	1960	18.3	1.2
Malta and Gozo	1960	26.1	1.8
Portugal	1960	24.2	1.6
Romania	1960	19.1	1.1
Spain	1960	21.9	1.4
Yugoslavia	1960	23.5	*1.4*
Northern America:			
Canada	1960	26.7	1.9 [e]
United States	1960	23.7	1.8
Oceania			
Australia [f]	1960 †	22.4	1.7
Fiji Islands	1946-1951	49.0	3.5 [g]
New Zealand [h]	1960 †	25.1	2.0
Union of Soviet Socialist Republics:			
USSR	1960	24.9	1.4

† Births tabulated by year of registration rather than occurrence.

Note: Basis for rates is "complete" birth registration statistics except for Greece and the Fiji Islands. For these countries, rates are "reverse-survival" estimates based on relatively satisfactory data on population by age groups. Official population estimates were used in calculating all rates except those in italics, which are based on population estimates prepared by the United Nations.

[a] Excluding Faeroe Islands and Greenland.

[b] In calculating the gross reproduction rate, the pattern of fertility by age of mother was assumed to be the same as in Ireland.

[c] Births include adjustment for incomplete registration, estimated at slightly more than one per cent.

[d] In calculating the gross reproduction rate, the pattern of fertility by age of mother reported for 1960 was assumed to apply to the period 1951-1956.

[e] Calculated from age-specific birth rates pertaining to all of Canada, excluding Newfoundland.

[f] Excluding aborigines.

[g] In calculating the gross reproduction rate, the pattern of fertility by age of mother reported for 1949 was assumed to apply to the entire period 1946-1951.

[h] Excluding Maoris.

A recent United Nations study dealt in detail with trends of fertility up to 1954 in most of the principal European countries and in Australia, Canada, New Zealand and the United States.[1] In the present study, the principal measures of fertility trends are extended up to 1960, and the Soviet Union and some additional European countries are included (Albania, Austria, Bulgaria, Greece, Hungary, Luxembourg, Malta and Gozo, Poland and Yugoslavia). The Fiji Islands are also included as the only area in Oceania outside Australia and New Zealand, having 250,000 or more inhabitants in 1960, for which a satisfactory basis for fertility estimates could be found. Data are lacking for Papua

[1] *Recent Trends in Fertility in Industrialized Countries.* United Nations publication, Sales No.: 57.XIII.2.

Table 6.2. Trends of crude birth rates in Europe, Northern America, Oceania and the Union of Soviet Socialist Republics: 1900-1960

(Births per 1,000 population)

	Northern and Western Europe											
										United Kingdom [e]		
Year	*Belgium*	*Denmark* [a]	*Finland*	*France* [b]	*Ireland* [c]	*Luxembourg* [d]	*Netherlands*	*Norway*	*Sweden*	*England and Wales*	*Northern Ireland*	*Scotland*
1900-1904 [f]	27.9	29.0	31.3	21.2	23.1	...	31.5	28.5	26.4	28.2	...	29.4
1905-1909 [g]	25.1	28.4	31.0	20.1	22.7	29.9	30.0	26.7	25.6	26.7	...	28.1
1910-1914	22.5	26.4	28.2	19.0 [h]	22.7	26.7	28.2	25.3	23.7	24.3	24.1	25.9
1915-1919	13.6	23.8	23.3	11.4 [h]	20.6	18.4	25.7	24.0	20.8	20.9	21.9	21.5
1920-1924	21.1	22.6 [i]	25.4	19.9	20.5	20.6	26.7	23.5	20.3	21.3	23.9	24.3
1925-1929	18.9	19.8	22.8	18.5	20.3	21.1	23.4	18.5	16.3	17.1	21.4	20.3
1930-1934	17.6	17.9	20.0	17.2	19.5	18.1	21.7	15.7	14.4	15.3	20.2	18.6
1935-1939	15.5	17.9	20.2	15.1 [j]	19.4	15.0	20.3	15.0	14.5	14.9	19.8	17.7
1940-1944	13.8	20.3	20.1	14.6 [j]	20.9	14.8	21.8	17.7	17.7	15.5	21.8	17.7
1945-1949	17.3	21.6	27.0	20.2 [j]	22.5	14.6	25.9	20.8	19.0	18.0	21.9	19.4
1950-1954	16.7	17.9	22.8	19.4	21.4	15.0	22.1	18.7	15.5	15.5	20.9	17.9
1955-1959	17.0	16.8	19.9	18.3	21.1	15.9	21.2	18.1	14.5	15.9	21.4	18.9
1955	16.8	17.3	21.2	18.5	21.1	15.3	21.3	18.5	14.8	15.0	20.8	18.1
1956	16.8	17.2	20.8	18.3	21.0	15.8	21.2	18.5	14.8	15.7	21.1	18.6
1957	17.0	16.8	20.1	18.3	21.2	16.1	21.2	18.1	14.6	16.1	21.5	19.1
1958	17.1	16.5	18.6	18.1	20.9	16.0	21.1	17.9	14.2	16.4	21.6	19.3
1959	17.4	16.3	18.9	18.2	21.1	16.1	21.3	17.7	14.1	16.5	21.9	19.2
1960	16.9	16.6	18.5	17.9	21.4	16.0	20.8	17.3	13.7	17.2	22.5	19.6

	Central Europe							
			Germany					
Year	*Austria* [k]	*Czechoslovakia*	*Eastern Germany* [l]		*Federal Republic* [m]	*Hungary* [n]	*Poland* [o]	*Switzerland*
1900-1904 [f]	35.7	35.1		34.3		37.4	...	28.2
1905-1909	34.3	32.9 [p]		32.3		36.3	40.1 [q]	26.4
1910-1914	23.9 [r]	29.6 [s]		28.2		35.2	38.2 [t]	23.8
1915-1919	15.3 [u]	22.4 [v]		16.0		21.9 [w]	30.5 [v]	18.9
1920-1924	22.6	26.8		23.1		30.2	34.3	20.0
1925-1929	18.4	22.9		19.1		26.6	32.9	17.8
1930-1934	15.1	19.7		16.3		23.2	28.9	16.7
1935-1939	14.7	17.1		19.4		20.1	25.4 [x]	15.4
1940-1944	19.1	20.8		17.4 [y]		19.3 [y]	...	17.9
1945-1949	16.7	22.4	13.0 [z]		16.9 [z]	19.9	28.4 [aa]	19.4
1950-1954	15.0 [bb]	22.0	16.6		16.1	21.1	30.1	17.3
1955-1959	16.8 [bb]	18.5	16.1		16.9	17.8	27.1	17.5
1955	15.6 [bb]	20.3	16.3		16.0	21.4	29.1	17.1
1956	16.6 [bb]	19.8	15.9		16.5	19.5	28.0	17.4
1957	17.0 [bb]	18.9	15.6		17.0	17.0	27.6	17.7
1958	17.1 [bb]	17.4	15.6		17.0	16.0	26.2	17.6
1959	17.6 [bb]	16.0	16.9		17.7	15.2	24.7	17.7
1960	17.8 [bb]	15.9	17.0		17.8	14.7	22.3	17.6

Table 6.2. Trends of crude birth rates (*continued*)

Year	Southern Europe								
	Albania [cc]	*Bulgaria*	*Greece* [dd]	*Italy* [ee]	*Malta and Gozo* [ff]	*Portugal*	*Romania* [gg]	*Spain* [hh]	*Yugoslavia* [ii]
1900-1904 [f] ...	...	40.7	35.2	32.6	...	32.0	39.6	35.1	...
1905-1909 ...	...	42.5	33.6	32.6	...	33.5	40.1	33.7	39.2
1910-1914 ...	...	39.0	...	31.8	...	33.7	41.8 [jj]	31.1	37.8 [kk]
1915-1919 ...	...	26.4	...	22.7	...	30.2	40.0 [ll]	29.0	...
1920-1924 ...	...	39.6	31.4	30.1 [i]	35.4 [i]	33.0	37.6	30.0	35.3
1925-1929 ...	...	34.2	32.4	27.2	32.3	31.7	35.4	28.7	33.9
1930-1934 ...	...	30.3	30.4	24.5	33.2 [mm]	29.3	33.7	27.5	33.0
1935-1939 ...	32.4 [nn]	24.1	27.6	23.2	33.6	27.1	30.2	21.9	27.9
1940-1944 ...	30.5 [oo]	22.1	...	20.8	31.2	24.5	23.2	21.9	...
1945-1949 ...	...	24.6	...	21.1	37.3	25.6	24.9 [z]	22.1	28.2 [aa]
1950-1954 ...	38.9	21.7	21.1	18.3	29.8	24.1	24.9	20.2	28.8
1955-1959 ...	41.8	18.7	19.9	18.0	26.8	24.1	22.9	21.2	24.8
1955	44.5	20.1	...	18.0	27.2	24.3	25.6	20.4	26.9
1956	41.9	19.5	...	18.0	26.8	23.4	24.2	20.6	26.0
1957	39.1	18.4	...	18.0	27.6	24.3	22.9	21.7	23.9
1958	41.8	17.9	...	17.7	26.5	24.3	21.6	21.8	24.0
1959	41.9	17.6	...	18.3	26.2	24.2	20.2	21.6	23.3
1960	43.4	17.8	...	18.3	26.1	24.2	19.1	21.7	23.5

Year	Northern America		Oceania		Soviet Union
	Canada	*United States* [pp]	*Australia* [qq, rr]	*New Zealand* [rr, ss]	*USSR* [tt]
1900-1904	...	...	26.7	26.3	48.0
1905-1909	...	...	26.8	27.3	45.9
1910-1914	...	...	28.1	26.2	45.3
1915-1919	...	24.1	25.8	24.3	32.2
1920-1924	28.1 [uu]	22.8	24.4	23.0	38.0
1925-1929	24.5	20.1	21.6	20.2	41.9
1930-1934	22.2	17.6	17.6	17.5	31.4
1935-1939	20.4	17.2	17.2	17.4	33.8
1940-1944	23.2	19.9	19.5	21.4	25.1
1945-1949	27.0	23.4	23.1	25.1	25.8
1950-1954	28.2	24.5	23.0	24.5	26.4
1955-1959	27.9	24.6	22.6	24.9	25.3
1955	28.2	24.7	22.6	24.9	25.7
1956	28.0	24.9	22.5	24.7	25.2
1957	28.1	25.0	22.9	24.9	25.4
1958	27.5	24.3	22.6	25.2	25.3
1959	27.5	24.1	22.6	25.1	25.0
1960	26.7	23.7	22.4	25.1	24.9

Sources: Rates for 1920 and later years from United Nations, *Demographic Yearbook*, 1959 and 1960, except as noted. Data for earlier years are from H. Bunle, *Le mouvement naturel de la population dans le monde de 1906 à 1936*, Paris, 1954 unless otherwise noted.

. . . Not available.

[a] Excluding Faeroe Islands and Greenland; prior to 1920, excluding South Jutland.

[b] For the sake of comparability, live-born infants dying within 24 hours of birth are excluded in computing the rates for all years. Beginning 1954, rates are computed on population including French servicemen stationed outside the country.

[c] Births registered within one year of occurrence.

[d] Prior to 1951, data tabulated by year of registration rather than occurrence.

[e] Data tabulated by year of occurrence for England and Wales, and by year of registration for Northern Ireland and Scotland.

[f] For 1901-1905, from R. R. Kuczynski, *The Balance of Births and Deaths*, vol. I, New York, 1928, and vol. II, Washington, 1931, except official data 1900-1904, for Sweden, Switzerland and Scotland, and 1900-1905 for England and Wales. Estimate for Greece 1900-1904.

[g] 1906-1909.

[h] Including estimates for territory previously under German administration, and territory invaded by the enemy during the war.

[i] 1921-1924.

[j] 1939-1942 and 1945: excluding departments of Bas-Rhin, Haut-Rhin and Moselle; in 1943 and 1944, excluding Corsica also.

[k] Prior to 1910: territory as of 1913, including extensive areas now belonging to Czechoslovakia, Italy, Poland, Romania, the Soviet Union and Yugoslavia, but not the Burgenland, then administered as part of Hungary.

[l] Prior to 1950, not including East Berlin.

(Footnotes continued overleaf)

and New Guinea, the only other areas in Oceania having a population of this size.[2]

For this group of regions it is possible to make a more extensive historical survey of fertility trends than is possible in the case of Africa, Asia, or Latin America, thanks to the existence of reliable series of vital statistics extending over considerable periods of time. For most countries of Europe, reliable data extend back to the beginning of this century and, in many countries, over a large part of the nineteenth century, or even the eighteenth century, as in the Scandinavian region. In Australia and New Zealand, reliable series of statistics go back to the late nineteenth century; in Canada and the United States the vital statistics have been virtually complete since the 1920's. In the few countries where the registration of births was still deficient at a recent time,[3] it is possible to derive estimates of fertility from data on age structure in population censuses. Countries in these regions also possess a variety of other types of relevant data which permit intensive analyses of the factors affecting fertility trends. For example, in studying the rise of the birth rate following the Second World War, it is possible to determine the relative contributions of demographic factors, such as changes in the sex and age composition of the population, and in the numbers of marriages and age at marriage, on the one hand, and of changing marital fertility, on the other. Such an assessment has been made in the earlier United Nations study, *Recent Trends in Fertility in Industrialized Countries*; it is not repeated in the present study, since the principal emphasis here is on fertility levels and trends in developing countries.

A. Present levels

In Europe, no birth rate higher than 24 has been recorded recently, except for Albania, and Malta and Gozo. Likewise, in Europe the gross reproduction rate rarely attains 1.5, this figure being exceeded only in Albania, Ireland, Malta and Gozo, and Northern Ireland (table 6.1). In some countries, on the other hand, the birth rate is barely 15, and the gross reproduction rate near unity.

Current levels of fertility in Northern America, Australia, New Zealand, and the Soviet Union are somewhat higher. Recent birth rates in these countries have been between 22 and 27, and gross reproduction rates between 1.6 and nearly 2.0. The Soviet Union has a slightly lower gross reproduction rate.

The average crude birth rate in Northern and Western Europe is 18. This is somewhat lower than the average for Southern Europe, which is 21, but the difference is due to differences in age composition of the population resulting from the earlier decline of Northern and Western European birth rates. Actually, the average gross reproduction rate is 1.3 in both regions. The apparent paradox is resolved when it is considered that women of reproductive ages now constitute 25 per cent of the population of Southern Europe, but only 20 per cent in Northern and Western Europe.

Generalization is less justified in the area of Central Europe, owing to a certain diversity of demographic conditions among countries composing that region. With the exception of West Berlin, where fertility is very low, the current birth rate ranges from 15 in Hungary to 22 in Poland. Past fertility trends have also differed appreciably among Central European countries, and the losses of the recent war have left a considerable mark on the sex-age structure of the population in some of these countries. For such reasons the birth rate in Austria and Germany is now close to that in Norway, though fertility, measured by the gross reproduction rate, is lower.

In the low-fertility regions outside the European sub-continent, the comparative levels of birth rates are also influenced by variations in sex-age composition of the population. New Zealand has the highest gross

[2] Hawaii, having become a State of the United States, is no longer included in Oceania.

[3] Greece and the Fiji Islands; for Albania the degree of completeness of birth registration is undetermined.

[m] Not including West Berlin.

[n] Prior to 1915: territory as of 1913, including extensive areas now belonging to Austria, Czechoslovakia, Romania, the Soviet Union, and Yugoslavia.

[o] Prior to 1940: territory as of 1937, i.e., including areas now belonging to the Soviet Union, but not Gdansk, and areas then administered as parts of Germany. Beginning 1950, including adjustment for incomplete registration, estimated as slightly more than 1 per cent.

[p] 1906-1910. R. R. Kuczynski, op. cit., vol. II, Washington, 1931.

[q] Estimate.

[r] 1910-1913. Present area, excluding Burgenland.

[s] 1911-1914. R. R. Kuczynski, op. cit., vol. II, Washington, 1931.

[t] For 1910-1911; estimate.

[u] 1915-1918; estimate.

[v] 1919 only.

[w] 1918-1919.

[x] 1935-1938.

[y] 1940-1943.

[z] 1946-1949.

[aa] 1947-1949.

[bb] Rates not revised to accord with population census result of 1961.

[cc] According to births registered with undetermined degree of completeness; probably approaching completeness in recent years. The crude birth rate estimated by "reverse-survival," was 40 for 1950-55.

[dd] Estimates by Vasilios G. Valaoras in "A Reconstruction of the Demographic History of Modern Greece", *Milbank Memorial Fund Quarterly* (New York), vol. 38, April 1960, pp. 115-139.

[ee] Prior to 1920, excluding areas previously administered as parts of Austria; 1920-1940, including area now part of Yugoslavia.

[ff] Excluding non-Maltese armed forces stationed in area.

[gg] Prior to 1920, territory of 1913, excluding extensive areas then administered as parts of Austria, Hungary and the Russian Empire, 1920-1940, including territory now part of the Soviet Union.

[hh] For the sake of comparability, live-born infants dying within 24 hours of birth are excluded in computing the rates for all years. The 1960 figure given in this table thus differs from the one shown in table 6.1.

[ii] Prior to 1920, territory of former Serbia only; 1920-1940, excluding area then administered as part of Italy.

[jj] 1910-1913.

[kk] 1910-1912.

[ll] Average for the two years, 1915 and 1919.

[mm] 1932-1934.

[nn] 1936-1939.

[oo] 1940-1942.

[pp] Prior to 1933, data are for an expanding registration area, extending over the 48 states of the Union (other than Alaska and Hawaii, which became states of the Union in 1959) from 1933 onward. Data for Hawaii are included from 1935 onward, and for Alaska from 1945 onward.

[qq] Excluding aborigines.

[rr] Births by year of registration rather than occurrence.

[ss] Excluding Maoris.

[tt] Official data for consecutive years only from 1950 onward. Series from 1900 to 1949 as estimated by Jean-Noël Biraben in "Essai sur l'évolution démographique de l'U.R.S.S.", *Population* (Paris), vol. 13, special number, June 1958, pp. 29 ff.

[uu] Excluding Yukon and Northwest Territories.

reproduction rate, 2.0, but because of lower fertility in the past the crude birth rate is somewhat lower than that of Canada. Heavy war losses in the Soviet Union, resulting in a deficiency of adult male population, must be held accountable for fertility of women being lower there than in the United States, although the crude birth rate is rather higher.

B. Trends

Trends in registered crude birth rates since 1900 are shown in table 6.2, so far as reliable series are available. The corresponding trends in gross reproduction rates are shown in table 6.3.

1. *Europe*

(a) *Long-range trends up to the Second World War*

Where data are available for the longest period, as in the Scandinavian countries, fluctuations in the birth rates since the eighteenth century indicate no general tendency of change until the latter part of the nineteenth century. With the exception of France, where a decline became noticeable early in the nineteenth century, and Ireland, where it is believed to have begun about the middle of that century,[4] no marked downward movement of the birth rate appears in any European country until after 1870. In large parts of Europe the decline did not start earlier than 1900.

In the early part of the nineteenth century the average birth rate of Europe as a whole has been estimated at 39 per 1,000.[5] Around 1880 the available data for European countries indicated birth rates averaging 35,

[4] A. M. Carr-Saunders, *World Population: Past Growth and Present Trends* (Oxford, Clarendon Press, 1936), pp. 88-92.

[5] Gustav Sundbärg, *Aperçus Statistiques Internationaux, dixième année*, Stockholm, 1905, quoted in H. Gille, "The Demographic History of the Northern European Countries in the Eighteenth Century", *Population Studies*, vol. 3, June 1949, p. 30.

Table 6.3. Trends of gross reproduction rates in Europe, Northern America, Oceania and the Union of Soviet Socialist Republics: 1899-1960

Year	*Northern and Western Europe*										
	Belgium [a]	*Denmark*	*Finland*	*France* [b]	*Ireland* [c]	*Luxembourg*	*Netherlands* [d]	*Norway*	*Sweden*	*England and Wales* [e]	*Scotland* [e]
1899-1902	1.81	...	...	1.39	...	...	...	2.14 [f]	...	...	...
1909-1912	1.44	1.76	2.04	1.23	1.59 [g]	1.90 [h]	1.93 [i]	1.85 [j]	1.72	1.40 [g]	1.54 [g]
1920-1924	1.21 [k]	1.43	1.67	1.21	...	...	1.75 [k]	1.61 [kl]	1.34	1.23 [m]	1.45 [m]
1925-1929	*1.09*	1.20	1.44	1.13	1.52 [n]	1.30	...	...	1.04	0.90 [o]	1.13 [o]
1935-1939	1.01 [p]	1.05	1.18	1.02	1.43 [q]	0.98	1.27 [r]	0.90	0.87	0.90 [p]	1.06 [p]
1946-1949	1.20	1.36	1.66	1.46	1.63 [s]	0.97	1.74	1.28	1.22	1.20	1.37
1950-1954	1.14	1.24	1.47	1.34	1.60 [t]	1.01	1.50	1.25	1.09	1.06	1.20
1955-1959	1.20	1.24	1.36	1.32	1.73	1.04	1.51	1.38	1.10	1.18	1.32
1955	1.16	1.26	1.42	1.32	1.66	1.04	1.48	1.34	1.10	1.08	1.24
1956	1.18	1.26	1.41	1.31	1.69	1.01	1.49	1.38	1.11	1.15	1.29
1957	1.20	1.25	1.38	1.32	1.75	1.04	1.50	1.38	1.11	1.20	1.34
1958	1.22	1.24	1.29	1.31	1.76	1.04	1.51	1.39	1.09	1.23	1.37
1959	1.25	1.22	1.31	1.33	1.83	1.05	1.54	1.40	1.09	1.24	1.37
1960	1.23	1.24	1.29	1.33	...	1.09	1.52	1.39	1.06	1.30	1.41

Year	*Central Europe*							
			Germany [v]					
	Austria [u]	*Czechoslovakia*	*Eastern Germany (including East Berlin)*	*Federal Republic* [w]	*Hungary* [x]	*Poland*	*Switzerland* [y]	
1899-1902	...	...	...	...	...	...	1.81	
1909-1912	...	...	1.87		2.37	...	1.56	
1920-1924	...	1.57 [z aa]	...	...	1.58 [z]	2.16 [bb]	1.21 [z]	
1925-1929	1.01	1.33	1.14 [cc]		1.43 [dd]	...	...	
1935-1939	0.81 [ee]	0.97 [ff]	1.09 [ee]		...	*1.46* [ee]	0.88	
1946-1949	*1.12*	1.42 [gg]	...	1.06 [hh]	*1.26* [hh]	*1.59* [ii]	1.24	
1950-1954	1.01 [jj]	1.44	1.15 [kk]	1.04 [jj]	*1.30*	1.75	1.15	
1955-1959	1.20	1.30	1.09	1.12	1.16	1.66	1.15	
1955	1.09	1.38	1.14	1.06	1.37	1.75	1.14	
1956	1.18	1.38	1.10	1.09	1.26	1.70	1.16	
1957	1.21	1.34	1.02	1.14	1.11	1.69	1.15	
1958	1.23	1.25	1.07	1.14	1.06	...	1.14	
1959	1.27	1.16	1.14	1.18	1.01	...	1.16	
1960	1.29	1.17	1.16	1.19	0.98	1.45	1.14	

Table 6.3. Trends of gross reproduction rates (*continued*)

Year	Southern Europe							Northern America		Oceania		Soviet Union
	Albania	*Bulgaria*	*Italy* [ll]	*Portugal* [mm]	*Romania* [nn]	*Spain* [oo]	*Yugoslavia* [pp]	*Canada* [qq]	*USA*	*Australia*	*New Zealand*	*USSR* [rr]
1899-1902	...	...	...	2.04	...	...	...	...	...	...	...	...
1909-1912	...	2.91 [aa]	2.21	2.21 [ss]	2.86 [tt]	2.17 [aa]	...	...	...	...	...	...
1920-1924	...	2.53 [z aa]	1.95 [uu]	2.02 [z]	...	1.96 [z aa]	2.30 [uu]	1.63 [vv]	...	*1.50*	*1.43*	...
1925-1929	...	*2.16*	...	*2.04*	*2.05*	*1.85*	...	1.59	...	1.36	1.28	...
1935-1939	...	1.47	1.46 [r]	*1.73*	*1.81*	*1.35*	...	1.30	1.00	1.06	1.07	2.15 [ww]
1946-1949	...	1.44	1.37	1.59	...	*1.31*	1.80 [xx]	1.69	1.47	1.47	1.64	...
1950-1954	*2.98*	1.24	*1.16*	1.51	...	*1.20*	1.71	1.77	1.60	1.53	1.70	...
1955-1959	*3.20*	1.12	*1.14*	1.50	*1.34*	*1.27*	1.43	1.90	1.77	1.65	1.89	1.37 [yy]
1955	*3.41*	1.17	*1.15*	1.51	*1.49*	*1.21*	1.56	1.87	1.72	1.60	1.82	...
1956	*3.20*	1.15	*1.16*	1.45	*1.42*	*1.23*	1.50	1.88	1.77	1.62	1.85	...
1957	*2.99*	1.10	1.13	1.50	*1.34*	*1.30*	1.37	1.92	1.81	1.67	1.88	...
1958	*3.21*	1.09	1.11	1.53	*1.27*	*1.31*	1.38	1.90	1.78	1.67	1.93	1.38 [zz]
1959	*3.21*	1.09	1.14	1.51	*1.19*	*1.31*	1.35	1.92	1.79	1.68	1.95	1.37 [aaa]
1960	*3.39*	1.13	1.16	1.55	*1.15*	*1.38*	1.38	1.90	1.78	1.68	1.97	1.37 [bbb]

Note: The gross reproduction rates shown in this table were calculated from actual tabulations of births by age of mother available for these countries for the given years. For years for which data on births by age of mother were lacking, the distribution of the fertility rates by age of mother was assumed to be the same as in some other year for which data were available. For periods longer than one year, the average annual number of births distributed by age of mother in the stated years has been related either to population data from a census taken during the middle of the period, or to an average of mid-year population estimates available for each year. Official census data or official population estimates were used in calculating all rates except those in italics, which have been calculated from registered births and population estimates prepared by the United Nations.

... Not available.

[a] For the sake of comparability, live-born infants dying before registration are excluded in computing the rates for all years. For periods before 1939, the age pattern of fertility was assumed to be the same as in 1939.

[b] For the sake of comparability, live-born infants dying within 24 hours of birth are excluded in computing the rates for all years. For periods before 1920, the age pattern of fertility was assumed to be the same as in 1920-1924.

[c] For periods before 1955, the age pattern of fertility was assumed to be the same as in 1955.

[d] For periods before 1936, the age pattern of fertility was assumed to be the same as in 1936-1939.

[e] For periods before 1939, the age pattern of fertility was assumed to be the same as in 1939.

[f] 1899-1900; from *Statistisk Årbok for Norge*, 1959 (Oslo 1959), p. 29.

[g] 1909-1913.

[h] The age pattern of fertility was assumed to be the same as in 1925-1929.

[i] 1908-1911.

[j] The age pattern of fertility was assumed to be the same as in 1910-1911.

[k] 1919-1922.

[l] The age pattern of fertility was assumed to be the same as in 1920-1921.

[m] 1919-1923.

[n] 1924-1928.

[o] 1929-1933.

[p] 1939.

[q] 1934-1938.

[r] 1936-1939.

[s] 1945-1948.

[t] 1949-1953.

[u] For periods before 1951, the age pattern of fertility was assumed to be the same as in 1951.

[v] For periods before 1937, the age pattern of fertility was assumed to be the same as in 1937.

[w] Not including West Berlin.

[x] For periods before 1927, the age pattern of fertility was assumed to be the same as in 1927-1929.

[y] For periods before 1935, the age pattern of fertility was assumed to be the same as in 1932-1934.

[z] 1919-1922.

[aa] The age pattern of fertility was assumed to be the same as in 1925-1929

[bb] 1919-1923. The age pattern of fertility was assumed to be the same as in 1931.

[cc] 1923-1927.

[dd] 1927-1929.

[ee] 1935-1938.

[ff] 1936.

[gg] The age pattern of fertility was assumed to be the same as in 1949.

[hh] 1947-1949.

[ii] The age pattern of fertility was assumed to be the same as in 1950-1954.

[jj] 1951-1954.

[kk] 1952-1954.

[ll] For periods before 1936, the age pattern of fertility was assumed to be the same as in 1936.

[mm] For periods before 1930, the age pattern of fertility was assumed to be the same as in 1930.

[nn] For periods before 1935, the age pattern of fertility was assumed to be the same as in 1935-1939.

[oo] For the sake of comparability, live-born infants dying within 24 hours of birth are excluded in computing the rates for all years. The 1960 figure given in this table thus differs from the one shown in table 6.1.

[pp] For periods before 1950, the age pattern of fertility was assumed to be the same as in 1950-1954.

[qq] Excluding Newfoundland. Excluding also Yukon and Northwest Territories prior to 1950, and Quebec prior to 1925.

[rr] Data from A. M. Vostrikova, "Izuczenije rozdojemosti; brakov i semji v USSR" ["Investigation of natality, marriage and family in the USSR"], Mczdunarodnyj demographiceskij simpozium [International Demographic Symposium], Budapest, 1962.

[ss] 1910-1913.

[tt] 1911-1914.

[uu] 1920-1923.

[vv] 1921-1924.

[ww] 1938-1939.

[xx] 1946-1950.

[yy] 1957-1959.

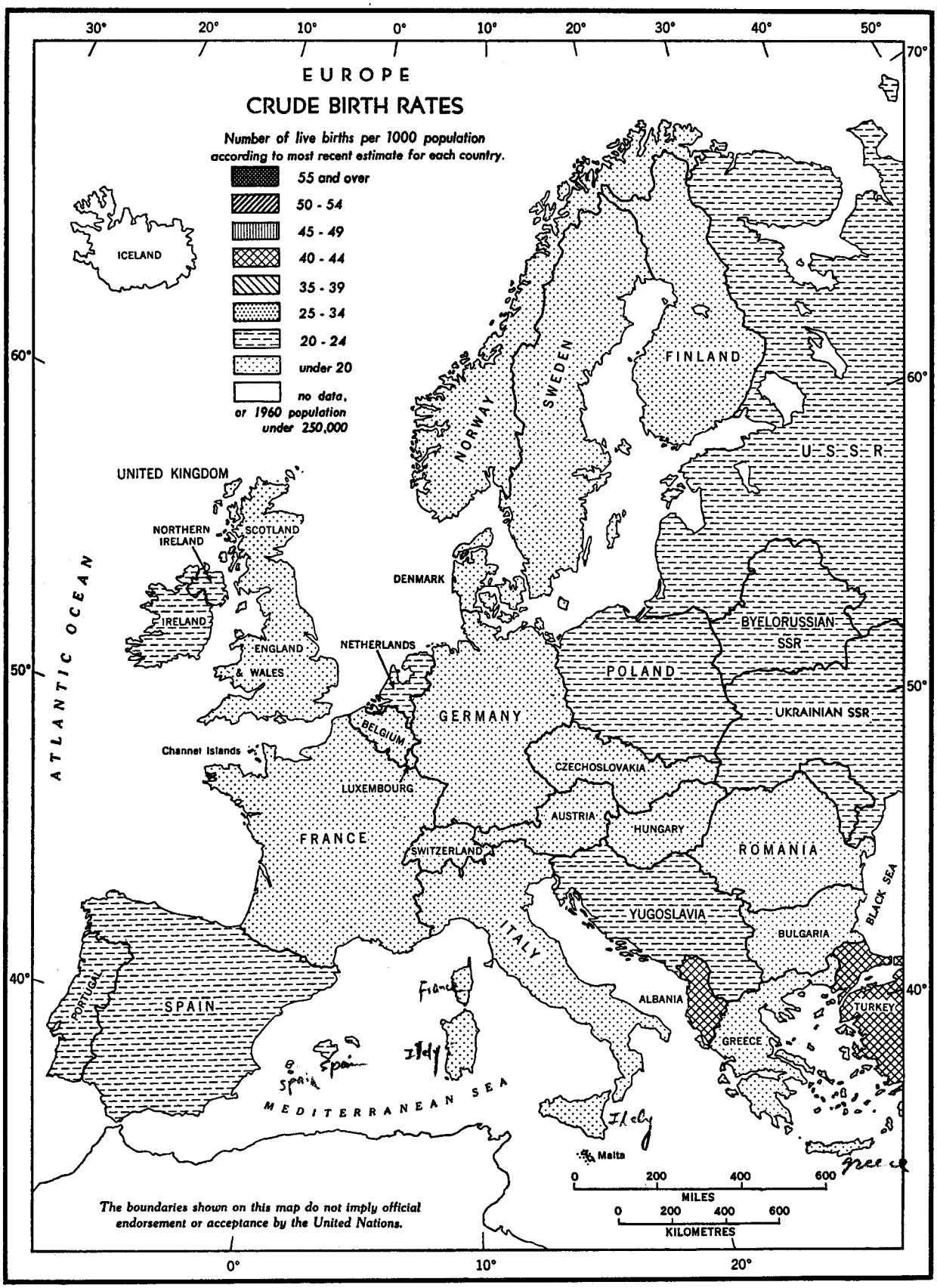
[zz] 1957-1958.

[aaa] 1958-1959.

[bbb] 1960-1961.

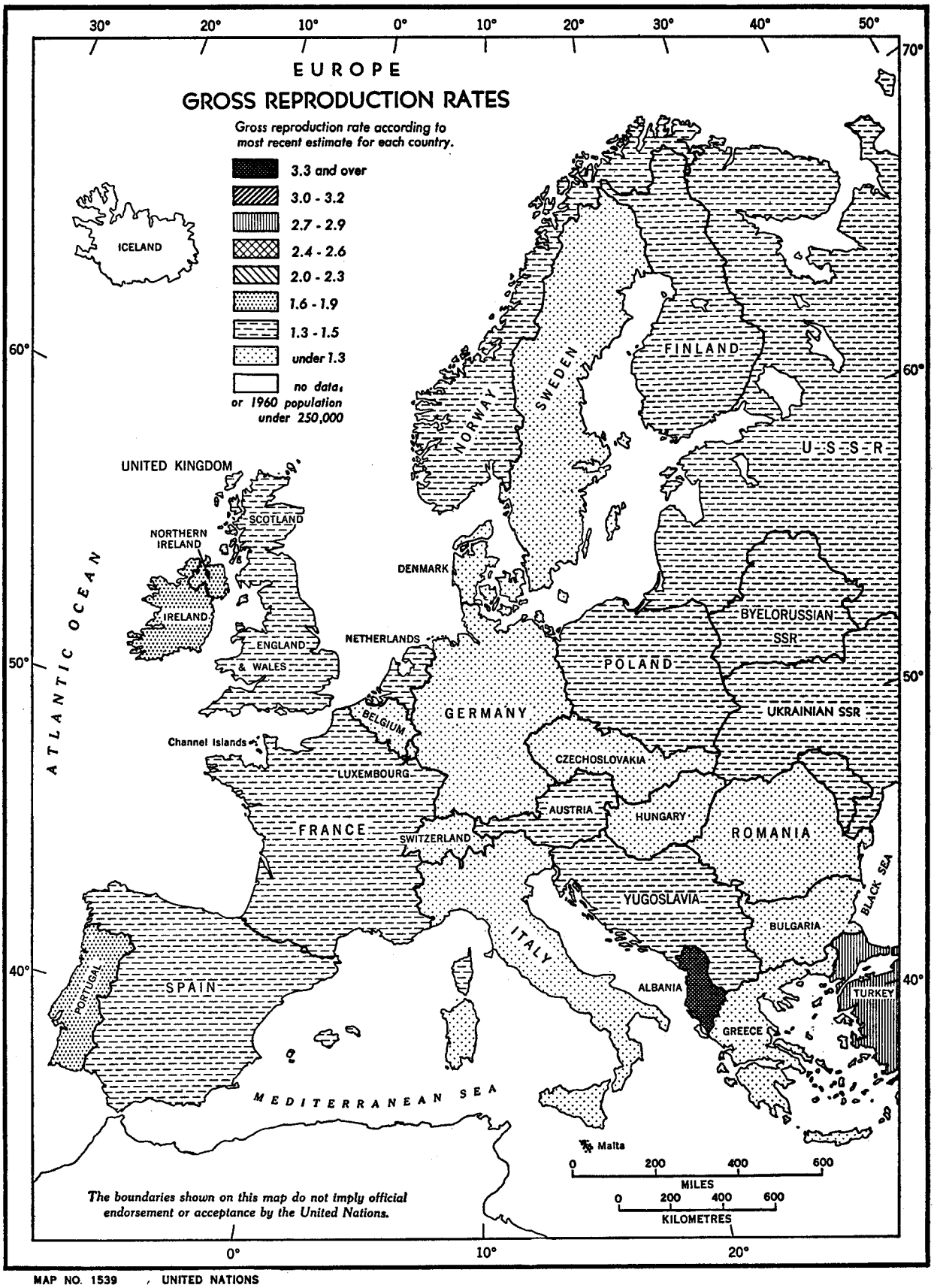
if not higher, and gross reproduction rates still decidedly above 2.0, except for France and Ireland. Compared with present levels in Europe these rates are high, although they are low in comparison with the rates now prevailing in the economically less developed parts of the world. The birth rate of 35 for late nineteenth century Europe is substantially less than the present estimated averages of 48 for Africa, 39-42 for Asia, and 41 for Latin America. It is doubtful that the average birth rate in Europe as a whole at any time since the Middle Ages was as high as the levels found in most countries of Africa, Asia and Latin America today, although such rates prevailed until recently in Russia and parts of Eastern Europe. It is very probable that birth rates were still very high in Russia in the nineteenth century. Birth rates were also exceedingly high in Northern

Figure 6.1



MAP NO. 1538 UNITED NATIONS
AUGUST 1963

Figure 6.2



MAP NO. 1539 , UNITED NATIONS
AUGUST 1963

America and Australia and New Zealand in the early periods of European settlement.

In 1906-1909, nearly all countries in Northern and Western Europe, where fertility decline first took place, had birth rates in the range from 25 to 30. Exceptions were Finland, where the birth rate was 31, and France and Ireland, where the rates were 20 and 23, respectively. In Central Europe at that time, the average birth rate was 35, with a range from about 40 in Poland to only 26 in Switzerland. In Southern Europe the recorded birth rates during this period ranged from about 33 (in Greece, Italy, Portugal and Spain) to near 40 (in Bulgaria, Romania and Serbia). Some of these rates were under-reported, as the vital registration systems had not yet attained complete coverage.[6] About that time the gross reproduction rate still exceeded 2.0 in Southern Europe generally, and in some parts of Central Europe, though in Northern and Western Europe it had already decreased considerably below that level.

The trends of European birth rates early in this century can be summed up as follows: (1) the average levels of the rates for various regions of Europe were diverging, birth rates being highest in Southern Europe, intermediate in Central Europe, and lowest in Northern and Western Europe; (2) the levels varied considerably within each region; (3) the decline in birth rates, most pronounced at that time in Northern and Western Europe, had begun to affect large parts of Central Europe, whereas in Southern Europe, at that time, birth rates were not perceptibly lower than they had been in the preceding century.

The First World War disturbed the continuity of these trends. The birth rates of all countries dropped, the decreases being the greatest in those countries which were most heavily involved in the war, notably Austria, Belgium, Bulgaria, France, Germany, Hungary, Italy, Luxembourg, and Poland. In other European countries the war-time birth deficit was less pronounced. Immediately after the war a brief recovery of the birth rate occurred in all countries in Europe.

During the 1920's the general decline in European birth rates was resumed. The trend acquired increasing momentum in Central Europe and eventually also in Southern Europe. The decreases were continuous and the regional differences persisted, with Northern and Western Europe still leading the downward trend. In the 1920's, gross reproduction rates greater than 2.0 could still be found in Bulgaria, Poland, Portugal and Romania, i.e., countries of the East and South where industrial development had a comparatively late start. The fertility decline continued past 1930, into the period of the economic depression, but the fall was not particularly accelerated by this economic adversity. The birth rate reached its lowest point, 16 per 1,000, in Northern and Western Europe during 1935-1939, at which time it averaged 20 in Central Europe, and 25 in Southern Europe (see table 6.4).

Table 6.4. Average crude birth rates for major regions of Europe, in selected periods, 1925-59

Region	*1925-1929*	*1935-1939*	*1945-1949*	*1955-1959*
Northern and Western Europe	19	16	20	18
Central Europe	23	20	20	19
Southern Europe	30	25	23	21

Because of the sharp drops in the birth rates of some countries during the First World War, the proportion of population in the young reproductive age groups was considerably reduced during the 1930's; hence crude birth rates exaggerated somewhat the decrease in fertility. But fertility as measured by the gross reproduction rate also had fallen quite low by 1935-1939. As a weighted average, the gross reproduction rate then was 1.0 in Northern and Western Europe, 1.16 in Central Europe, and 1.56 in Southern Europe. For a number of years in the 1930's gross reproduction rates were below unity in Austria, Czechoslovakia, England and Wales, Germany, Norway, Sweden and Switzerland. Germany was the only country experiencing an appreciable rise in fertility after 1934, a trend which may have been due partly or wholly to legislation favourable to employment and family formation at the inception of a new political regime. An upswing occurred later in Austria, also possibly related to political factors.

It is to be recalled that the downswing in the birth rate, beginning in some parts of Europe and spreading to others, had been in progress for a very long time, only temporarily interrupted by major fluctuations associated with the First World War. It had continued into the 1930's, when the great economic depression brought the birth rate down possibly to a lower level than would otherwise have been reached. In terms of gross reproduction rates a narrowing of regional differences became perceptible, though the crude birth rates varied more widely, as a result of variations in age structure of the population. Thus, birth rates in the 1930's were particularly low in Belgium and France, two countries where the earlier decline and the birth deficits of the First World War had reduced the proportion of the population at reproductive ages.

The Second World War had a different effect on birth rates from what might have been expected in view of the experience of the first war. Briefly, except in Spain, birth rates continued declining in Southern Europe while in Northern and Western Europe the immediate pre-war levels were at first generally maintained. In Germany, and later in Austria, the 1930's had already witnessed a moderate increase in the birth rate. In some countries, notably Czechoslovakia, Denmark, Norway, Sweden and Switzerland, there was an increase in the birth rate during the war years to levels comparable to those of 1925-1929. Birth registration was disrupted in some areas by the war's devastating effects, but it may be presumed that in those areas,

[6] Completeness of birth registration was estimated at between 90 and 95 per cent in the 1930's in Greece, Romania and Yugoslavia, Frank W. Notestein and others, *The Future Population of Europe and the Soviet Union*; Population Projections, 1940-1970 (Geneva, League of Nations, 1944), p. 196. It was probably as low or lower in these, and in some other countries, in 1906-1909.

notably Poland and Yugoslavia, fertility was also affected adversely. The maintenance or even partial recovery of birth rates in much of Northern, Western and Central Europe, despite the severe trials of the war, suggests that a discontinuance of the secular down-trend, protracted as it had been by the economic depression, was overdue. In Southern Europe, on the other hand, this was not yet the case. In general, gross reproduction rates followed the pattern of partial recovery observed in the birth rates, though, because of changes in age structure, not in equal proportion. In some countries, notably Finland, France and Norway, the rise of the gross reproduction rates was considerable even in war-time.

(b) *Post-war trends*

The immediate post-war period was one of recovery in birth rates in most countries where previously they had been lowest. The peak of the post-war birth rate was generally reached in 1946 or 1947. In the non-belligerent countries such as Sweden and Switzerland, where indications of an upswing in birth rates appeared in years immediately preceding the Second World War, the recovery continued with fair momentum until after the war; it reached its peak one or two years earlier than in the other countries and then declined. In the belligerent countries, various degrees of involvement in the war delayed, slowed down, or interrupted the upswing, thereby postponing and accentuating the peak induced by military demobilization. Political factors, as already noted, may have caused the noticeable pre-war upswing in the birth rates of Austria and Germany; in neither of these two countries was the post-war peak pronounced. Here, however, the war-time losses of men, some of them still in captivity in the immediate post-war years, left many women unmarried. While the depression and the two wars had temporarily influenced the rates, the secular trend, first downward and eventually levelling off, remained fundamentally unaltered. In Southern Europe, where low birth rates had generally not yet been attained before the war, the rates dropped below pre-war levels when the immediate post-war peak was passed.

For the more recent years, three distinct types of trends may be distinguished. First, in North-Western and Central Europe, where fertility fell lowest in the early 1930's, the trend has been upward to a war-time or early post-war peak, and subsequently downward with a recent tendency towards stabilization. The present average level of the crude birth rate, as a result, is not very different from that of the 1930's, though, because of changes in age composition, this represents a somewhat higher average level of fertility. Second, in Southern Europe (except Portugal and Spain), birth rates are still decreasing, though no longer so rapidly as they did in the 1930's.[7] Finally, certain countries of Eastern, Central, and South-Eastern Europe experienced a more pronounced drop in birth rates about 1956 and in subsequent years when their governments began to adopt measures favourable to reduction of the size of families. These measures have included legislation legalizing abortion, and a wider dissemination of the techniques of birth control.[8]

2. *Northern America and Oceania*

The long-term trend of fertility in countries of European overseas settlement has been generally similar to that of Northern and Western Europe.

In the United States the decline in the crude birth rate started early in the nineteenth century, if not before. In 1800 it is estimated that the crude birth rate was 55 per 1,000[9] — among the highest rates known ever to have existed in any large area of the world. The decline proceeded without any significant interruptions (except for a temporary slight rise following the First World War) until 1933, when the birth rate probably dropped to 18 per 1,000.[10] After the economic depression the crude birth rate rose very slightly. The Second World War accentuated this rise, and a peak rate of 25.8 was reached in 1947. This change was reflected in a gross reproduction rate rising from about 1.0 in the 1930's to 1.5 immediately after the war. The birth rate then settled at a level only a little lower than that peak, with a slight further decrease recently. But the stability in the birth rate concealed a further rise in the gross reproduction rate to nearly 1.8, this rise in fertility being mostly compensated by a decrease in the proportion of women of child-bearing ages in the population.

Canadian birth statistics were notably incomplete before 1920.[11] In the nineteenth century, fertility must have been very high, particularly in the French-speaking regions, where, for a period preceding 1850, a gross

[7] As mentioned earlier, Albania is an exception to the prevailing trends of the region. Crude birth rates computed from registration data, available for the 1950's, give no indication that a decline from a high fertility level has begun.

[8] James W. Brackett and Earl E. Huyck, " The Objectives of Government Policies on Fertility Control in Eastern Europe ", *Population Studies*, vol. 16, November 1962, pp. 134-146; David V. Glass, " Family Limitation in Europe: A Survey of Recent Studies ", *Milbank Memorial Fund Quarterly* (to be published); Vladimír Srb, " Population Development and Population Policy in Czechoslovakia ", *Population Studies*, vol. 16, November 1962, particularly pp. 156-157; Christopher Tietze, " The Demographic Significance of Legal Abortion in Eastern Europe ", Paper presented to the Population Association of America, Philadelphia (USA), April 1963. Recent surveys giving information on the practice of birth control and abortion in two of these countries are described in György Acsádi and András Klinger, " A termékenység, a családtervezés és a születésszabályozás néhány kérdése " [" Some Problems of Fertility, Family Planning and Birth Control "], *Demográfia* (Budapest), vol. 2, Nos. 2-3, pp. 176-216; Vladimír Srb, *et al.*, " Průzkum manzelstuí, antikoncepcea potratů (1959) " [" Investigation Concerning Marriage, Birth Prevention and Abortion (1959) "], *Demografie* (Prague), vol. 3, No. 4, 1961, pp. 311-330.

[9] Warren S. Thompson and P. K. Whelpton, *Population Trends in the United States* (New York, McGraw-Hill, 1933), p. 263. This rate, and rates for the remainder of the century, were calculated from the age composition of the white population according to data from decennial censuses.

[10] Rate corrected for estimated under-registration of births. *See* U. S. Bureau of the Census, *Vital Statistics Rates in the United States, 1900-1940*, by Forrest E. Linder and Robert D. Grove (Washington, Government Printing Office, 1943), p. 101.

[11] A uniform Dominion-wide system of vital statistics was introduced in 1921.

reproduction rate as high as 3.9 has been calculated.[12] In 1920-1924, Canada's birth rate was 28, and the rate continued declining until 1937, when it was 20. The gross reproduction rate then was no more than 1.3. The post-war peak in births brought the gross reproduction rate to 1.6, and the subsequent trend, parallel to that in the United States, has seen the maintenance of a crude birth rate of nearly 28, with the gross reproduction rate rising to about 1.9.

In Australia and New Zealand [13] the crude birth rate declined substantially during the latter part of the nineteenth century, then went up slightly, and later resumed its downward trend. A temporary check to the decline occurred early in the present century as a result of a new wave of heavy immigration, which altered the age composition of the population in favour of a higher birth rate.[14] The decline then continued until the early 1930's, when the birth rate fell to 17 and the gross reproduction rate to very near 1.0 as an average for the two countries. Subsequently the birth rate rose again, more steeply in New Zealand than in Australia. There have been further recent rises in fertility which brought the gross reproduction rate to 1.7 in Australia and nearly 2.0 in New Zealand. The crude birth rates, however, remained nearly constant (about 23 in Australia and 25 in New Zealand), since the proportion of women of reproductive ages in the population was reduced.

3. *The Soviet Union*

Only limited historical statistics of births in the Soviet Union are available.[15] These statistics have been supplemented by analyses of census age data.[16] As indicated by the population structure of the 1897 census, the crude birth rate must have been of the order of nearly 50 per 1,000 during most of the second half of the nineteenth century, and it may have been equally high for a longer past period, since, despite undoubtedly high mortality, the population of the Russian Empire then grew considerably more rapidly than that of other European countries.

A decrease in this high birth rate became noticeable soon after the turn of the century, and in the decade preceding the outbreak of the First World War the rate may have been about 45 or 46 per 1,000. The mobilization then provoked a sharp fall in the birth rate, and it appears to have remained relatively low during the revolution and the subsequent period of civil warfare. Registration data for 1926 and 1927 indicate birth rates of 43.5 and 43.0, respectively, and the actual rates may have been slightly higher because of possibly incomplete registration in some areas.[17]

Some data on birth rates, published intermittently, and " reverse-survival " estimates based on published summaries of 1939 census data lead to the inference that in 1930 and a few subsequent years the birth rate probably averaged little more than 30 per 1,000, a very sharp fall from the level observed only a few years previously. Those were years of a sharply accelerated tempo in farm collectivization and industrialization, involving large population displacements and changes in social relationships, which were not favourable to family-building. During those years there was wide resort to induced clinical abortions.[18]

Higher birth rates occurred again in the later 1930's; a rate as high as 38 per 1,000 was published for 1938,[19] but official data put the rate for 1940 at only 31.3. Explanations for a temporary rise in the birth rate during 1936-38 are not difficult to find. A more tranquil period began with the second five-year plan of national development, initiated in 1933. In 1936 a governmental decree was published which embodied a series of new laws favouring the welfare of mothers, children, and families, incidentally also prohibiting the performance of clinically induced abortions. The level to which the birth rate apparently recovered, and from which it later subsided again, indicates that the long term trend towards smaller family size was asserting itself over a period of time during which large strides were made in industrialization, urbanization, popular education and the rising status of women and diversification of their roles. The wide fluctuations about this trend should be regarded not only in the world-wide setting, but also in relation to periods of stress, especially at the early time of consolidation of the social revolution, and again under the impact of the first five-year plan when the measures for the construction of the socialistic society were particularly incisive.

Military mobilization in the Second World War, the devastation of large territories, and other war-time hardships produced another large war-time birth deficit, reflected in the relatively small number of adolescents enumerated at the 1959 census. The census data offer no evidence that the immediate post-war recovery of the birth rate was large. The birth rate was 26.7 in 1950, and fell gradually to 24.9 by 1960.

Ever since the First World War the Soviet population has had a deficit of adult males as compared with the number of women. In both wars, military casualties were heavy. This had less consequence in the late 1930's, when the number of women of reproductive ages was

[12] Frank Lorimer and others, *Culture and Human Fertility* (Paris, UNESCO, 1954), p. 34.

[13] Excluding the Maori population of New Zealand, for which statistics are tabulated separately.

[14] W. D. Borrie, *Population Trends and Policies*; A Study in Australian and World Demography (Sydney, Australasian Publishing Co., 1948), pp. 33 ff.

[15] Continuing series of official birth statistics are available only from 1950 onward. The 1960 *USSR Statistical Yearbook* shows a crude birth rate of 47.0 for 1913, 31.3 for 1940, and 26.7 for 1950, with no data for intervening years.

[16] Such endeavours have been made by Frank Lorimer in: *The Population of the Soviet Union: History and Prospects*, Geneva, League of Nations, 1946; and by Jean-Noël Biraben in: " Essai sur l'évolution démographique de l'U.R.S.S. ", op. cit., June 1958, pp. 29 ff.

[17] Frank Lorimer, *The Population of the Soviet Union . . .*, op. cit., estimated the 1926-1927 rate as 45.7 per 1,000, but considered the estimate as only approximate.

[18] Very high rates of abortion, especially in cities, were reported. A. Gens, " Iskustvennyj abort kak sotsialnobytovoe yavleniye ", *Bolshaya Meditsinskaya Entsiklopediya*, vol. I, cols. 40-47.

[19] Article by I. Sautin in *Pravda*, June 27, 1939.

more nearly matched by the number of men, since these cohorts were too young to have been victims of the First World War. Similarly, with the passing of time the effect of the Second World War losses of young men will pass into more advanced ages, though in 1959 it was evidently still considerable.[20] Gross reproduction rates calculated in relation to numbers of women have to be interpreted in the light of these varying shortages of men, which reduced marriage opportunities more severely for the women in the Soviet Union than in most other countries involved in the two wars.

According to one source the gross reproduction rate of the Soviet Union, or previously of the Russian Empire, can be calculated as 3.29 for years immediately preceding 1897, 2.64 for 1926, and 2.39 for 1938.[21] For the present study a rate of 1.39 has been calculated for 1960. If rates had been calculated on the basis of men, rather than women, those for 1926 and for 1959 would be noticeably increased, though not necessarily the ones for either 1897 or 1938. Also, in view of war-induced changes in age composition, the recent gradual subsiding of the birth rate may be consistent with the maintenance of constant, possibly even slightly rising, fertility of the groups in reproductive ages. It may therefore be presumed that the long secular decline of fertility in the Soviet Union has by now mostly run its course, resulting in stabilization at a level nearer to that found in Northern America and Oceania than to the low levels now prevailing in Western European countries.

[20] Of 1,000 men aged 16 years and over, 690 were married in 1939, and 695 in 1959. On the other hand, of 1,000 women aged 16 years and over, 605 were married in 1939, but only 522 in 1959, implying that, owing to the shortage of men, a much increased proportion of women was either unmarried or widowed in 1959, as compared with 1939. Data from P. G. Podyachikh, *Naselenie SSSR*, Moscow, 1961, p. 26.

[21] Frank Lorimer, *The Population of the Soviet Union...*, op. cit., p. 131. Rates calculated by "reverse-survival", from data of censuses taken in 1897, 1926 and 1939.

Chapter VII

AGE PATTERNS OF FERTILITY

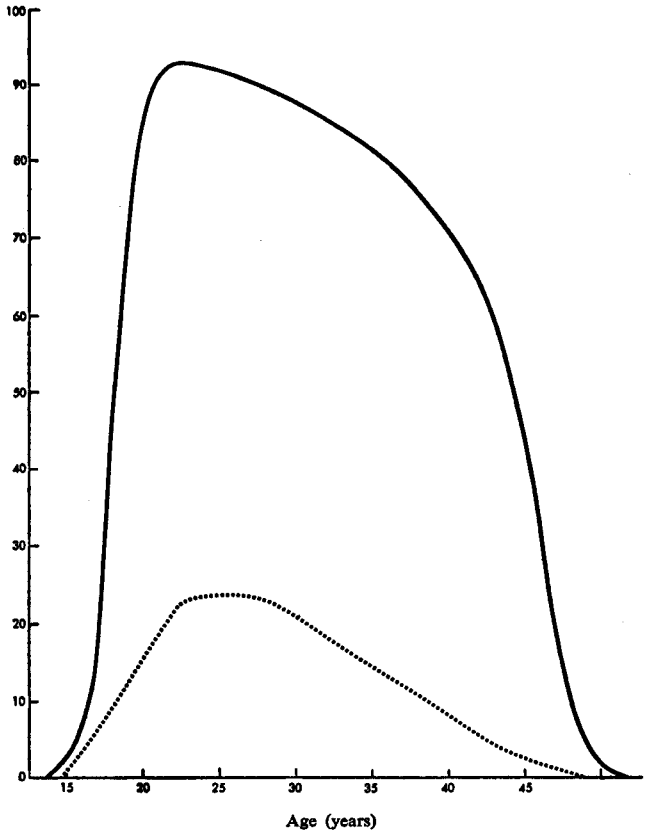
The reproductive age span of women is generally considered to extend over a period of about thirty-five years, from about age 15 to age 50, though very few women are able to bear children throughout this entire span. While only a small proportion of women are physiologically sterile throughout their lifetime, the great majority are sterile during some part of the earlier and later years in the reproductive age span. The proportions of women who are sterile at different ages are not known, but a hypothetical model of fecundity from a recent study,[1] reproduced in figure 7.1, shows the percentage of women capable of procreation rising from only about one per cent at age 14 to a maximum of 93 per cent at age 22, and then falling, at first gradually and then with increasing rapidity with advancing age, until at age 50 it is again only about one per cent.

Among the women of each age who are able to bear children, the annual proportion actually giving birth varies from one population to another, depending on many factors, among which are the customary age of women at marriage; the incidence of widowhood among women still of reproductive age and customs pertaining to remarriage of widows; and the extent to which married couples practise diverse forms of fertility control. A measure of the frequency of child-bearing among women in a given age group is provided by the number of births in a calendar year per 1,000 women in the given age group at the middle of the year. This measure is known as the *age-specific birth rate*. If the age-specific birth rates of a given population are plotted on a chart with ages of women on the horizontal axis, they form a bell-shaped curve, which can be called the age curve of fertility. The typical form of this curve is shown in figure 7.1, representing the average age-specific birth rates for 72 countries, along with the model of the age curve of fecundity mentioned above.

The rate of child-bearing is generally low at ages under 20, when relatively few women have entered into sexual unions. It rises to a peak at ages in the 20's, when a majority of women have married and fecundity is at a high level. Thereafter, the curve tapers off, rapidly in some populations and more gradually in others, depending on the incidence of sterility, the practice of family limitation, and other factors.

The form of the age curve of fertility varies among different populations, and may change, in any population, in the course of time. The variations of form of this curve, which are the subject of the present chapter,

Figure 7.1. Hypothetical fecundity model and average age-specific birth rates in 72 countries



——— Fecundity model (percentage of women of given age capable of procreation)
- - - - - - - - Fertility curve (annual births per 100 women of given age)

are significant in several ways. Even when the gross reproduction rate is the same in two populations, earlier child-bearing in one population may lead to a higher annual crude birth rate. For example, it has been shown that although Chinese women in Singapore have a slightly higher gross reproduction rate than Malaysian women, the earlier average start to child-bearing of the Malaysian women causes them to have a higher crude birth rate and a higher rate of increase than do the Chinese.[2] Such findings have a bearing on population policy,

[1] Frank Lorimer *et al., Culture and Human Fertility* (Paris, UNESCO, 1954), pp. 52-53.

[2] Ansley J. Coale and C. Y. Tye, "The Significance of Age-Patterns of Fertility in High Fertility Populations", *Milbank Memorial Fund Quarterly* (New York), vol. 39, October 1961, pp. 631-646.

since measures aimed at raising the average age at marriage might prove feasible as one means of reducing the rate of population growth in high-fertility countries where women now marry young. Analysis of age-patterns of fertility and factors associated with their variations may also be useful in providing a basis for estimating gross reproduction rates for populations lacking detailed data on births by age of mother.

A. Sources and limitations of data

Table 7.1 shows age-specific birth rates for 1960 or the most recent available date for 72 countries. Table 7.2 shows the rates for each age group expressed in terms of percentages of the sum of rates for all age groups; that is, the relative contribution of women in each age group to total fertility.

Among the 72 countries are 35 (and the white population of South Africa) with gross reproduction rates of 2.0 or below.[3] For all these countries of low fertility, the age-specific rates were calculated from registration statistics on births by age of mother[4] related to official estimates of the female population by age groups, many of them based on 1960 census age distributions.

Tables 7.1 and 7.2 also show data for 36 countries having gross reproduction rates above 2.0 (and for the coloured population of South Africa). These are the

[3] Of the low-fertility countries included in the present study, only Northern Ireland, Argentina and Uruguay lacked the necessary data for calculating age-specific birth rates for 5-year age groups of women, and are excluded from the analysis in this chapter.

[4] For all low-fertility countries except Greece, birth registration was reported to be complete, and for Greece the amount of under-registration was not very great.

Table 7.1. Age-specific birth rates: 1960 or most recent available date

(Births per 1,000 women in each age group)

Region and country	Year	Gross total fertility (sum of age-specific rates)	Age of women (in years)						
			15-19	20-24	25-29	30-34	35-39	40-44	45-49
Africa:									
Cameroon [a]	1960	955	195	237	202	153	104	52	12
Central African Republic:									
Central Ubangi	1959	813	108	247	194	139	82	28	15
Congo (Leopoldville)	1955-1957	993	136	265	232	168	92	70	30
Dahomey	1961	1371	197	336	306	254	166	86	26
Gabon	1960-1961	851	182	201	171	137	97	36	27
Guinea	1955	1399	240	335	310	246	171	69	28
Mauritius	1960	1150.3	123.8	291.6	282.9	220.0	168.8	57.0	6.2
Niger	1959-1960	1452	209	341	306	259	191	99	47
Réunion	1960	1276.3	63.4	250.8	321.8	296.1	224.7	108.5	11.0
South Africa:									
Coloured population	1959	1287.2	126.6	329.1	312.9	231.6	180.9	82.9	23.2
White population	1959	719.0	44.4	222.6	224.4	129.5	72.1	23.8	2.3
United Arab Republic:									
Egyptian region	1950-1955	1157.5	44.8	255.1	361.2	274.3	167.5	38.8	15.8
Upper Volta	1960-1961	1221	169	308	265	220	154	84	21
Northern America:									
Canada [b]	1961	777.3	59.7	233.0	223.9	145.9	84.0	28.4	2.4
United States	1960	728.9	87.8	257.0	198.4	113.2	56.2	15.4	0.9
Middle America:									
El Salvador	1961	1340.6	145.5	326.3	319.5	267.3	190.7	70.5	20.7
Guadeloupe	1960	1157.8	67.4	221.2	279.5	268.4	208.9	101.4	11.0
Guatemala	1948-1952	1350.5	164.5	290.4	302.8	269.3	198.9	89.6	35.0
Honduras	1961	1298.3	138.6	289.5	306.7	266.5	189.7	86.4	20.9
Jamaica	1956	994.1	134.4	284.6	256.3	173.5	100.9	38.0	6.5
Martinique	1960	1133.3	54.6	208.6	273.2	276.2	203.1	104.2	13.4
Mexico	1960	1284.3	104.9	299.3	314.2	270.9	200.0	74.0	21.0
Panama [c]	1960	1119.0	148.5	305.1	285.9	199.0	129.7	42.0	8.8
Puerto Rico	1960	933.2	96.7	279.8	235.0	155.0	107.5	50.2	9.0
Trinidad and Tobago	1960	1103.0	132.5	311.6	282.5	211.2	127.4	37.2	0.6
South America:									
British Guiana [d]	1956	1203.2	160.2	341.8	293.5	229.9	128.6	45.9	3.3
Chile	1960	910.1	77.0	179.1	230.8	223.7	126.0	59.3	14.2
Colombia	1941-1946	1207.0	99.0	287.7	312.9	247.2	171.5	67.4	21.3
Paraguay	1940-1945	1186.2	92.9	281.0	289.6	229.2	176.3	87.7	29.6
Venezuela	1960	1279.2	138.5	326.5	324.0	232.8	182.2	59.2	16.0

Table 7.1. Age-specific birth rates: 1960 or most recent available date (*continued*)

Region and country	Year	Gross total fertility (sum of age-specific rates)	Age of women (in years)						
			15-19	20-24	25-29	30-34	35-39	40-44	45-49
Asia:									
Ceylon	1953	1040.4	66.3	256.2	291.8	236.2	147.1	36.2	6.6
China (Taiwan)	1960	1154.8	48.9	254.3	334.4	255.7	169.8	79.0	12.7
Cyprus	1960	702.9	31.5	182.4	209.7	133.8	106.3	31.9	7.3
Federation of Malaya	1956-1958	1327.6	120.4	328.4	338.4	260.3	177.6	80.0	22.5
India	1958-1959	1038.4	145.2	263.4	244.3	188.3	127.8	49.6	19.8
Israel: Jewish population	1960	700.9	47.8	211.1	213.1	134.7	69.4	20.6	4.2
Japan	1960	402.0	4.3	106.8	180.9	80.5	23.9	5.2	0.4
Philippines	1950-1955	1447.6	65.1	335.9	366.1	320.1	226.9	107.5	26.0
Ryukyu Islands	1960	637.8	10.4	115.9	192.4	160.9	110.6	42.5	5.1
Sarawak	1950-1955	1410.2	112.5	343.5	340.1	281.3	209.5	98.2	25.1
Singapore [e]	1957	1312.5	78.0	302.5	354.6	289.5	194.8	81.3	11.8
Thailand	1950-1955	1331.0	53.1	269.3	324.6	282.5	246.3	121.6	33.6
Europe:									
Northern and Western Europe:									
Belgium	1960	509.6	25.6	151.6	162.8	100.7	50.4	17.4	1.1
Denmark [f]	1960	508.7	41.8	170.7	157.6	87.7	38.7	11.5	0.7
Finland	1960	530.4	28.6	158.0	152.8	102.5	61.1	25.0	2.4
France	1960	545.7	22.4	161.3	175.7	108.8	55.1	21.1	1.3
Ireland	1959	750.0	7.4	84.2	217.6	219.3	164.6	52.5	4.4
Luxembourg	1960	446.7	23.9	143.4	138.2	90.1	37.7	12.4	1.0
Netherlands	1960	621.4	16.3	120.1	208.1	152.5	88.5	33.1	2.8
Norway	1960	569.0	26.5	163.0	172.6	117.5	63.2	24.0	2.2
Sweden	1960	434.4	34.6	128.7	136.7	82.6	38.8	12.2	0.8
United Kingdom:									
England and Wales	1960	532.9	34.2	165.5	171.8	100.6	46.2	13.8	0.8
Scotland	1960	578.3	32.2	176.0	184.9	112.7	56.1	15.5	0.9
Central Europe:									
Austria	1960	527.6	48.7	166.8	145.8	93.6	56.1	15.5	1.1
Czechoslovakia	1960	478.8	46.0	198.7	131.8	63.8	29.1	8.8	0.6
Germany:									
Eastern Germany	1960	475.6	74.8	169.6	124.9	67.6	31.0	7.4	0.3
Federal Republic of Germany	1960	486.6	23.4	129.8	161.3	101.8	51.2	18.1	1.0
Hungary	1960	400.4	50.8	156.6	105.7	53.4	25.0	8.4	0.5
Poland	1960	594.1	48.3	203.4	164.0	99.6	55.7	20.9	2.2
Switzerland	1960	467.1	16.0	124.3	151.4	102.5	53.6	18.0	1.3
Southern Europe:									
Albania	1960	1390.3	67.7	291.8	327.3	285.4	212.4	142.5	63.2
Bulgaria	1960	461.5	75.0	187.2	120.1	51.3	19.7	7.2	1.0
Greece	1960	444.0	17.5	105.8	151.0	108.3	46.3	13.0	2.1
Italy	1960	474.1	19.1	107.7	151.6	109.6	61.6	22.6	1.9
Malta and Gozo	1960	723.8	22.4	198.1	200.8	150.4	105.0	41.8	5.3
Portugal	1960	636.0	26.5	152.5	181.0	133.1	95.7	43.1	4.1
Romania	1960	470.1	59.2	165.9	122.1	67.9	39.8	13.7	1.5
Spain	1960	564.1	9.4	107.3	189.9	143.8	80.7	29.5	3.5
Yugoslavia	1960	566.9	51.1	179.3	158.8	94.5	52.1	25.5	5.6
Oceania									
Australia [g]	1960	690.5	44.2	220.5	216.2	127.2	62.8	18.3	1.3
Fiji Islands	1946-1951	1440.3	173.2	381.9	359.5	247.0	183.4	68.1	27.2
New Zealand: European population	1960	806.4	44.1	252.4	259.0	152.3	76.1	20.8	1.6
USSR									
USSR (Union of Soviet Socialist Republics)	1960-1961	559.7	35.2	164.8	160.7	110.0	60.7	23.5	4.8

[a] Data are for 5 provinces of North Cameroon.

[b] Excluding Newfoundland.

[c] Excluding tribal Indian population (except in provinces of Bocas del Toro and Darién) and data for Canal Zone.

[d] Excluding Amerindians.

[e] Excluding non-locally domiciled population.

[f] Excluding Faeroe Islands and Greenland.

[g] Excluding aborigines.

Table 7.2. Relative contribution of women in each age group to gross total fertility: 1960 or most recent available date

(Per cent distribution of age-specific birth rates)

Region and country	Year	Total	Age of women (in years)						
			15-19	20-24	25-29	30-34	35-39	40-44	45-49
Africa:									
Cameroon [a]	1960	100	20.4	24.8	21.2	16.0	10.9	5.4	1.3
Central African Republic: Central Ubangi	1959	100	13.3	30.4	23.9	17.1	10.1	3.4	1.8
Congo (Leopoldville)	1955-1957	100	13.7	26.7	23.4	16.9	9.3	7.0	3.0
Dahomey	1961	100	14.4	24.5	22.3	18.5	12.1	6.3	1.9
Gabon	1960-1961	100	21.4	23.6	20.1	16.1	11.4	4.2	3.2
Guinea	1955	100	17.2	23.9	22.2	17.6	12.2	4.9	2.0
Mauritius	1960	100	10.8	25.3	24.6	19.1	14.7	5.0	0.5
Niger	1959-1960	100	14.4	23.5	21.1	17.8	13.2	6.8	3.2
Réunion	1960	100	5.0	19.6	25.2	23.2	17.6	8.5	0.9
South Africa:									
Coloured population	1959	100	9.8	25.6	24.3	18.0	14.1	6.4	1.8
White population	1959	100	6.2	31.0	31.2	18.0	10.0	3.3	0.3
United Arab Republic: Egyptian region	1950-1955	100	3.9	22.0	31.2	23.7	14.5	3.4	1.3
Upper Volta	1960-1961	100	13.8	25.2	21.7	18.0	12.6	6.9	1.7
Northern America:									
Canada [b]	1961	100	7.7	30.0	28.8	18.8	10.8	3.7	0.3
United States	1960	100	12.0	35.3	27.2	15.5	7.7	2.1	0.1
Middle America:									
El Salvador	1961	100	10.9	24.3	23.8	20.0	14.2	5.3	1.5
Guadeloupe	1960	100	5.8	19.1	24.1	23.2	18.0	8.8	1.0
Guatemala	1948-1952	100	12.2	21.5	22.4	19.9	14.7	6.6	2.6
Honduras	1961	100	10.7	22.3	23.6	20.5	14.6	6.7	1.6
Jamaica	1956	100	13.5	28.6	25.8	17.5	10.1	3.8	0.7
Martinique	1960	100	4.8	18.4	24.1	24.4	17.9	9.2	1.2
Mexico	1960	100	8.2	23.3	24.5	21.1	15.6	5.8	1.6
Panama [c]	1960	100	13.3	27.2	25.5	17.8	11.6	3.8	0.8
Puerto Rico	1960	100	10.4	30.0	25.2	16.6	11.5	5.4	1.0
Trinidad and Tobago	1960	100	12.0	28.3	25.6	19.1	11.6	3.4	0.1
South America:									
British Guiana [d]	1956	100	13.3	28.4	24.4	19.1	10.7	3.8	0.3
Chile	1960	100	8.5	19.7	25.3	24.6	13.8	6.5	1.6
Colombia	1941-1946	100	8.2	23.8	25.9	20.5	14.2	5.6	1.8
Paraguay	1940-1945	100	7.8	23.7	24.4	19.3	14.9	7.4	2.5
Venezuela	1960	100	10.8	25.5	25.3	18.2	14.3	4.6	1.3
Asia									
Ceylon	1953	100	6.4	24.6	28.0	22.7	14.1	3.5	0.6
China (Taiwan)	1960	100	4.2	22.0	29.0	22.1	14.7	6.8	1.1
Cyprus	1960	100	4.5	26.0	29.8	19.0	15.1	4.6	1.0
Federation of Malaya	1956-1958	100	9.1	24.7	25.5	19.6	13.4	6.0	1.7
India	1958-1959	100	14.0	25.4	23.5	18.1	12.3	4.8	1.9
Israel: Jewish population	1960	100	6.8	30.1	30.4	19.2	9.9	3.0	0.6
Japan	1960	100	1.1	26.6	45.0	20.0	5.9	1.3	0.1
Philippines	1950-1955	100	4.5	23.2	25.3	22.1	15.7	7.4	1.8
Ryukyu Islands	1960	100	1.6	18.2	30.2	25.2	17.3	6.7	0.8
Sarawak	1950-1955	100	8.0	24.4	24.1	19.9	14.9	7.0	1.8
Singapore [e]	1957	100	6.0	23.0	27.0	22.1	14.8	6.2	0.9
Thailand	1950-1955	100	4.0	20.2	24.4	21.2	18.5	9.1	2.5
Europe:									
Northern and Western Europe:									
Belgium	1960	100	5.0	29.7	31.9	19.8	9.9	3.4	0.2
Denmark [f]	1960	100	8.2	33.6	31.0	17.2	7.6	2.3	0.1
Finland	1960	100	5.4	29.8	28.8	19.3	11.5	4.7	0.5
France	1960	100	4.1	29.6	32.2	19.9	10.1	3.9	0.2
Ireland	1959	100	1.0	11.2	29.0	29.2	21.9	7.0	0.6
Luxembourg	1960	100	5.4	32.1	30.9	20.2	8.4	2.8	0.2
Netherlands	1960	100	2.6	19.3	33.5	24.5	14.2	5.3	0.5

Table 7.2. Relative contribution of women in each age group to gross total fertility: 1960 or most recent available date (*continued*)

Region and country	Year	Total	Age of women (in years)						
			15-19	20-24	25-29	30-34	35-39	40-44	45-49
Europe *(continued)*									
Norway	1960	100	4.7	28.6	30.3	20.7	11.1	4.2	0.4
Sweden	1960	100	7.9	29.6	31.5	19.1	8.9	2.8	0.2
United Kingdom:									
England and Wales	1960	100	6.4	31.1	32.2	18.9	8.7	2.6	0.1
Scotland	1960	100	5.6	30.4	32.0	19.5	9.7	2.7	0.1
Central Europe:									
Austria	1960	100	9.3	31.6	27.6	17.8	10.6	2.9	0.2
Czechoslovakia	1960	100	9.6	41.5	27.5	13.3	6.1	1.9	0.1
Germany:									
Eastern Germany	1960	100	15.7	35.7	26.3	14.2	6.5	1.5	0.1
Federal Republic of Germany	1960	100	4.8	26.7	33.2	20.9	10.5	3.7	0.2
Hungary	1960	100	12.7	39.1	26.4	13.3	6.3	2.1	0.1
Poland	1960	100	8.1	34.2	27.6	16.8	9.4	3.5	0.4
Switzerland	1960	100	3.4	26.6	32.4	21.9	11.5	3.9	0.3
Southern Europe:									
Albania	1960	100	4.9	21.0	23.5	20.5	15.3	10.3	4.5
Bulgaria	1960	100	16.3	40.6	26.0	11.1	4.3	1.6	0.2
Greece	1960	100	3.9	23.8	34.0	24.4	10.4	2.9	0.5
Italy	1960	100	4.0	22.7	32.0	23.1	13.0	4.8	0.4
Malta and Gozo	1960	100	3.1	27.4	27.7	20.8	14.5	5.8	0.7
Portugal	1960	100	4.2	24.0	28.5	20.9	15.0	6.8	0.6
Romania	1960	100	12.6	35.3	26.0	14.4	8.5	2.9	0.3
Spain	1960	100	1.7	19.0	33.7	25.5	14.3	5.2	0.6
Yugoslavia	1960	100	9.0	31.6	28.0	16.7	9.2	4.5	1.0
Oceania:									
Australia [g]	1960	100	6.4	31.9	31.3	18.4	9.1	2.7	0.2
Fiji Islands	1946-1951	100	12.0	26.5	25.0	17.1	12.7	4.7	1.9
New Zealand: European population	1960	100	5.5	31.3	32.1	18.9	9.4	2.6	0.2
USSR:									
USSR (Union of Soviet Socialist Republics)	1960-1961	100	6.3	29.4	28.7	19.7	10.8	4.2	0.9

[a] Data are for 5 provinces of North Cameroon.

[b] Excluding Newfoundland.

[c] Excluding tribal Indian population (except in provinces of Bocas del Toro and Darién) and data for Canal Zone.

[d] Excluding Amerindians.

[e] Excluding non-locally domiciled population.

[f] Excluding Faeroe Islands and Greenland.

[g] Excluding aborigines.

high fertility countries having data of fairly satisfactory quality for studying the patterns of age-specific birth rates.[5] For nineteen countries (and the coloured population of South Africa) data on births by age of mother were derived from "complete" birth registration statistics,[6] for nine countries from sample surveys and for eight countries from incomplete registration statistics. For the latter countries with one exception,[7] the age-specific birth rates derived from incomplete registration statistics were adjusted to the level of fertility estimated by the "reverse-survival" method. This procedure is based on the assumption that under-registration is proportionally the same for births to women of all age groups. Little information is available on differentials in birth under-registration for different age groups of women.[8]

For nineteen of the thirty-six high-fertility countries listed in the tables, census data on the number of females in the reproductive age groups were available for calculating the age-specific birth rates. For eight countries and for the coloured population of South Africa, offi-

[5] Distributions of age-specific birth rates available for some additional high fertility countries were excluded for a variety of reasons. For example, rates available for Angola, Brazil and Mozambique were derived from census data on lifetime births to women of different age groups and hence are not comparable with the rates for other countries. Age-specific birth rates derived from sample surveys in small areas of Ivory Coast, Mali and Senegal were considered possibly unrepresentative of their countries; rates for Bolivia and Korea, based on incomplete registration data, gave evidence of exaggerations at the older ages; and those for Nicaragua were computed on a population base of unknown origin.

[6] Birth registration in Albania is assumed to have been complete in recent years.

[7] The exception is Honduras, where registration was not believed to be greatly deficient. In this case the age-specific birth rates derived from registration data are shown in table 7.1, without adjustment.

[8] See chapter II.

cial population estimates for intercensal years were used in deriving the birth rates, and for nine other countries the population figures were derived from sample surveys which also furnished the data on births.

The sources of the data on births by age of mother and female population by age groups are summarized for high-fertility countries by regions in table 7.3.

Errors in the pattern of age-specific birth rates may result from biases in age reporting. Both the registration data and the census reports are subject to errors in the reporting of women's ages, but since the age-specific birth rates computed from such data generally form a smooth curve, it is believed that the biases are similar in the two sets of data, and hence tend to offset each other. Where the age-specific birth rates are based on population estimates by age groups for some years distant from the census, the chances of error are greater than when the rates pertain to a census year, since the biases of understatement or overstatement present in the census data are likely to be transferred to older age groups in the estimation process.[9]

Another possibility of error stems from the long delays in birth registration which are common in some of the high-fertility countries. It may be that in such circumstances the age of mother reported on the registration form corresponds to the date of registration rather than to the date of the child's birth. Errors of this type may possibly account for some of the seemingly exaggerated birth rates for women past age 40 in a few countries.

B. Types of age patterns of fertility

The measures of relative frequency of child-bearing at different ages for the seventy-two countries listed in table 7.2 show dissimilarities in the form of the age curve of fertility between low-fertility and high-fertility countries, as well as variations within each of these groups. The differences can be described mainly in terms of two variables: the age at which the age-specific birth rate is at a maximum, and the degree of concentration of fertility in age groups at or near the peak.

1. *Peak age of fertility*

Three major types are discernible with respect to the peak age of fertility: an early-peak type in which the maximum fertility occurs in the age group 20-24 years, a late-peak type in which the maximum is in the age group 25-29 years, and a broad-peak type in which the age-specific birth rates for women 20-24 and 25-29 years of age differ only slightly, while greatly exceeding the rates for younger and older groups. Of the seventy-two countries for which data are available, only Ireland does not conform to any of these types. In Ireland, where women marry very late, the peak fertility rates occur in the groups 25-29 and 30-34 years, the rates for these two groups being approximately equal.

No great difference is apparent between countries of low and high fertility in their distributions by peak ages of fertility. Of the 35 low-fertility countries (gross reproduction rate below 2.0) other than Ireland, 9 belong to the early-peak, 10 to the late-peak, and 16 to the broad-peak type. Of the high-fertility countries, 15 are of the early-peak, 13 of the broad-peak, and 9 of the late-peak type.

2. *Degree of concentration of fertility at peak ages*

In low-fertility countries, women's child-bearing tends to be concentrated in a narrower range of ages than it is in high-fertility countries. This difference is brought out by the comparison in table 7.4, which shows distributions of high- and low-fertility countries (and also of countries in each region of the world) according to the proportions of gross total fertility contributed by women in three broad age groups. As a rule, 75 per cent or more of total fertility in countries with gross reproduction rates below two results from births to women between 20 and 34 years of age, whereas only two of the high-fertility countries showed such a high concentration at these ages. In nearly all the high-fertility

[9] For example, if age group 20-24 was over-enumerated at the census, this error would be transferred to the group 25-29 in population estimates for a date five years later. Such errors might be at least partly eliminated by smoothing the census age data, but this would not result in a commensurate improvement in accuracy of the age-specific birth rates unless the birth registration reports on age of mother were smoothed as well.

Table 7.3. Sources of data for computing age-specific birth rates in high-fertility countries

(Gross reproduction rates above 2.0)

Region	Number of countries	Source of data on births by age of mother			Source of data on female population by age groups		
		"Complete" registration data	Incomplete registration data	Sample survey data	Census age data	Official estimates for intercensal years	Sample survey data
Total	37 [a]	20 [a]	8	9	19	9 [a]	9
Africa	12 [a]	3 [a]	1	8	1	3 [a]	8
Asia	8	4	3	1	6	1	1
Latin America	15	12	3	—	10	5	—
Europe and Oceania .	2	1	1	—	2	—	—

[a] Including the coloured population of South Africa.

Table 7.4. Distribution of 72 countries according to per cent contribution to gross total fertility of women in three broad age groups

Level of fertility and geographical region	Total number of countries	Countries with women under age 20 contributing to gross total fertility: Below 10 per cent	Countries with women under age 20 contributing to gross total fertility: 10 per cent or more	Countries with women aged 20-34 contributing to gross total fertility: Below 75 per cent	Countries with women aged 20-34 contributing to gross total fertility: 75 per cent or more	Countries with women aged 35-49 contributing to gross total fertility: Below 15 per cent	Countries with women aged 35-49 contributing to gross total fertility: 15 per cent or more
Level of fertility							
Gross reproduction rate 2.1-3.5	37 [a]	17	20	35	2	2	35
Gross reproduction rate 1.0-2.0	36 [b]	31	5	4	32	24	12
Geographical region:							
Africa	13 [c]	4	9	11	2	1	12
Asia	12	11	1	9	3	2	10
Middle and South America	15	6	9	15	—	2	13
Europe	27	23	4	3	24	17	10
Northern America	2	1	1	—	2	2	—
Oceania	3	2	1	1	2	2	1
USSR	1	1	—	—	1	—	1

Source: Data of table 7.2.

[a] Including the coloured population of South Africa.

[b] Including the white population of South Africa.

[c] Including the coloured and white populations of South Africa, tabulated separately.

countries, on the other hand, women past 35 years of age account for 15 per cent or more of total fertility, while a smaller contribution at these ages is usual in low-fertility countries. The contribution of young women under 20 to total fertility was also much greater, on average, in the high-fertility countries than in those with low gross reproduction rates. The latter finding reflects mainly the later average age at marriage in the low-fertility countries.

Japan stands out among the countries of low fertility with an extraordinarily high concentration of fertility in the peak age group of 25 to 29 years, this age group accounting for 45 per cent of the total Japanese fertility. Five other low-fertility countries are exceptional for the high proportion of fertility contributed by women under 20 years of age, namely, Bulgaria, Eastern Germany, Hungary, Romania and the United States, each with 12 per cent or more of total fertility attributable to women under 20 years of age. At the other extreme are five low-fertility countries — Ireland, Malta and Gozo, the Netherlands, Portugal and Spain — in which women 35 years of age and over contributed 20 per cent or more of total fertility.

In spite of these variations, the data for low-fertility countries in general show a remarkable homogeneity of age patterns of fertility among those assigned to each of the three major groups in terms of the peak age. Only Japan, in the late-peak group, is set apart as a case almost *sui generis* by the extremely high proportion of fertility contributed by women in the age group 25-29. In this case, late marriage and widespread use of fertility control measures within marriage have combined to sharply reduce birth rates at the youngest and oldest reproductive ages. With this exception, no distinct subtypes are identifiable among the three types of age patterns of fertility defined with reference to the peak age, for countries of low fertility. Moreover, each of these three groups of low-fertility countries is distinct from the other two in a statistical sense, as shown by the tests of significance of differences among the three groups with respect to the percentage of total fertility contributed by women in each age group (table 7.5). For all age groups up to 45 years, the differences are significant at the 5 per cent level, with the exception of the values for the 25-29 age group as between the broad-peak and late-peak models.[10]

Among the high-fertility countries, on the other hand, there is less homogeneity of age patterns within the three major types defined with reference to the peak age of fertility. The early-peak and late-peak types of high-fertility patterns can each be divided into two clear-cut sub-types with reference to degree of concentration at the peak ages and skewness of the age distribution of fertility rates. Within the early-peak type, sub-type A, with eight cases, consists of countries having particularly high fertility in the age group under 20 years, while sub-type B, with seven cases, has a higher degree of concentration of fertility at the peak age of 20-24 years. Within the late-peak type, sub-group A consists of four cases with a high degree of concentration in the peak age group (25-29 years) and considerable skewness, while sub-group B, with five cases, exhibits less concentration and little skewness. The differences between the mean values for at least four of the seven age groups are significant between the two pairs of sub-types in the early-peak and late-peak patterns of high fertility.

[10] In addition, the t value for age group 40-44 in the comparison of early-peak and broad-peak types is just short of the 5 per cent level of significance.

Table 7.5. Test of significance of differences between average percentages of gross total fertility contributed by women in each age group for different types of age patterns

Age of women	Degrees of freedom	Observed value of t	Closest values from table of t: Value	Closest values from table of t: Level of significance
Low-fertility patterns				
(*a*) Difference between two means of Early-Peak and Broad-Peak types				
15-19	23	6.75	3.77	.001
20-24	23	5.71	3.77	.001
25-29	23	7.08	3.77	.001
30-34	23	7.38	3.77	.001
35-39	23	3.32	3.10	.005
40-44	23	1.99	2.07	.05
45-49	23	0.00	—	—
(*b*) Difference between two means of Early-Peak and Late-Peak types				
15-19	16	7.84	4.02	.001
20-24	16	8.04	4.02	.001
25-29	16	6.94	4.02	.001
30-34	16	7.72	4.02	.001
35-39	16	5.78	4.02	.001
40-44	16	4.22	4.02	.001
45-49	16	1.56	1.75	.10
(*c*) Difference between two means of Broad-Peak and Late-Peak types				
15-19	23	4.59	3.77	.001
20-24	23	7.80	3.77	.001
25-29	23	1.75	1.71	.10
30-34	23	5.46	3.77	.001
35-39	23	4.49	3.77	.001
40-44	23	3.31	3.10	.005
45-49	23	2.00	2.07	.05
High-fertility patterns				
(*d*) Difference between two means of Early Peak, Types A and B				
15-19	13	2.94	3.01	.01
20-24	13	5.96	4.22	.001
25-29	13	6.35	4.22	.001
30-34	13	0.80	0.87	.40
35-39	13	1.06	1.08	.30
40-44	13	3.67	3.37	.005
45-49	13	3.76	3.37	.005
(*e*) Difference between two means of Early Peak, Type A, and Broad Peak				
15-19	19	6.12	3.88	.001
20-24	19	1.67	1.73	.10
25-29	19	5.35	3.88	.001
30-34	19	5.28	3.88	.001
35-39	19	7.20	3.88	.001
40-44	19	1.17	1.19	.25
45-49	19	1.03	1.07	.30
(*f*) Difference between two means of Early Peak, Type A, and Late Peak, Type A				
15-19	10	6.67	4.59	.001
20-24	10	2.62	2.63	.025
25-29	10	8.14	4.59	.001
30-34	10	9.74	4.59	.001
35-39	10	4.28	4.59	.001
40-44	10	0.98	1.09	.30
45-49	10	3.29	3.17	.01

Table 7.5. Test of significance of differences between average percentages of gross total fertility contributed by women in each age group for different types of age patterns (*continued*)

Age of women	Degrees of freedom	Observed value of t	Closest values from table of t: Value	Closest values from table of t: Level of significance
(*g*) Difference between two means of Early Peak, Type A, and Late Peak, Type B				
15-19	11	6.85	4.44	.001
20-24	11	9.78	4.44	.001
25-29	11	4.77	4.44	.001
30-34	11	9.34	4.44	.001
35-39	11	6.30	4.44	.001
40-44	11	4.14	4.44	.001
45-49	11	2.22	2.20	.05
(*h*) Difference between two means of Early Peak, Type B, and Broad Peak				
15-19	18	3.83	3.92	.001
20-24	18	7.11	3.92	.001
25-29	18	1.70	1.73	.10
30-34	18	4.16	3.92	.001
35-39	18	9.86	3.92	.001
40-44	18	4.24	3.92	.001
45-49	18	2.49	2.44	.025
(*i*) Difference between two means of Early Peak, Type B, and Late Peak, Type A				
15-19	9	9.99	4.78	.001
20-24	9	6.67	4.78	.001
25-29	9	5.00	4.78	.001
30-34	9	8.50	4.78	.001
35-39	9	6.67	4.78	.001
40-44	9	1.34	1.38	.20
45-49	9	0.27	0.26	.80
(*j*) Difference between two means of Early Peak, Type B, and Late Peak, Type B				
15-19	10	8.37	4.59	.001
20-24	10	13.39	4.59	.001
25-29	10	1.31	1.37	.20
30-34	10	8.17	4.59	.001
35-39	10	7.27	4.59	.001
40-44	10	8.30	4.59	.001
45-49	10	1.26	1.22	.25
(*k*) Difference between two means of Broad Peak and Late Peak, Type A				
15-19	15	3.09	2.95	.01
20-24	15	0.98	1.07	.30
25-29	15	6.54	4.07	.001
30-34	15	4.64	4.07	.001
35-39	15	0.59	0.54	.60
40-44	15	1.72	1.75	.10
45-49	15	1.87	1.75	.10
(*l*) Difference between two means of Broad Peak and Late Peak, Type B				
15-19	16	2.87	2.92	.01
20-24	16	6.22	4.02	.001
25-29	16	0.43	0.39	.70
30-34	16	5.47	4.02	.001
35-39	16	4.30	4.02	.001
40-44	16	2.63	2.58	.02
45-49	16	1.09	1.07	.30
(*m*) Difference between two means of Late Peak, Types A and B				
15-19	7	0.48	0.55	.60
20-24	7	5.47	5.40	.001
25-29	7	4.98	5.40	.001
30-34	7	0.92	0.90	.40
35-39	7	2.77	2.84	.025
40-44	7	3.53	3.50	.01
45-49	7	1.12	1.12	.30

C. Model age patterns of fertility

The average per cent distributions of age-specific birth rates for countries assigned to each type and sub-type of age pattern of fertility are tabulated in table 7.6. These average distributions can be used as models of the corresponding fertility patterns. Thus a set of eight models is provided: three for low-fertility and five for high-fertility populations. A ninth model is furnished by the general average distribution of the rates for all seventy-two countries covered by this study, which also appears in table 7.6. The eight models for low- and high-fertility populations are charted in figure 7.2.

These are empirical models, in contrast with the theoretical models of fertility and its distribution by

Table 7.6. Model age patterns of fertility

(Mean per cent distributions of age-specific birth rates for groups of countries classified according to model type, and standard deviations of values about the mean for each age group)

Model type	Number of countries	Total fertility	Age of women (in years)						
			15-19	20-24	25-29	30-34	35-39	40-44	45-49
General pattern	72	Mean: 100	8.9	25.6	26.3	19.7	12.9	5.3	1.3
Low-fertility patterns:									
Early peak	9	Mean: 100	11.7	36.1	27.0	14.8	7.6	2.6	0.3
		S.D:	2.78	3.40	0.73	1.99	1.88	0.93	0.28
Broad peak	16	Mean: 100	5.9	30.4	30.7	19.3	10.0	3.4	0.3
		S.D.:	1.33	1.43	1.40	0.91	1.53	0.92	0.23
Late peak	9 [a]	Mean: 100	3.4	22.9	31.9	22.8	13.5	4.9	0.5
		S.D.:	1.11	3.16	1.86	2.14	2.19	1.23	0.23
High-fertility patterns:									
Early peak:									
Type A	8	Mean: 100	16.2	24.7	21.9	17.4	11.8	5.8	2.3
		S.D.:	2.94	1.00	1.09	0.88	1.13	1.03	0.70
Type B	7	Mean: 100	12.5	28.5	25.1	17.8	11.2	4.0	0.9
		S.D.:	1.06	1.29	0.64	0.92	0.87	0.68	0.64
Broad peak	13	Mean: 100	8.9	23.7	24.4	19.9	14.7	6.5	1.9
		S.D.:	2.23	1.41	0.92	1.07	0.62	1.39	0.89
Late peak:									
Type A	4	Mean: 100	5.1	22.9	28.8	22.6	14.5	5.0	1.0
		S.D.:	1.09	1.06	1.56	0.60	0.27	1.54	0.26
Type B	5	Mean: 100	5.6	19.4	24.6	23.3	17.2	8.4	1.4
		S.D.:	1.55	0.61	0.53	1.21	1.70	0.99	0.58

Source: Computed from data in table 7.2. Means are unweighted. S.D. = standard deviation.

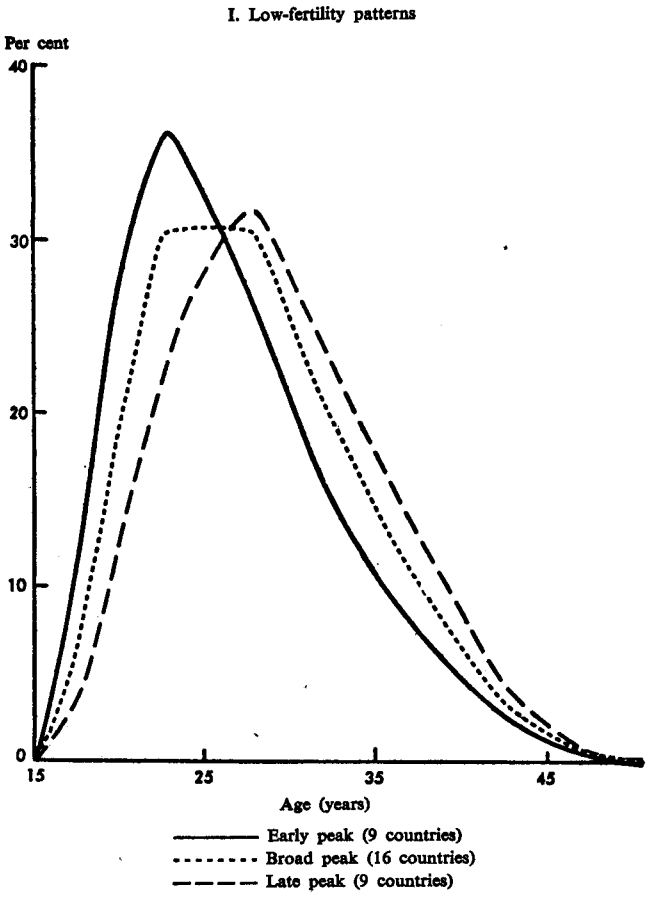
[a] Excluding Ireland and Japan.

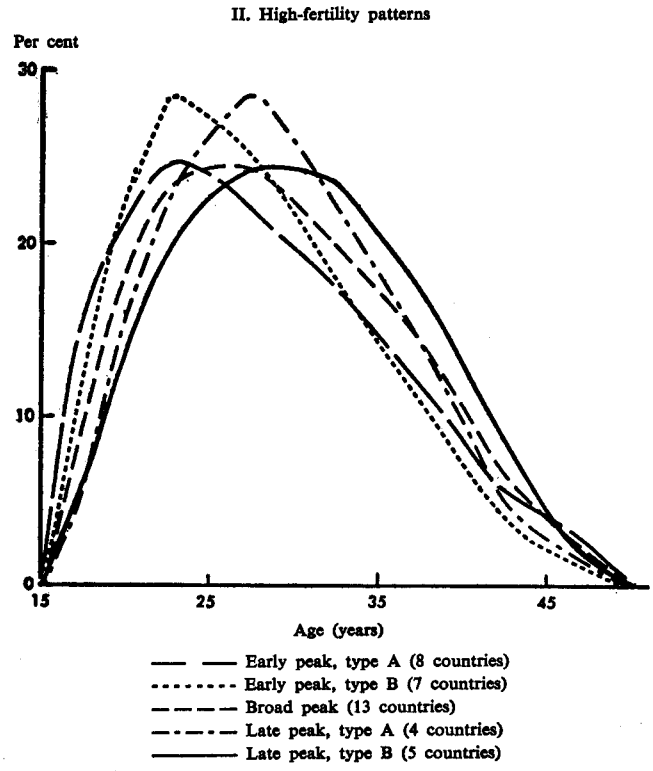
Table 7.7. Selected parameters of mean per cent distributions of age-specific birth rates for different model types

Model type	Number of countries	Gross reproduction rate	Mean age of child-bearing (years)	Standard deviation from the mean (years)	Asymmetry or skewness	Kurtosis
Low-fertility patterns:						
Early peak	9	1.28	26.48	5.992	.57	3.11
Broad peak	16	1.47	27.93	5.910	.33	2.80
Late peak	9	1.36	29.34	5.995	.18	2.60
High-fertility patterns:						
Early peak:						
Type A	8	2.83	28.03	7.641	.27	2.45
Type B	7	2.65	27.62	6.766	.28	2.61
Broad peak	13	3.18	29.25	7.184	.14	2.38
Late peak:						
Type A	4	2.84	29.38	6.378	.14	2.56
Type B	5	2.83	30.40	6.895	.03	2.28

Figure 7.2. Model age patterns of fertility

(Mean per cent of total fertility contributed by women in each 5-year age group)





age, calculated in some recent studies by assuming theoretical values for various biological and cultural determinants. Empirical models such as those presented here may be used as an aid in estimating the gross reproduction rate and other demographic quantities for populations lacking adequate data for computation of age-specific birth rates. In selecting an appropriate model for the purpose of such estimates with regard to a given country, it may be helpful to take into account the results of the analysis in later sections of this chapter, on the geographical distribution of populations exhibiting each type of age pattern of fertility and on the roles of age at marriage and other factors in determining these patterns. Future studies may provide a basis for modifying and extending these models and throw further light on their applicability in different situations.

Some other parameters of these model distributions are shown in table 7.7, which also gives the average gross reproduction rate for populations classified as belonging to the different types. It is seen that for both high-fertility and low-fertility countries, a broad-peak type of curve tends to be associated with the highest gross reproduction rates, and not much difference appears between the average fertility levels of countries having early- and late-peak curves.

D. Geographical distribution of types of age patterns

Table 7.8 shows a classification of countries by type of distribution of age-specific birth rates. Among the low-fertility countries, those having an early fertility pattern are found for the most part in central and southern Europe: Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, Romania and Yugoslavia. Generally, births to women aged 20-24 years account for 35-40 per cent of total fertility in these countries. Age of marriage tends to be somewhat earlier than in north-west-central Europe. In addition, the recent liberalization of abortion laws in these countries has led to a rapid reduction of fertility of older women. Austria and the United States also have fertility patterns of this type. Early marriage in the latter country, as well as a widespread practice of birth control and an early completion of family building help to explain the pattern.

The most common fertility pattern in northern and western Europe and among overseas populations of European origin (except in the United States) is the broad-peak type. The Soviet Union also belongs to this type. For most of these countries, average age at marriage of women is higher than in the first group.

Late-peak fertility patterns are found more frequently in southern Europe (Greece, Italy, Portugal and Spain), than in other regions of low fertility. In north-west-central Europe only the Federal Republic of Germany, Ireland, the Netherlands and Switzerland have this kind of curve. Three of the four low-fertility countries in Asia (Cyprus, Japan and the Ryukyu Islands) also belong to the late-peak type. In Japan and the Ryukyu

Table 7.8. Classification of countries according to type of fertility age curve

Region	Low-fertility countries			High-fertility countries				
				Early peak			Late peak	
	Early peak	Broad peak	Late peak	Type A	Type B	Broad peak	Type A	Type B
Africa		South Africa: white population		Cameroon Congo (Leopoldville) Dahomey Gabon Guinea Niger Upper Volta	Central African Republic: Central Ubangui	Mauritius South Africa: coloured population	UAR: Egypt	Réunion
Northern America	United States	Canada						
Middle America					Jamaica Panama Puerto Rico Trinidad and Tobago	El Salvador Guatemala Honduras Mexico		Guadeloupe Martinique
South America					British Guiana	Colombia Paraguay Venezuela		Chile
Asia		Israel: Jewish population	Cyprus Japan Ryukyu Islands	India		Federation of Malaya Philippines Sarawak	Ceylon Singapore China: Taiwan	Thailand
Europe:								
Northern and Western Europe		Belgium Denmark Finland France Luxembourg Norway Sweden England and Wales Scotland	Ireland Netherlands					
Central Europe	Austria Czechoslovakia Eastern Germany Hungary Poland		Federal Republic of Germany Switzerland					
Southern Europe	Bulgaria Romania Yugoslavia	Malta and Gozo	Greece Italy Portugal Spain			Albania		
Oceania		Australia New Zealand			Fiji			
USSR		USSR						

Islands, increases in age at marriage played a major role in the initial stages of fertility decline; the present proportions of women married before age 25 in these countries are among the lowest in the world.

Among the high-fertility countries, most of those in tropical Africa for which data are available conform to the early-peak pattern of fertility. Seven countries in this part of the world belong to sub-type A of the early-peak type, having very high fertility among women under 20 years of age. India, a borderline case, is also assigned to this sub-type. Although precise statistical data on age at marriage are lacking for most of the African countries, it is known to be customary for girls to marry shortly after puberty. In Guinea, for example, a 1955 survey showed that nearly four-fifths of girls aged 15-19 were married. Extremely early marriage has also been traditional in India.

Sub-group B of the early-peak type, characterized by a high degree of concentration of fertility at the peak ages 20-24, is found in a number of countries in the Caribbean region, namely, British Guiana, Jamaica, Puerto Rico and Trinidad and Tobago, as well as in one tropical African country and the Fiji Islands. Early marriage among the large East Indian populations of some of these countries is no doubt a factor in establishing such a pattern, as is the early entry into relatively unstable forms of marital unions which are frequent among the populations of African descent in British Guiana, Jamaica, and Trinidad and Tobago. In Puerto Rico, where the birth rate has declined to a moderate level, the practice of fertility control within marriage by some segments of the population undoubtedly has modified the fertility age pattern.

The broad-peak type of fertility age curve is found in all three of the major less-developed regions of the world. It is perhaps most typical of the Central American mainland and of South America; all of the countries in this region for which data are available, except Chile and Panama, have patterns of this type. In addition to seven Latin American countries and three countries in South-East Asia, Mauritius, the coloured population of South Africa, and Albania have fertility curves conforming to this model.

The relatively few late-peak fertility curves in high-fertility countries also have a wide geographical distribution. In some cases (Ceylon, China (Taiwan), Singapore, and Chile), this pattern is associated with an average age of women at marriage above the typical range of high-fertility countries, and fertility at only a moderately high level. Thailand offers an example of very high fertility in spite of relatively late marriage of women, and a late-peak curve of fertility. In other cases, the late-peak fertility pattern appears in spite of a rather low average age at marriage; this is the case of the United Arab Republic and possibly also of Guadeloupe and Martinique. (Although the official statistics of Guadeloupe and Martinique, referring to women in legal marriages, do not indicate a low average age at marriage, it is likely that in these, as in other West Indian islands, the average age would be much lower if consensual and other types of informal unions were taken into account.)

More detailed studies are required to determine whether some of the observed variations in fertility age patterns among the high-fertility countries reflect reality or whether they result from deficiencies in the data.

E. Factors associated with different age patterns of fertility

1. *Effect of variations in marital status distribution of women of reproductive age*

Age at marriage has already been mentioned as an important factor in determining the age pattern of fertility. In table 7.9, the types of fertility curves found in selected countries are compared with the proportions of married women in the reproductive age groups.[11] In general, according to expectation, early-peak fertility curves are associated with relatively early marriage, and late-peak curves with relatively late marriage.

The association between the peak age of child-bearing and average age at marriage is weakened in some countries by a high percentage of illegitimate births. Where, as for example in Jamaica, the great majority of births to young mothers are illegitimate (in 1956 the illegitimacy rates were 95 per cent for mothers 15-19 and nearly 85 per cent for mothers 20-24), it is not surprising that an early-peak type of fertility curve is associated with a rather high mean age at marriage. Rates of illegitimacy are generally high in Latin America, where many marital unions are of the consensual type and thus their offspring are legally illegitimate. In Asia, however, illegitimacy rates are relatively low if the few countries for which data are available are at all representative of this region. Illegitimate births account for only about 5 to 8 per cent of all births in most industrialized countries,[12] but there are a few exceptions. Thus, in Austria and Sweden about half of the births to mothers aged 15-19 are illegitimate, and in Austria the proportion is about one quarter at ages 20-24.

In general, early marriage of women is much more common in the economically less developed regions, where fertility is generally high, than it is in the more developed, low-fertility countries. As table 7.9 shows, in the countries of low fertility the proportion married among the female population in the age group 15-19 years ranges from about 2 per cent or less in Ireland, Spain and Switzerland to 19 per cent in Bulgaria, and in the age group 20-24 years, from about 22 per cent in Ireland to 71 per cent in Bulgaria. Among the high fertility countries listed in the table, on the other hand,

[11] In computing these proportions, consensually married, as well as legally married women, have been included in the numerator wherever possible.

[12] *Recent Trends in Fertility in Industrialized Countries* (United Nations publication, Sales No.: 57.XIII.2), p. 44.

Table 7.9. Percentage of married women among all women in each reproductive age group, and type of fertility age pattern: selected countries

Country and year		Percentage married among women aged (in years)							Type of fertility age pattern
		15-19	20-24	25-29	30-34	35-39	40-44	45-49	
Low-fertility countries:									
Austria	1951	3.4	32.8	59.7	68.4	70.6	71.6	70.1	Broad peak [a]
Bulgaria	1956	18.8	71.1	88.2	91.8	92.3	91.5	89.5	Early peak
Canada	1961	8.7	59.2	83.7	88.1	88.5	87.0	83.7	Broad peak
Cyprus	1960	9.2	55.2	79.8	86.4	88.8	87.0	85.3	Late peak
Eastern Germany (including East Berlin)	1950	3.0	38.3	63.3	69.9	73.0	74.8	74.2	Early peak
Federal Republic of Germany	1961	5.1	44.6	77.3	83.6	81.4	76.5	70.6	Broad peak
Finland	1960	5.0	45.0	73.4	79.5	79.6	77.0	71.8	Broad peak
Hungary	1960	14.6	67.1	85.6	87.0	85.2	80.9	77.4	Early peak
Ireland	1961	1.1	21.8	54.7	69.7	74.9	74.6	71.6	Late peak
Netherlands	1960	3.7	40.2	78.6	86.3	86.9	85.4	82.2	Late peak
Poland	1960	9.0	59.6	82.7	86.0	84.9	81.0	75.7	Early peak
Spain	1960	2.1	26.4	64.8	78.4	82.3	79.6	76.3	Late peak
Sweden	1960	2.7	41.9	77.1	84.6	85.1	84.1	80.7	Broad peak
Switzerland	1950	1.2	25.8	60.8	74.3	76.4	74.9	71.9	Late peak
USSR	1959	8.5	50.1	75.9	77.6	72.5	62.3	54.9	Broad peak
United States	1960	15.1	67.2	83.4	85.9	85.4	83.3	80.0	Early peak
Yugoslavia	1953	10.8	57.0	89.3	80.3	78.8	77.9	75.1	Broad peak [b]
High-fertility countries:									
Albania	1955	22.9	74.4	90.0	92.1	90.3	85.5	79.3	Broad peak
Ceylon	1953	23.7	65.8	84.4	87.9	86.5	80.7	73.9	Late peak (Type A)
China (Taiwan)	1956	11.4	69.7	93.2	93.8	90.8	85.6	78.0	Late peak (Type A)
Federation of Malaya	1957	34.7	74.8	89.7	90.9	87.7	80.7	71.5	Broad peak
Fiji Islands	1956	28.6	72.4	86.3	89.7	88.0	84.0	78.0	Early peak (Type B)
Pakistan	1961	73.0	91.6	93.7	91.8	87.4	77.4	70.2	... [c]
Sarawak	1960	29.6	69.7	87.2	89.4	89.3	83.2	77.9	Broad peak
Singapore	1957	19.7	65.9	88.7	91.6	88.1	79.9	68.8	Late peak (Type A)
Thailand	1960	12.5	56.4	79.6	86.1	86.4	82.6	77.3	Late peak (Type B)
UAR (Egypt)	1960	31.8	73.4	88.8	89.9	89.0	79.5	76.2	Late peak (Type A)

[a] Broad peak in 1951; early peak in 1960.
[b] Broad peak in 1953; early peak in 1960.
[c] Not available.

the range of these percentages is much higher, from about 11-12 per cent married in the age group 15-19 in China (Taiwan) and Thailand, to 73 per cent for this age group in Pakistan, and from 56 per cent for the age group 20-24 years in Thailand to nearly 92 per cent in Pakistan. As already mentioned, though data are lacking for most African countries, the average age at marriage of females in tropical Africa is known, in general, to be low. Statistics for Latin American countries are not included in table 7.9 because of the confusion which results from the high frequency of consensual unions in many countries in this region and consequent reporting in the censuses of many women as unmarried who actually are or have been in some type of union other than legal marriage.

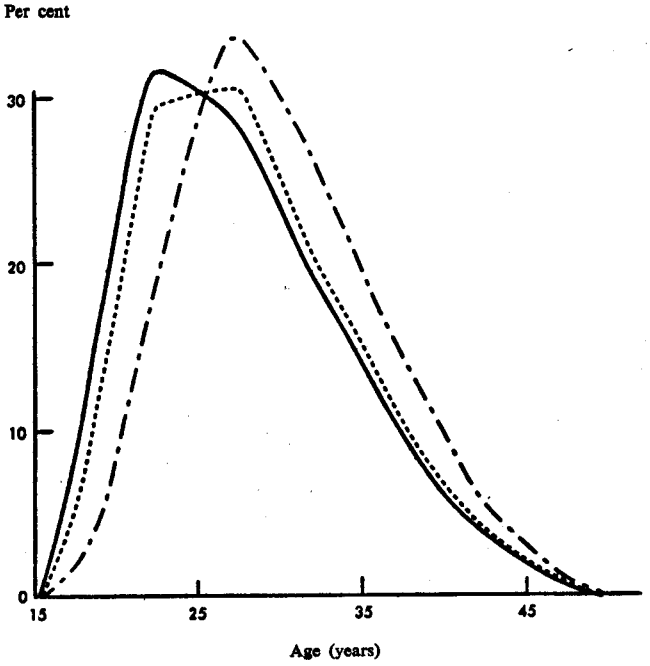
Not only age at marriage, but also other factors affecting the marital status distribution of the female population have an influence on fertility. In populations where the mortality level is high, a larger proportion of women are widowed while still in their reproductive years than in countries where mortality is low. In some countries a high divorce rate may similarly reduce the proportion of married women. Even in societies which impose no restrictions on remarriage of widows and divorcees there is generally some delay in remarriage, and this tends to lower fertility. Differences in the proportions of married women in the older reproductive ages, however, play only a minor role in shaping the age curve of fertility.

The effect of differences in age of women at marriage on the shape of the fertility curve is illustrated in figure 7.3. For high- and low-fertility countries separately, standard sets of marital age-specific birth rates (births per 1,000 married women in each 5-year age group) were applied to models of age-specific proportions of married women in populations representing different patterns with respect to age at marriage. For the low-fertility countries the proportions of women married in the United States, Canada and Spain were taken to represent early, intermediate and late marriage, respectively, while for high-fertility countries the corresponding marriage models were based on the statistics for Pakistan, the Federation of Malaya and Thailand. The standard marital age-specific birth rates used were those of Spain,

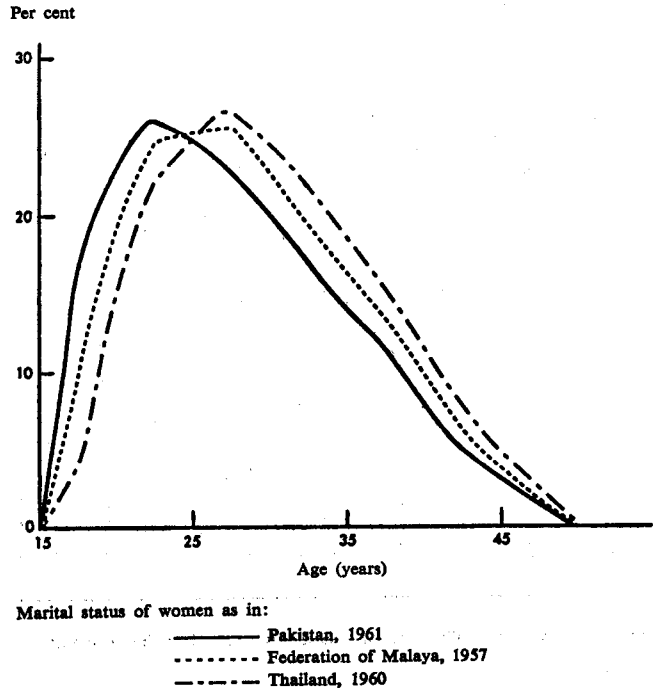
Figure 7.3. Hypothetical age patterns of fertility: data standardized for marital fertility rates

(Percentage of total fertility contributed by women in each 5-year age group)

I. Low-fertility patterns (age-specific birth rates for married women in Spain, 1960 taken as standard)



II. High-fertility patterns (age-specific birth rates for married women in the Federation of Malaya, 1957 taken as standard)



for the low-fertility countries, and the Federation of Malaya for the high-fertility countries.

For both high- and low-fertility countries, an early-peak fertility curve is derived, as would be expected, from the early-marriage model, and a late-peak type from the late-marriage model, while an intermediate age-at-marriage pattern yields a broad-peak curve.[13] The results are to some extent fortuitous, however, since if different sets of marital birth rates had been selected as the standards, less consistent results might have been obtained.[14]

In the case of high-fertility countries, figure 7.3 shows that the hypothetical early-peak curve derived from a combination of the marital age-specific birth rates of the Federation of Malaya and the early-marriage pattern of Pakistan is very similar to sub-type A of the early-peak high-fertility models. This is the pattern observed in countries of tropical Africa, where age at marriage is believed to be very early; it is also similar to the pattern of India. The hypothetical late-peak fertility curve for high-fertility countries, on the other hand, resembles sub-type A of the late-peak models.

2. *Effect of variations in age-specific marital fertility rates*

While the proportion of married women in the young reproductive age groups has been shown to exert a major influence in shaping the fertility curve, other factors also play an important role. Among these are the extent to which birth limitation is practised by married couples in different age groups, the incidence of sterility among women (or their husbands) in each of the child-bearing age groups, and the frequency of pregnancy wastage (miscarriages and stillbirths) in relation to age of women. As pointed out in an earlier chapter, birth limitation practices take many forms, ranging from customs such as prohibition of intercourse for long periods after childbirth, absences of one partner for considerable periods, and the like, to the use of contraceptives or inducement of abortion. While contraception is important mainly in low-fertility countries, other limiting factors may assume considerable importance in high-fertility populations.

Available data are not adequate for a broad international study of the effects of these factors individually

[13] Actually, the hypothetical fertility curve derived from the combination of Spain's marital age-specific birth rates and an early-marriage pattern resembles sub-type B of the early-peak high-fertility model curves developed in the present study more closely than it resembles the early-peak type of the low-fertility models. This is not surprising, since the rather high marital fertility rates of Spain combined with an early-marriage pattern yields a gross reproduction rate above 2.0, a level classified as "high fertility" in the present study. The hypothetical curves derived from the intermediate- and late-marriage patterns, on the other hand, bear a fairly close resemblance to the broad-peak and late-peak low-fertility model curves described earlier in the chapter.

[14] For example, the pattern of marital age-specific birth rates found in the United States, where child-bearing is highly concentrated in the early reproductive years, is likely to yield an early-peak fertility curve even where marriage is only moderately early.

on the age patterns of fertility. It is possible, however, to study their combined effects as measured by differences between countries in age-specific birth rates of married women. Table 7.10 shows such rates for a selected group of countries of low and high fertility. In computing these rates, the totals of legitimate and illegitimate births for each age group of mothers have been related to the corresponding numbers of married women classified by age (including, where possible, women in consensual unions). Rates calculated in this way overstate marital fertility to the extent that illegitimate births are included in the numerator but the corresponding numbers of women at risk of giving birth to illegitimate children are not included in the denominator. Such a distortion may occur for several reasons: because consensually married women are excluded from the statistics of the married and not enumerated as a separate category, or because the enumeration of the consensually married is incomplete, or because some births occur to women who are neither consensually nor legally married. Some indication of the possible magnitude of overstatement of the rates may be obtained from the percentages of illegitimate births among all births, which are shown in the table for the countries for which the pertinent data are available.[15] The extent of overstatement due to illegitimacy varies with the age of mothers and may be considerable in the age group 15-19 years even where the percentage of illegitimate births in all age groups combined is not high.

In general, birth rates of married women decline more steeply with advancing age of the women in low-fertility countries than they do in high-fertility countries. This difference is probably explained chiefly by the tendency, in countries where birth limitation is practised extensively, for couples to practise it more assiduously as they grow older and the size of their families increases. The steeply declining trend of the rates with increasing age is most pronounced in Bulgaria and the United States among the countries listed in table 7.10. In Bulgaria, the birth rate for married women 30-34 years old is only one quarter of the rate for the age group 20-24. In contrast, the corresponding proportion for China (Taiwan) is about 80 per cent, and for Thailand about 70 per cent. The figures for other countries show various patterns between these extremes; those for Puerto Rico, for example, show a ratio of about 37 per cent between the birth rates of married women in age groups 30-34 and 20-24, which is probably explained by the fairly extensive family limitation practices in this country during recent times.[16]

Effects of variations in the pattern of age-specific marital birth rates upon the shape of the age curve

[15] In the cases of Panama and Puerto Rico, where very many illegitimate births are recorded (74 and 25 per cent, respectively, of all births in 1960), no doubt the great majority of the illegitimate births belong to consensually married women, who are included in the denominators used for the computation of the rates. It is therefore unlikely that the rates for these two countries are very greatly exaggerated; nevertheless, they may be exaggerated to a considerable extent, as some illegitimate births may pertain to women who would not be reported in the census as either consensually or legally married.

[16] The rapid fall after age 25 in the birth rates for married women in some countries might also be due partly to inflation of the rates for younger age groups resulting from the inclusion of illegitimate births; but this factor appears to be of only minor importance in Puerto Rico, at least. Nearly the same rapid fall is seen when Puerto Rican data on legitimate births are related to the numbers of legally married women.

Table 7.10. Age-specific birth rates for married women (births per 1,000 married women in each age group): [a] selected countries

Country and year		Percentage of illegitimate births	Age of women (in years)						
			15-19	20-24	25-29	30-34	35-39	40-44	45-49
Low-fertility countries:									
Bulgaria	1956	7	328.2	256.1	144.8	66.4	31.1	11.0	2.0
Canada	1961	4	639.7	380.5	262.9	163.7	91.6	31.5	2.7
Cyprus	1960	Under 1	342.6	330.6	262.4	154.6	119.6	36.8	8.6
Finland	1960	4	539.7	364.2	219.2	131.1	77.4	32.1	3.4
Germany, Federal Republic of	1961	7	504.2	310.5	217.6	121.7	62.3	24.3	1.3
Poland	1960	5	553.0	352.1	204.8	119.5	67.8	26.6	3.1
Spain	1960	3	450.1	400.8	289.3	180.8	96.8	36.6	4.5
United States	1960	5	587.7	384.9	236.6	131.0	65.6	18.6	1.2
High-fertility countries:									
Albania	1955	1	276.8	369.2	382.0	318.1	276.7	145.6	92.4
Ceylon	1953	...	290.0	394.1	349.5	280.2	173.5	47.3	9.2
China (Taiwan)	1956	2	439.5	377.1	361.6	312.6	241.3	123.6	29.3
Federation of Malaya	1957	...	346.9	439.5	377.5	286.5	202.7	99.3	31.5
Panama	1960	74	688.2	536.7	396.6	253.1	164.2	55.1	12.3
Puerto Rico	1960	25	608.4	515.5	311.2	190.2	130.0	61.4	11.9
Singapore	1957	...	395.4	459.0	400.0	316.4	221.2	101.8	17.2
Thailand	1960 [b]	...	426.8	469.1	402.8	331.8	280.4	144.7	42.4

... Indicates that information is not available.

[a] Including both legitimate and illegitimate births in the numerator. Consensually, as well as legally, married women are included in the denominator, wherever possible.

[b] Rates based on registration data have been inflated to correct for under-registration.

of fertility can be analysed by a method of standardization analogous to the method described above for analysing effects of variations in age at marriage. Different sets of marital birth rates selected from table 7.10 are applied to a standard model of percentages of married women in each age group of the female population, and the shapes of the resulting curves of age-specific birth rates are compared. The results of this analysis show that the effect of variations in the pattern of marital birth rates depends on the kind of model selected to represent the percentages of married women i.e., whether it is an early-marriage, late-marriage, or intermediate age-at-marriage model. An early-marriage model in most cases yields an early-peak type of fertility curve, and a late-marriage model a late-peak type, when combined with various patterns of marital birth rates. When a model corresponding to an intermediate value for the average age at marriage is selected, the effects of varying patterns of marital birth rates are more pronounced. Some results obtained with the use of intermediate age-at-marriage models are charted in figure 7.4.[17]

F. Shifts in age patterns

For some countries which now have low fertility, it is possible to study changes in the age patterns of fertility over a long period. Such an analysis can show

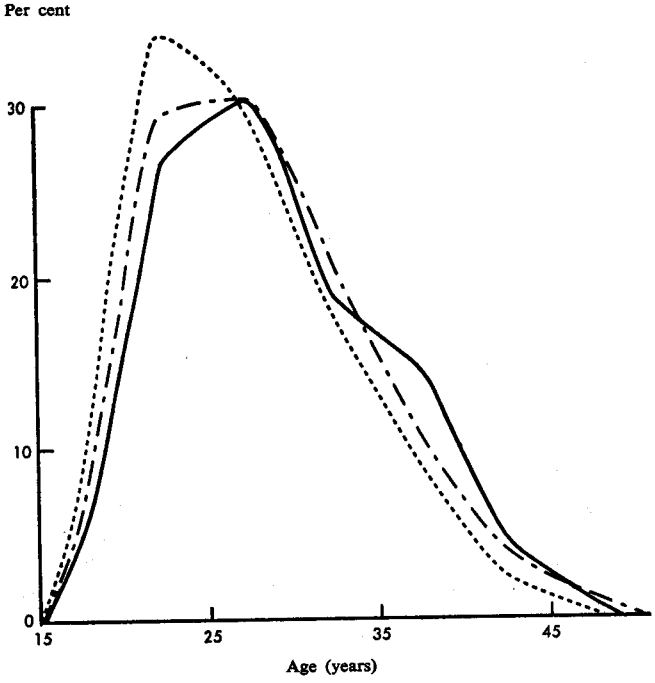
[17] For each group of countries (low- and high-fertility), each of three sets of percentages of married women in various age groups representing early, intermediate and late marriage) was combined with six different sets of age-specific marital fertility rates. The results can be summarized as follows:

Percentage of married women	*Forms of fertility curves obtained with marital fertility rates of different countries (name of countries shown in parentheses)*
a) Low-fertility countries:	
Early marriage (United States).	5 early-peak curves (Bulgaria; Canada; Germany; Spain; United States)
	1 broad-peak curve (Cyprus)
Intermediate marriage (Canada)	2 early-peak curves (Bulgaria; United States)
	3 broad-peak curves (Canada; Germany; Spain)
	1 late-peak curve (Cyprus)
Late marriage (Spain)	6 late-peak curves (Cyprus; Bulgaria; Canada; United States; Germany; Spain)
(*b*) High-fertility countries:	
Early marriage (Pakistan) ...	4 early-peak curves (Chile; Malaya; Puerto Rico; Thailand)
	2 broad-peak curves (Albania; China (Taiwan))
Intermediate marriage (Malaya)	2 early-peak curves (Chile; Puerto Rico)
	2 broad-peak curves (Malaya; Thailand)
	2 late-peak curves (Albania; China (Taiwan))
Late marriage (Thailand)	1 early-peak curve (Puerto Rico)
	1 broad-peak curve (Chile)
	4 late-peak curves (Albania; China (Taiwan); Malaya; Thailand)

Figure 7.4. Hypothetical age patterns of fertility: data standardized for proportions of married women at each age in the population

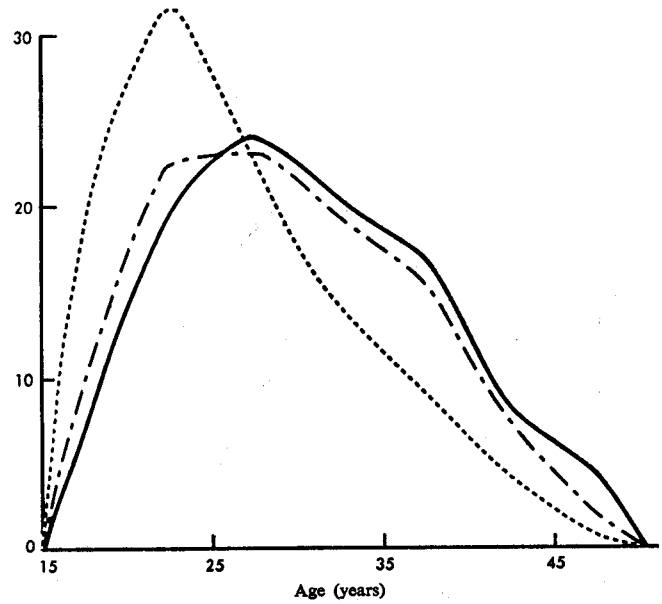
(Percentage of total fertility contributed by women in each 5-year age group)

I. Low-fertility patterns (marital status of women in Canada, 1961, taken as standard)



Age-specific birth rates for married women as in:
——— Cyprus, 1960
- - - - - - - - United States, 1960
— - — - — Spain, 1960

II. High-fertility patterns (marital status of women in the Federation of Malaya, 1957, taken as standard)



Age-specific birth rates for married women as in:
——— Albania, 1955
- - - - - - - - Puerto Rico, 1960
— - — - — Thailand, 1960

Figure 7.5. Shifts in age patterns of fertility for selected countries

(Percentage of total fertility contributed by women in each 5-year age group)

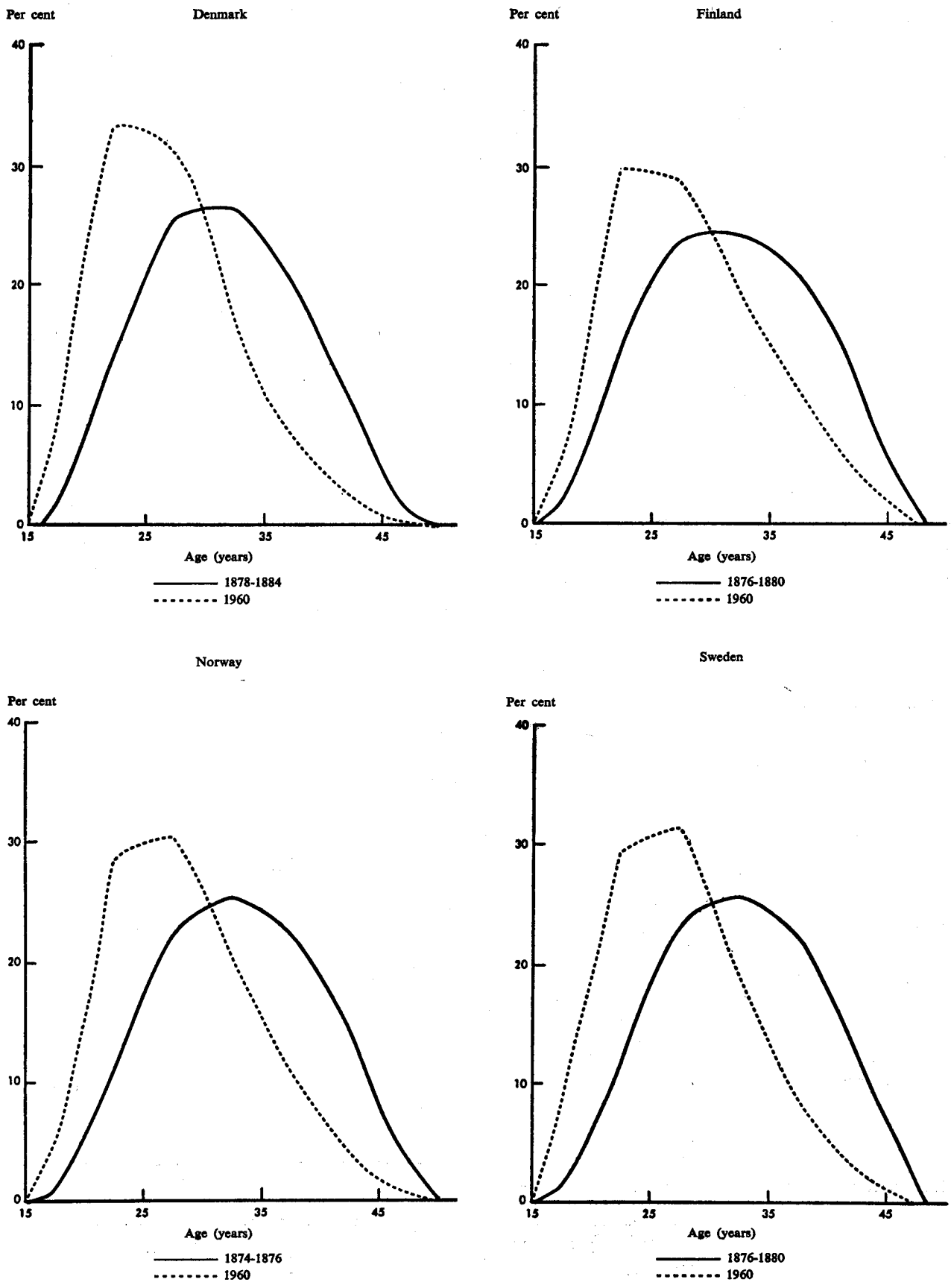
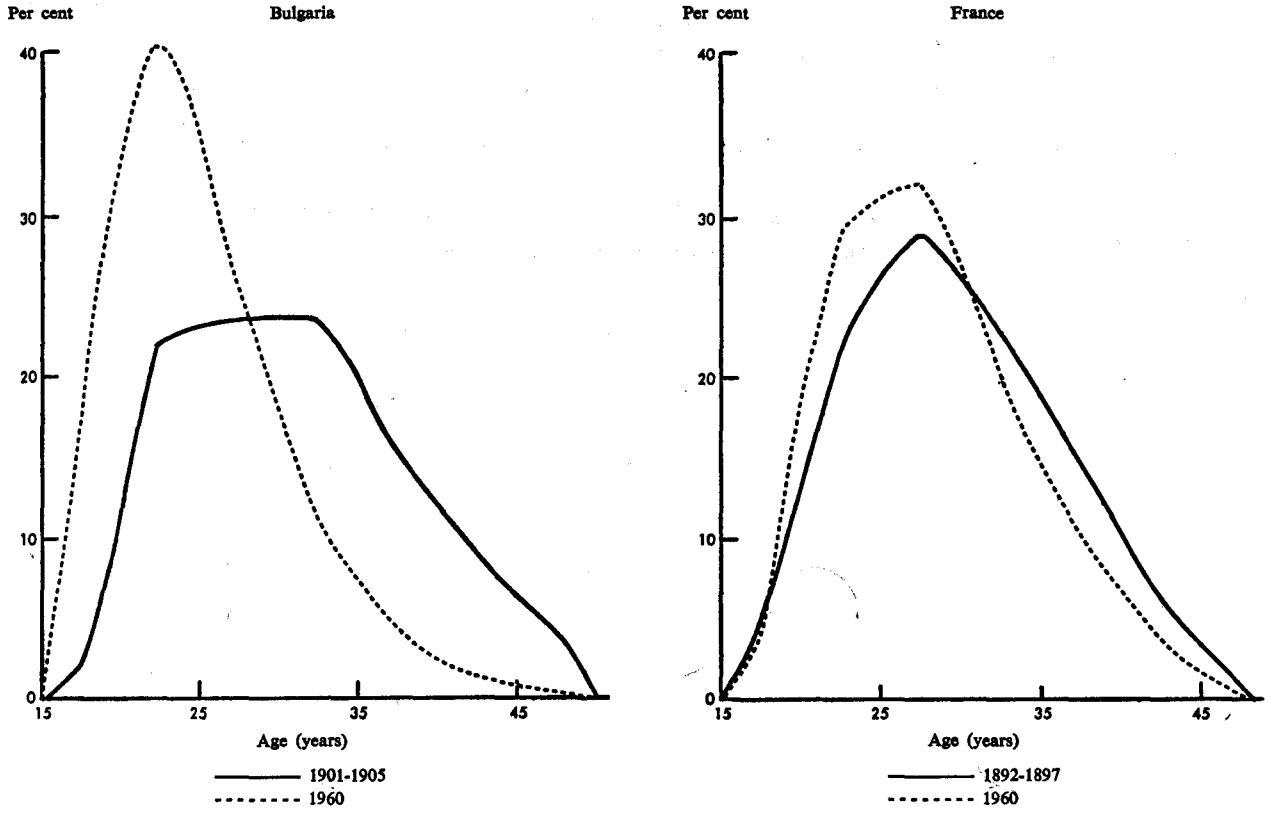


Figure 7.5. (*continued*)



whether these countries, at a time when their fertility was still high, had age curves similar to those of the high-fertility countries today, and may give an indication of transitional types of age curves associated with fertility decline.

For Denmark, Finland, Norway, and Sweden, figure 7.5 shows a comparison of the per cent distributions of age-specific birth rates in 1960 with the corresponding distributions in the 1870's, when the gross reproduction rates of these countries were in the moderately high range of 2.2 to 2.4.[18] In these Scandinavian countries (and elsewhere in north-western Europe) prior to the decline of fertility which began with the popularization of birth-control practices in the late nineteenth century, late marriage and failure of many women to marry at all were major factors in moderation of fertility. The fertility age curves for these countries in the late 1870's somewhat resemble sub-type B of the late-peak high-fertility curves, but they differ in that, owing to later marriage, the contribution of young women to total fertility was less, and that of older women more, than in the model.

In Norway and Sweden in the 1870's, peak rates of child-bearing occurred at ages 30-34, while in Denmark and Finland birth rates were nearly equal for age groups 25-29 and 30-34, as they are in Ireland at present.[19]

The decline in fertility which began in the late nineteenth century in the Scandinavian countries entailed falling birth rates for all except the youngest age group of women. By the early 1920's, the gross reproduction rates had been reduced to about 1.4-1.5. Younger women then contributed a larger share of total fertility than they did formerly, the highest birth rates being those of women 25-29 years of age. This shift was relatively slight; no major transformation had yet taken place in the fertility age curve despite the low level to which fertility had fallen. The gradual shift continued in the 1930's, with birth rates decreasing more among women in the older than in the younger reproductive age groups; and again during the war and immediate post-war years, when the birth rates turned upward, rising somewhat more among women in the younger than in the older age groups. A more drastic alteration in the shape of the fertility curve has taken place in more recent years, as the birth rates for women under 25 years of age have continued upward as a result of a trend toward earlier marriage, while those for older women have declined. By 1960, the four Scandinavian countries had fertility curves identifiable as belonging to the broad-peak, low-fertility type.

[18] For the gross reproduction rates for early years, see Robert R. Kuczynski, *The Balance of Births and Deaths*, vol. I, Western and Northern Europe (Institute of Economics of the Brookings Institution, New York, MacMillan, 1928), p. 33.

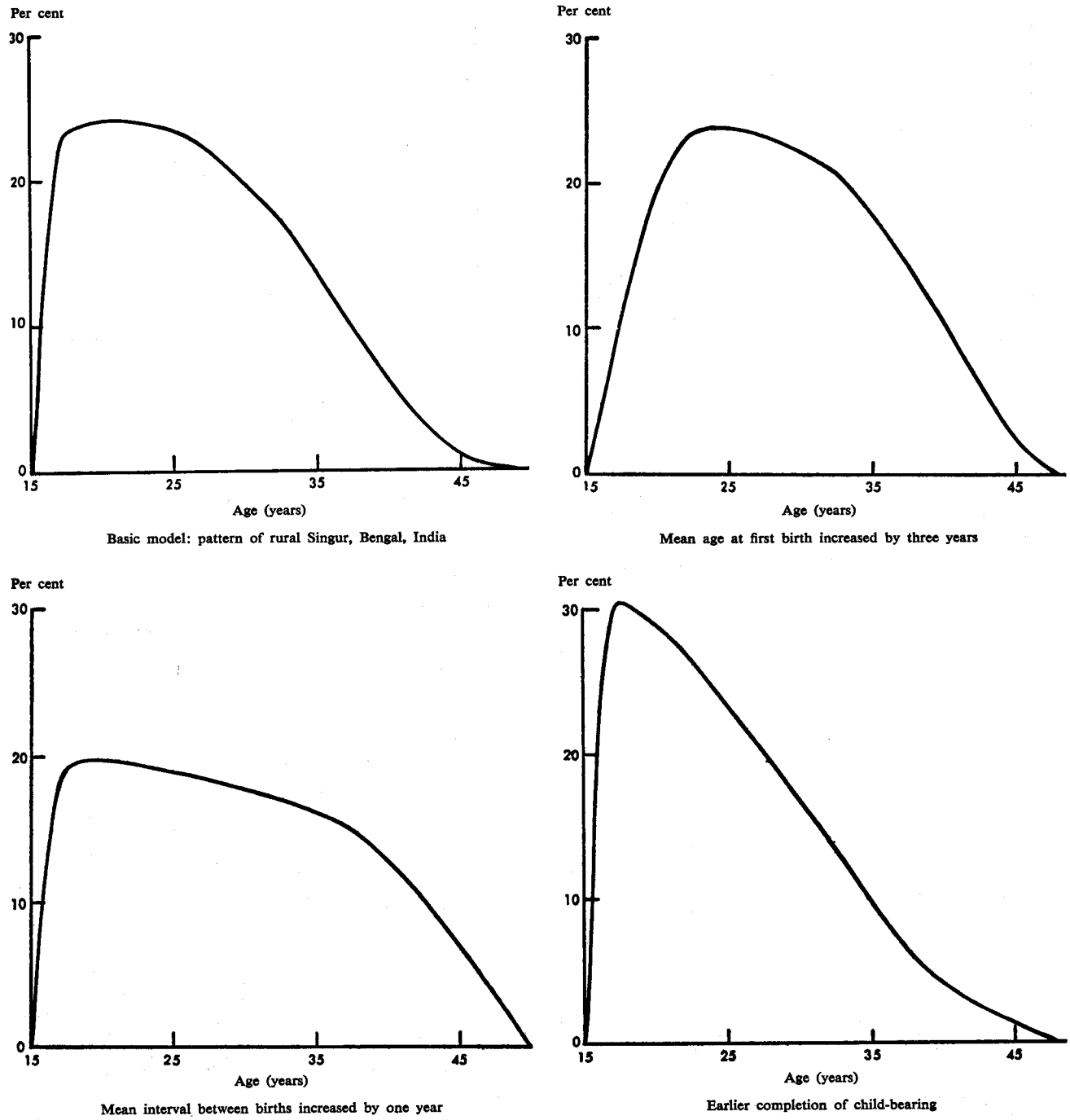
[19] In Sweden, a much longer historical series of age-specific birth rates indicates that the same general age pattern of fertility had been in existence for at least a century prior to the 1870's.

France, where the fertility decline started much earlier than in the Scandinavian countries, has a series of age-specific birth rates dating back only to the last decade of the nineteenth century when the gross reproduction rate had already fallen to the low level of 1.4. The French age curve of fertility at that time resembled the low-fertility, late-peak model. Thereafter birth rates for women past 25 years of age fell more rapidly than did those for younger women, so that by the 1930's France had a broad-peak fertility curve, the rates for age groups 20-24 and 25-29 being nearly equal. The same general pattern has been maintained in more recent years.

Very few countries in southern and eastern Europe, where the decline in the birth rate started much later, have statistics for studying long-term changes in ferti-

Figure 7.6. Hypothetical model age patterns of fertility derived from data of the Singur study (India)

(Percentage of total fertility contributed by women in each 5-year age group)



Source: Nandita Ghosh, "Some Considerations of the Variations in the Forms of Age-Specific Fertility Curves". Demographic Training and Research Centre, Chembur, Bombay, India, 1961 (processed).

lity age patterns. Bulgaria, however, provides an example of a country which has experienced a very pronounced fertility decline, accompanied by a drastic shift in the age pattern of birth rates during the course of half a century. In the early years of the present century, Bulgaria had a gross reproduction rate of 3.2 and the age curve was rather similar to the type B, late-peak, high-fertility model. After passing through a transitional stage in the 1920's, when the curve was similar to the broad-peak, high-fertility model type, Bulgaria shifted to a curve of the early-peak type. This pattern seems to have prevailed since the middle 1930's.

In Bulgaria, before the decline of fertility set in, women married earlier than in the countries of North-west Europe, and very few remained unmarried. The Bulgarian marriage pattern has not changed much since the beginning of the twentieth century, except that there has been some increase in the proportion of women who married before age 20. While the birth rate dropped in all except the youngest age group, the proportional decline has been greater in the older than in the younger groups, as shown in the following table:

	Age-specific birth rates		*1956 as a percentage of 1901-1905*
	1901-1905	*1956*	
15-19	23.5	61.4	261
20-24	288.6	181.7	63
25-29	312.2	126.2	40
30-34	309.4	61.3	20
35-39	204.3	29.8	15
40-44	121.0	9.9	8
45-49	55.5	1.8	3

G. Theoretical model age patterns of fertility

This chapter has been mainly concerned with empirical models of fertility age curves based on patterns currently in existence in different parts of the world. As mentioned earlier, models of another kind can be constructed to illustrate how a basic pattern of age-specific birth rates would be altered by specified changes in certain variables. Some theoretical models of the latter type which are pertinent in the present context were developed in a recent study, starting from a basic set of data on births classified by birth order and age of mother for Singur, a rural area in West Bengal, India.[20] In deriving these models, some of which are depicted graphically in figure 7.6, different assumptions were made regarding women's age at birth of first child, intervals between births, and age at which child-bearing ceases. The results show that, by increasing women's age at birth of first child by three years (which can be considered roughly as the equivalent of a three-year advance in age at marriage), a fertility curve of the early-peak type (characteristic of present-day India as a whole) is transformed into one of the broad-peak type. These model curves are not very different from the type A, early-peak and broad-peak high-fertility models of the present study. On the other hand, the fertility curves derived from assumptions of lengthening birth intervals without any change in age at marriage bore little resemblance to any of the current patterns for 37 high fertility countries included in the present study. This observation suggests that, while there may be differences among high fertility countries in the length of birth intervals which have a bearing on age patterns of fertility, these differences are not of the magnitude or type assumed in the models.

The author of the Singur models also calculated the type of fertility pattern that would result if the rate of cessation of reproduction at each stage of child-bearing, beginning with the first birth, should be increased by 10 per cent and if the women's age at birth of first child and the length of birth intervals remained as they were observed. Under this assumption, it was found that the gross reproduction rate would fall from 3.1 to 2.0 and the resultant fertility curve would be highly skewed with a peak at ages 15-19. There is no example, among the high- or low-fertility countries included in the present study, of a fertility curve with so early a peak.

[20] Nandita Ghosh, "Some Considerations of the Variations in the Forms of Age-Specific Fertility Curves". Demographic Training and Research Centre, Chembur, Bombay, India, 1961 (processed).

Chapter VIII

RURAL-URBAN AND EDUCATION DIFFERENCES OF FERTILITY

A. The significance of fertility differentials

One of the questions of principal interest in research on fertility is the pattern of fertility differences among population groups such as the inhabitants of rural and urban areas, social and economic groups defined in terms of educational level, income, occupation, size of land holdings, or other indicators of social and economic status, and ethnic groups defined in terms of race, national origin, language or religion. Information about such differences in fertility is useful both in assessing the factors and prospects of change in the composition of the population in respect of such characteristics, and in efforts to reach an understanding of the determinants of the fertility level and to forecast its changes in the population as a whole.

The aim of the present chapter is to summarize present information on rural-urban educational-level differences of fertility in various parts of the world. Limitations of time and resources available for this study have precluded an attempt to deal with fertility differences among other types of social and economic or ethnic groups.[1] The rural-urban and educational-level differences are singled out for attention here because urbanization and rising levels of popular education are among the most impressive and significant social and economic changes currently taking place in many developing countries and their possible effect on the future trends of fertility is a question of major interest.

In the low-fertility areas of the world, the fertility of city dwellers is generally lower than that of the rural population, and there is substantial evidence of such a rural-urban difference having existed at least since the middle of the nineteenth century in several European countries and the United States.[2] Some studies, furthermore, have lent support to the hypothesis that urban fertility has been lower than rural fertility in European society since a much earlier time. On the other hand, in the world regions of high fertility at present, although information on rural-urban differences is far from being comprehensive, it is apparent that lower urban than rural fertility is not a universal rule.

It is also well established, so far as low-fertility areas are concerned, that a generally inverse relationship exists between fertility and social-economic status of population groups defined in terms of educational level, occupation, income, etc. Such a relationship appears to have existed in various European countries and the United States at least as long ago as the late nineteenth century. There are indications, however, that it may not have been the general rule in European societies in earlier times. A study of the fertility of Polish peasants in the late nineteenth century,[3] for example, has shown evidence of a positive association with size of land holdings, which might well be indicative of a general pattern in European agrarian societies in earlier centuries. Likewise, studies in some countries where fertility is high at present have yielded indications of positive associations between fertility and social-economic status in the rural population.[4] Where negative associations have been found between fertility and educational level or other social-economic indicators in high-fertility countries, such associations have generally appeared to be weaker and less consistent than they are in low-fertility countries.

The pattern of generally inverse relationships between fertility and social-economic status in low-fertility countries has not always been found to be entirely consistent. Where such a pattern held true with regard to broadly defined groups of educational level, occupation, income, or other status indicators, it has not necessarily always held with regard to particular categories within such broad groups. For example, in France about the turn of the twentieth century, while fertility was, in general, related inversely to income, families in the highest income brackets were found to have more children than those in somewhat lower brackets.[5] Furthermore, the patterns of these relationships in the low-fertility countries have shifted in the course of time.

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[1] A summary of findings of studies on rural-urban, social-economic and ethnic group differences of fertility up to about 1950 was presented in *The Determinants and Consequences of Population Trends* (United Nations publication, Sales No.: 53.XIII.3). The present chapter refers chiefly to results of more recent studies on rural-urban and education-level differences.

[2] On fertility differentials in the United States since the 19th century, see, in addition to the work cited above, Clyde V. Kiser, "Differential Fertility in the United States", in: *Demographic and Economic Change in Developed Countries*, Princeton (U.S.A.), 1960, pp. 77-116.

[3] W. Stys, "The Influence of Economic Conditions on the Fertility of Peasant Women", *Population Studies* (London), vol. 11, No. 2, November 1958, pp. 136-148.

[4] See for example, *The Mysore Population Study*, a co-operative project of the United Nations and the Government of India. United Nations publication, Sales No.: 61.XIII.3.

[5] France, Bureau de la Statistique générale, *Statistiques des familles en 1906*, Paris, 1912, pp. 9, 46.

In general, it appears that the magnitude of differences of fertility among social and economic groups has diminished in low-fertility countries during recent decades, and the same is true of the rural-urban differences.

An old theory which now has little currency attributed the relatively low fertility of city dwellers in general and of the upper economic and social strata in particular to a supposed weakening of sexual desire or procreative power due to effete modes of life. In the modern view, the explanation is sought rather in different attitudes and patterns of behaviour pertaining to marriage and birth of children, and differences in knowledge of means of limiting births. According to the " cultural lag " theory of fertility differentials in countries where fertility has been declining, attitudes and practices conducive to diminishing fertility have been adopted first by the better educated, wealthier, and socially more favoured groups of the city population and transmitted in the course of time to intermediate and lower status groups and to the rural population. So, higher fertility of the latter groups at any time in the process of declining fertility would be explained. A similar " cultural lag " in the upturn of fertility in many low-fertility countries during and shortly after World War II is suggested by the findings of some recent studies. The upper social and economic strata of the urban population appear to have taken the lead in this reversal of the former declining trend, and to have made the greatest gains in fertility at this time.

While the " cultural lag " theory may be valid as a partial explanation of fertility differentials in low-fertility countries, it does not account for all the apparent facts. It does not explain, for instance, the observation that rural-urban differences, if not other social-economic differences of fertility, already existed in some countries before fertility began to decline. Nor does it account for the persistence of such differentials (in modified form, to be sure) in countries where the level of fertility seems now to have become at least temporarily stabilized.

Another interpretation, which may serve as a complement if not a substitute for the " cultural lag " theory, emphasizes the differences among various groups of the population in circumstances motivating them to restrict births, as a means of safeguarding or improving their social status and conditions of life. For example, explanations of lower fertility in urban than in rural communities are sought in such factors as the higher costs of rearing children in the city, longer and costlier education required to fit the child for work in urban occupations, keener urges upon urban families to better their levels of living and climb the ladder of social status, and superior opportunities in the cities for women to be employed if they are not too much hindered by responsibilities of motherhood. Likewise, fertility differences among groups defined in terms of educational level, income, occupations, etc., are interpreted mainly as results of differing types and degrees of pressure for limitation of births, rather than lagging transmittal of new attitudes and knowledge from one group to another. Alternatives to birth limitation as a means of satisfying the needs and aspirations of various population groups have also been emphasized in efforts to explain fertility differences. For instance, the possibility of migration to the cities has been considered as a factor contributing to the maintenance of relatively high fertility in rural communities.[6]

Other causal factors which may bear on fertility differentials also need to be taken into consideration. For example, marked inequalities in the conditions of health, morbidity, nutrition and mortality among different groups of the population may affect the pattern of fertility differences through the influence of sterility and pregnancy wastage rates and the incidence of widowhood. Migration between rural and urban areas may affect fertility differences by its effects on the marital-status composition of the population and the proportion of separated couples in both the areas of in- and out-migration. The fertility of the most highly educated groups in the population may be diminished merely because so many of their years of early adult life are spent in school and so their marriage is delayed.

Regardless of the causal interpretation, rural-urban and social-economic group differences of fertility imply the likelihood of future changes in the average level of fertility in the population as a whole where economic and social developments can be expected to bring about large changes in the proportionate distribution of population among the pertinent groups. If urban fertility is substantially less than rural fertility in a country undergoing urbanization, the average level of fertility can be expected on that account to fall in the course of time if other factors remain equal. The same implication is inherent in educational level differentials and other social-economic differentials of fertility in a country undergoing social and economic development, though the importance of the condition of other factors remaining equal must be borne prominently in mind whenever such inferences are drawn. Furthermore, to the extent that such differences of fertility may correctly be attributed to " cultural lag", they are omens of impending fertility decline in the population groups where fertility is still comparatively high — subject again to the condition of other factors remaining equal.

B. Measures of fertility differences and their interpretation

The proper interpretation of results of studies of fertility differentials often depends on the statistical measures of fertility that are used and on the definitions of the population groups to which the measures relate. The available statistics, especially for the less developed countries, are often not adequate for an analysis that would bring the causal factors into clear view. For example, the implications of fertility differences that can be traced to differences in age at marriage, stability

[6] For further discussion, see Kingsley Davis, " The Theory of Change and Response in Modern Demographic History ", *Population Index* (U.S.), vol. 29, No. 4, October 1963, pp. 345-366.

of marriage, or the incidence of widowhood are not the same as the implications of differing marital fertility rates, and the available data are often not sufficient to sort out these kinds of differences. The specific measures of age at marriage, frequency of non-marriage, widowhood, divorce or separation, specific marital fertility rates in relation to age, duration of marriage, or year of marriage and detailed pregnancy histories, which would make possible a full study of fertility differentials, are generally lacking in the less developed countries. Comparisons of such measures as crude birth rates, gross reproduction rates, age-specific or standardized birth rates, total fertility rates, and average numbers of children born per woman at the end of the reproductive age span, suffer various types and degrees of limitations in accounting for the factors of differential fertility and eliminating extraneous influences. The ratio of children to women of reproductive ages as enumerated in the census is one of the poorest measures, though it is among the measures used most widely, especially for studies of rural-urban differences in fertility. This ratio is often greatly influenced by variations of infant and child mortality, by errors in the enumeration and age-classification of children, and by the effects of migration on population structure, which are likely to be especially important in rural-urban comparisons. A major defect of the lifetime average number of children born to all women or to currently married or ever-married women of given ages as reported in censuses or household sample surveys often results from incomplete reporting of the number of births, especially by the older and less educated women.

Thorough studies of differential fertility are dependent largely upon detailed data obtained in intensive sample surveys which may have to be limited to a segment of the population and, in that case, may not be representative of the total population. Where such surveys are aimed to provide material for ascertaining the relative importance of each of several interrelated characteristics, the results may have to be classified in such detail as to risk loss of statistical significance and clarity of interpretation. Consequently, there is much variation in the degree of assurance attached to findings on the relationship of fertility to urban or rural residence and social and economic status.

Some of the more conclusive studies of fertility differentials rely upon histories of the reproductive behaviour of groups, or cohorts, of women or men born or married in given years. The use of birth and marriage cohorts for fertility analysis eliminates the problems of variations in age and in marriage duration and permits observation of patterns of family building throughout the reproductive years. Only limited use has been made of the cohort approach in this chapter, because very few of the developing countries have the necessary statistics.

In the following analyses it has been necessary, for want of uniform data, to utilize whatever acceptable measures were available for the different countries. As a result, international comparisons can be made only in a few instances and then only with much caution.

C. Low-fertility countries

As already noted, the evidence pertaining to fertility differentials in Western Europe and the United States around the end of the last century implies that fertility was, for the most part, inversely correlated with social-economic status and with the degree of urbanization of the community, and fertility differentials were relatively stable. But as national birth rates declined, the differentials widened markedly — due to the earlier and more pronounced fertility decreases among urban upper classes. Divergent patterns began to emerge when the long-term downward trend was interrupted in some countries, although, with few exceptions, the inverse correlation was maintained.[7]

During and after the Post-World-War II recovery of the birth rate, the differentials narrowed and a positive relationship of fertility with status and degree of urbanization was frequently observed. Research in the field of differential fertility at that time became oriented toward determining the factors responsible for the gaps in fertility between various social classes and the changes in size of these gaps in the course of time. Interest became focused upon the attitudes and values of urban-rural residence groups and socio-economic classes with respect to reproductive behaviour, ideal family size and means af obtaining the ideal.

1. *Rural-urban differences*

The most generally available index of rural-urban fertility differentials is the ratio of children aged 5-9 years to women of reproductive age (20-49 years).[8] As full results of most censuses taken in and around 1960 are not yet available, the most recent figures for a large number of countries at nearly the same date are those of the censuses around 1950 (table 8.1). The child-woman ratios are significantly higher in rural than in urban areas of each country represented in the table. From a comparison of crude birth rates for the Soviet Union as a whole and for its urban areas around 1958, lower urban than rural fertility is also indicated in that country: the rates were 25.3 for the whole country and 22.5 for urban areas.[9]

Where more refined measures are available, they confirm that fertility is at present higher among rural than among urban residents of low-fertility countries. In Hungary in 1960, gross reproduction rates were

[7] United Nations, *Determinants and Consequences of Population Trends*, United Nations publication, Sales No.: 53.XIII.3, chap. V; D. H. Wrong, " Trends in Class Fertility in Western Nations ", *The Canadian Journal of Economics and Political Science*, vol. 24, No. 2, May 1958, pp. 216-229; A. M. Carr-Saunders, *World Population*, Oxford (U.K.), 1936, chap. VIII and IX.

[8] By relating the number of children aged 5-9 to women 20-49 years of age instead of using a ratio that involves the age group under 5 years, distortion due to differential under-enumeration of infants and very young children is avoided.

[9] V. N. Starovsky, " O metodike prognoza rosta chislennosti naseleniya Sovetskogo Soyuza " (On method of forecasting population growth for the Soviet Union), *Vestnik Akademii Nauk SSSR*, No. 2, 1960, pp. 44-54. The effect of differences in age structure of rural and urban communities may conceal a more marked rural-urban differential.

Table 8.1. Children aged 5-9 years per 1,000 women aged 20-49 in urban and rural areas of selected low-fertility countries, recent census years

Country	Census year	Children per 1,000 women: Urban	Rural	Urban / Rural × 1,000
European countries:				
Belgium [a]	1947	257	335	77
Bulgaria	1956	386	435	89
Czechoslovakia [a]	1961	447	527	85
Denmark [a]	1960	368	563	65
Finland [a]	1960	410	638	64
France [a b]	1962	428	554	77
Greece [c]	1961	310 [d]	479	65
Hungary [e]	1961	371	477	78
Iceland [a]	1950	478	607	79
Ireland	1961	519	679	76
Norway [a]	1960	365	529	69
Poland [b]	1960	514	647	79
Romania	1956	292	483	60
Spain [f]	1950	331	447	74
Sweden [a]	1960			
United Kingdom:				
England and Wales	1951	318	359	89
Yugoslavia	1961	415	542	77
Other low-fertility countries:				
Australia [g]	1954	455	633	72
Canada [a]	1956	474	773	61
Cyprus	1960	494	687	72
Israel (Jewish population) [a]	1961	585	819	71
Japan [e]	1960	390	557	70
New Zealand	1956	503	702	72
United States [h]	1960	494	639	77

Sources: Statistical Office of the United Nations, and official census publications of the various countries.

[a] *De jure* population.

[b] Based on five per cent sample of the census results.

[c] Based on two per cent sample of census returns.

[d] Data relate to combined areas defined in the census as "urban" and "semi-urban"

[e] Based on one per cent sample of census returns.

[f] Children aged 10 to 14 years per 1,000 women aged 25 to 54.

[g] Excluding full-blooded aborigines, numbering 39,319.

[h] Excluding armed forces overseas and civilian citizens absent from country for an extended period of time, estimated at 609,720 and 764,701, respectively, for the total country.

0.59 for Budapest, 0.91 for other towns and 1.12 for rural villages.[10] In Poland in 1960, the gross reproduction rates were 1.20 for urban and 1.71 for rural areas.[11] The situation is similar in Finland where, in 1961, the rural communes had an average gross reproduction rate of 1.45 compared with 1.16 for towns.[12]

Data for France at the height of the "baby boom" (1946) showed fertility to be inversely correlated with size of community: gross reproduction rates for four classes of communities in ascending order of population size were 1.66, 1.56, 1.43 and 1.23.[13] Likewise, results of a survey in West Germany (1958) revealed the following inverse relationship between family size of married women aged 45 and over and size of community:[14]

Size of community (number of inhabitants)	Mean number of children ever born
500,000 and more	2.0
499,999-100,000	2.1
99,999-20,000	2.4
19,999-5,000	2.5
4,999-2,000	2.6
Under 2,000	2.7

[10] Hungary: Kozponti Statisztikai Havital, 1960 *Evi Népszámálás*, vol. 2, Személyi és családi Adatok Képviseleti Minta Alapjan. Budapest. 1960, pp. 36-38.

[11] Poland. Gtówny Urzad Statystyczny. *Rocznik Statystyczny*, 1962, Warsaw, 1962, p. 37.

[12] Finland, Central Statistical Office, *Statistical Yearbook of Finland*, New Series, 58th year. 1962, Helsinki, 1963, p. 53.

[13] "Notes et documents", *Population*, 6e année, no. 2, Paris, avril-juin 1951, p. 352.

[14] Freedman, R., *et al.*, "Expected Family Size and Family Size Values in West Germany". *Population Studies*, vol. XIII, No. 2, November 1959, p. 145.

As noted earlier, the rural-urban differential in European countries became progressively larger during the time of declining fertility and progressively smaller during the post-war recovery. Unfortunately, information is not available that would indicate the average trend of the differential in the major regions of Europe during the 1950's, for this is a matter of much interest in view of the dissimilarity of recent trends in birth rates for these regions. However, such information is available for a few countries. During the decade of the 1950's, while gross reproduction rates declined in both rural and urban areas of Poland, the decrease was somewhat greater in the urban communities. In the towns, the drop was from 1.6 to 1.2, while the rural gross reproduction rate decreased from 2.0 to 1.7. As a result, there was some widening of the differential during this period.[15] The decline of the Soviet Union's urban birth rate from 30.6 in 1940 to 22.5 in 1958 compared with a decrease of from 31.3 to 25.3 for the entire country during the same period suggests that the differential may also have widened there although, in view of possible differences in age structure of the rural and urban population, the extent of the change is uncertain.[16]

On the other hand, there was a slight narrowing of the rural-urban fertility differential in Finland and Switzerland during approximately the same period, because urban fertility remained stable while there were slight declines in the rural areas. The changes were as follows: [17]

	Finland,[a]			*Switzerland,*[b]		
Year	*Urban*	*Rural*	*Ratio of urban to rural*	*Cities*	*Rest of country*	*Ratio of urban to rural*
1951-1955	1.2	1.6	75	1.9	2.7	70
1955-1960	1.2	1.5	80	1.9	2.5	76
1961	1.2	1.4	86	1.9	2.4	79

[a] Gross reproduction rates.

[b] Number of legitimate live births per mother.

Both the size and trends of the rural-urban fertility differential in some of the Eastern European countries from around 1956 onward have probably been affected to a considerable extent by the adoption of official policies which had the effect of facilitating birth limitation.[18]

[15] Rates calculated from: Poland, Glowny Urzad Statystyczny. *Rocznik Statystyczny*, 1963, p. 37.

[16] Starovsky, op. cit., pp. 44-54.

[17] Finland, Central Statistical Office, *Statistical Yearbook of Finland*, New Series, 58th Year, 1962, p. 53; and Switzerland, Bureau Fédéral de Statistique, *Annuaire Statistique de la Suisse*, 1962, p. 58.

[18] See chapter VI, part B. 1 (*b*). Legalization of abortion in Hungary, for example, has depressed the birth rate to a far greater extent in Budapest than in the remainder of the country. In Budapest (1956), the crude birth rate was only about 37 per cent as high as it would have been if there had been no induced abortions and if all confinements resulting in induced abortions had instead resulted in live births. In the remainder of the country, the actual birth rate was about 79 per cent of the " expected " rate. By 1959, the comparable figures for the city and the remainder of the country were 25.1 and 56.1 per cent, respectively. These comparisons may be somewhat exaggerated if many rural women went to Budapest to obtain service for abortions, and if the birth statistics are by place of residence while the data on abortions are by place of occurrence. Nevertheless, the gross reproduction rate for Budapest in 1960 was 0.59 compared with 1.12 for the rural villages. Data on abortions computed from: Hungary, Statisztikai Idószaki Közlemenyek. *Magyarország Népesedése*, 1959, tables 5.12 and 5.13.

Table 8.2. Number of children ever born alive per ever-married woman 45 years of age and over, by age, urban and rural areas of the United States, 1960

	Children per woman			*Indices: Urban = 100*	
Age of woman	*Urban*	*Rural (non-farm)*	*Rural (farm)*	*Rural (non-farm)*	*Rural (farm)*
45-49	2.15	2.90	3.35	135	155
50-54	2.09	2.90	3.32	139	158
55-59	2.22	3.09	3.44	139	155
60-64	2.45	3.33	3.62	136	149
65 and over	2.95	3.81	4.13	129	140

Source: United States Bureau of the Census, *United States Census of Population 1960*, United States Summary. Detailed Characteristics, Final Report, Washington, 1960, pp. 1-480 to 1-481.

Statistics on the number of children ever born alive per ever-married woman at the United States census of 1960 indicate that the average completed family size of women aged 45-49 was 2.2 in urban communities, 2.9 in rural non-farm areas and 3.3 for rural farm women (table 8.2). Similar differences prevailed among older women. Earlier census records show that urban fertility in the United States has been lower than rural fertility for more than a century.[19] Between 1920 and 1940, it seemed that then the size of this difference was increasing, but the differential narrowed between 1940 and 1950.[20] There is tentative evidence, based on data for young age cohorts, that the rural-urban differential (in current fertility) may have continued to diminish during the 1950's. Results of the 1960 census showed that numbers of children born per ever-married urban woman in the age groups 20-21 and 22-24 were 83 and 78 per cent, respectively, as large as the average number born to rural farm women in comparable age groups. Among urban women aged 40 to 44, however, family size was only 68 per cent as large as that of women

[19] For information on the rural-urban fertility differential from 1800 to 1950, see C. V. Kiser, " Differential Fertility in the United States ", *Demographic and Economic Change in Developed Countries*, Princeton, 1960, pp. 78-87.

[20] *Ibid.*; See also, C. F. Westoff, " Differential Fertility in the United States: 1900 to 1952 ", *American Sociological Review*, vol. 19, No. 5, October, 1954, pp. 549-561 and " Differential Fertility Trends in the United States since 1900 ", World Population Conference, 1954, *Papers*, vol. I, United Nations publication, Sales No.: 55.XIII.8(1), pp. 755-773. In these papers, Westoff presented ratios of children under age 5 per 1,000 women aged 20 to 44, for rural and urban areas of the United States at each decennial census 1910 to 1950. The ratios were standardized for differences between rural and urban areas in distribution of women by age within the age group 20 to 44, and corrections were made for under-enumeration and mortality of children. The ratios showed, for each census beginning in 1910 the following relationships of urban to rural fertility: 56, 60, 57, 54, and 69 per cent.

of comparable age in rural farm areas.[21] One study concluded that the contraction of the urban-rural differential in this country might have been due partly to the influx into cities of migrants whose level of education was below the average for urban inhabitants and partly to the exodus of highly educated urban people to non-farm suburban areas.[22]

Following are data on the number of children ever born alive per woman aged 45-49 at the United States census of 1950 in urban areas by size.[23]

Size of community (number of inhabitants)	*Mean number of children ever born per ever-married woman aged 45-49*
Over 500,000	1.99
250,000-500,000	2.07
100,000-250,000	2.28
25,000-100,000	2.36
10,000-25,000	2.50
5,000-10,000	2.64
2,500-5,000	2.88

Though the inverse relationship is a fairly strong one, it is important to note that the range in average family size among the different categories of communities was only from two to three children. The data suggest that relevant attitudes may have been fairly uniform during the period when these women were bearing children, and also that knowledge of techniques for controlling family size was widespread.

Proximity of residence to an urban centre was found to be related to the level of fertility among inhabitants of the Province of Ontario, Canada (1941). The greater the distance from the city, the higher the average number of children born per ever-married woman of completed fertility.[24]

An inverse association of fertility with degree of urbanization was not found among the Jews of Palestine, as the reproduction rate was higher in Jerusalem than in other parts of the country.[25] This atypical pattern is considered to reflect both the unique character of immigration, to which the marked heterogeneity of the Jerusalem population is attributable, and low fertility in collective farm settlements, due to a high frequency of induced abortions.[26] The child-woman ratios in table 8.1 suggest that, at the 1948 census, fertility was higher in rural than in urban areas of Israel.

Differences in fertility between rural and urban inhabitants of Japan conform to the pattern most often observed in developed countries: in 1950, age-standardized birth rates for five classes of communities in descending order of size class, beginning with those having 100,000 or more inhabitants, were 21, 23, 25, 27 and 28, respectively.[27] The range in standardized birth rates for communities of the same size in 1930 was from 23 to 38, which indicates a remarkable contraction of the differentials during a period when the Japanese crude birth rate was fairly stable (except for fluctuations during 1938-1939 and the war years, 1945-1946).[28]

2. *Educational status*

Less information is available on the relationship of fertility to level of education than to rural-urban residence in low-fertility countries. A close relationship exists between educational status and other socio-economic characteristics, each of which has a bearing on family size. Among the latter, occupation of husband, income, and employment status of the wife are especially important. In certain countries, ethnic or religious characteristics may also play a large role. To ascertain the relationship of any one of these characteristics to fertility, it is necessary to isolate its effect from that of all others.

In the four European countries for which results of relevant studies were found, the relationship between fertility and education is apparently not systematic. There is reliable evidence that married women in Great Britain (1951-1952) who had completed college had higher fertility than the average married woman in that country.[29] Also, average family size of Swedish men in 1935-1936 varied directly in relation to their educational status. The Swedish data showed that the fertility of a select occupational group living in urban communities varied negatively with educational attainment when incomes were low, but the reverse was true among those with higher incomes. When differences in fertility due to income and marriage duration were eliminated, the association was clearly a positive one.[30] The British data for 1951-1952 mentioned above showed that fertility was lower among the more educated women at early durations of marriage, i.e., up to five years, but at all subsequent durations the college women had a larger average family size. Thus, this study showed not only a difference in completed fertility, but also that the time intervals between marriage and successive subsequent births varied by educational status. The pattern observed in Great Britain and Sweden, that

[21] United States Bureau of the Census, *United States Census of Population 1960*, Summary, Detailed Characteristics, Final Report, Washington, 1960, pp. 1-480 to 1-482.

[22] Goldberg, D. " The Fertility of Two-Generation Urbanites ", *Population Studies*, vol. XII, No. 3, March 1959, pp. 214-222.

[23] Ruggles, Richard and Nancy. " Differential Fertility in United States Census Data ", in *Demographic and Economic Change in Developed Countries*, Princeton (USA), 1960, pp. 155-190, annex table A-4.

[24] Keyfitz, N., " Differential Fertility in Ontario. Application of Factorial Design to a Demographic Problem ", *Population Studies*, vol. VI, No. 2, November, 1952, pp. 123-134.

[25] Gabriel, K. R., " The Fertility of the Jews in Palestine, a Review of Research ", *Population Studies*, vol. VI, No. 3, March, 1953, pp. 273-305.

[26] *Ibid.*

[27] Ueda, M., " Wagakuni Jinke Saiseisanryoku no Chiikikoze ni Kansuru Kenkyu ", *Annual Reports of the Institute of Population Problems*, Tokyo, 1956, p. 7.

[28] United Nations *Demographic Yearbook*, 1949-1950, United Nations publication, Sales No.: 51.XIII.1, pp. 290-291.

[29] G. Z. Johnson, " Differential fertility in European countries ", in: Demographic and Economic Change in Developed Countries, Princeton (USA), 1960, p. 51.

[30] Moberg, S., " Marital Status and Family Size Among Matriculated Persons in Sweden ", *Population Studies*, vol. IV, No. 1, June 1950, p. 124. In ascending order of educational status, the standardized marital fertility rates were 1.16, 1.26 and 1.35.

is, higher fertility among the more educated, was also reflected in the Netherlands census data of 1947.[31]

Results of a survey in West Germany[32] showed a different pattern. The mean number of children ever born per married woman aged 45 and over was inversely related to educational status. For three groups in ascending order of status, the figures were 2.5, 2.1 and 1.5. Among younger women, whose fertility was incomplete, the relationship was not clear; rates for the three education groups indicated a J-shaped pattern, which suggests that among women still in the reproductive ages, a change may have been occurring in the relationship of fertility to level of education. However, in view of the fact that the figures relate to women of incomplete fertility, differences between these groups in the distribution of women by age, duration of marriage and parity could also account for the lack of a clear association between the two factors.

Thus, in two of four European countries, fertility has been found to vary in direct relation to educational status and, in two others, the inverse relationship that existed in the recent past seems to have been disappearing. In the latter two, there are some indications that a positive relationship may be emerging. It cannot yet be stated to what extent either a positive relationship or a tendency in that direction is now characteristic of European countries; more recent information pertaining to a larger number of countries is needed.

Several surveys of attitudes towards the size of family desired by individuals with various degrees of education in the United States have disclosed that preferences were more or less uniform.[33] Nevertheless, information on actual performance by degree of education of wives in the United States shows a strong inverse relationship between education and fertility. One study disclosed that in the whole of the United States (1957), children ever born per ever-married woman aged 15-44 (with all data standardized for age structure within this group) classified according to six educational status groups varied regularly from 3.12 for women with less than 8 years of education to 1.59 for those with four or more years of college training. The range for urban women was from 2.79 to 1.60.[34] The author noted that " the range of the variation is smaller within urban areas than in the United States as a whole, because the groups with lowest education are more heavily weighted by rural people than are those of high education ".[35] It was also noted that the differential by education had tended to widen during the period 1950 to 1957.

In both rural and urban localities of Japan (1950), the number of children ever born per woman in a first marriage (husband present) was inversely related to educational status of husband. This held for women of all ages and marriage durations except urban women aged 15-19 and married less than five years (table 8.3.). A partial explanation of Japanese fertility differentials, both with regard to urban-rural residence and educational status, relates to the practice of birth control. Results of a survey disclosed that in 1959 contraception was practised by 47 per cent of wives in the six major cities, compared with 40 per cent in rural communities.

[31] The Netherlands, Central Bureau voor de Statistiek, *12e Volkstelling Annex* Woningtelling 31 Mei 1947, Deel 4, Utrecht, 1951, pp. 114, 138. The numbers of births per male college graduate in a first marriage and births per male in all first marriages were compared. The ratio of graduates' fertility to national fertility increased from 79 for marriages contracted in 1914-18 to 102 for those originating in 1939-1943.

[32] Freedman, R., *et al.*, op. cit., p. 145.

[33] See for examples, Freedam, R., " Social Values about Family Size in the United States ". Paper presented to the International Population Conference, Vienna, 1959, and Campbell, A. A. *et al.*, " The Reliability of Birth Expectation of U.S. Wives ". Paper presented to the International Population Conference, New York, 1961.

[34] Kiser, C. V., " Differential Fertility in the United States " *Demographic and Economic Change in Developed Countries.* Princeton, 1960, p. 105.

[35] *Ibid.*

Table 8.3. Japan, 1950. Number of children ever born per woman married once, husband present, by age, educational level of husband, and urban-rural residence

Residence and educational level of husband	*Age and duration of marriage of woman*						
	Aged 15-19 years and married 0-4 years	*Aged 20-24 years and married 5-9 years*	*Aged 25-29 years and married 10-14 years*	*Aged 30-34 years and married 15-19 years*	*Aged 35-39 years and married 20-24 years*	*Aged 40-44 years and married 25-29 years*	*Aged 45-49 years and married 30-34 years*
Urban							
Husband educated:							
0-6 years	0.31	2.06	3.26	4.48	5.27	6.02	6.21
7-9 years	0.49	1.86	3.01	4.08	5.17	5.58	5.58
10 or more years	0.38	1.75	2.85	3.80	4.18	4.59	4.60
Rural							
Husband educated:							
0-6 years	0.62	2.07	3.46	4.86	6.03	6.88	6.93
7-9 years	0.45	1.90	3.25	4.60	5.70	6.26	6.36
10 or more years	0.37	1.84	3.09	4.24	5.24	5.29	5.33

Source: Japan, Bureau of Statistics, Office of the Prime Minister. *1950 Population Census of Japan, Special Report.* Fertility of Japanese Women, table 2. Tokyo, 1957.

Differences by education of husbands in the percentage practising birth control were much greater: where the husbands had more than 13 years of school, 54 per cent of wives practised contraception, but of women where husbands had less than nine years of schooling, only 38 per cent used contraceptive methods.[36] It was also found that attitudes towards family size bore the same relationship as fertility to degree of education and rural-urban residence.[37]

D. High-fertility countries

Generally speaking, in the developing countries (most of which have high fertility), the distinction between upper and lower classes is very sharp and the middle class, which theoretically represents the link for the diffusion of new ideas and behaviour patterns between the small upper class minority and those of low socio-economic status, is relatively small. It is only the reduction of fertility among the rural masses and the urban lower classes that will bring important declines in national birth rates. Changes are occurring in the distribution of population between rural and urban communities of these countries, and substantial advances are being made in the extension of literacy and a modest level of education to larger segments of the population. If, as in the earlier phases of the demographic transition in Western countries, there develops a strong inverse relationship of fertility to educational status and degree of urbanization then these changes may have important effects on the national birth rates in the future.

1. *Rural-urban differences*

(a) *Africa*

Less is known of relationships between fertility and rural-urban residence or educational status in African countries than in those of other major regions. The vast majority of the available information for countries south of the Sahara has been obtained from sample surveys undertaken during the last decade and, in many cases, the procurement of demographic data was incidental to other objectives. Except for the United Arab Republic, there are not in the whole of Africa any data on differences in fertility by educational status, and it is only for the United Arab Republic that suitable indicators are available for analysis of national trends in the rural-urban fertility differential.

Unfortunately, the inquiries undertaken in most of the tropical African countries did not furnish data adequate to establish concrete evidence of the existence of a rural-urban fertility differential in the country as a whole. Nor did they provide a basis for determining satisfactorily the factors involved in the observed differences. In some countries the survey was undertaken in a small section which, from the demographic point of view, was not necessarily representative of the country as a whole. Moreover, many of these countries had experienced recent large-scale rural to urban migration, and data on length of residence in the place of enumeration were not obtained. The strongest migration currents appear to have been directed to the most important cities, leaving the smaller urban centres far less affected by in-migration. Thus, in many cases it is difficult to know to what extent the observed differences reflect the effects of internal migration.

Results of the 1947 census of the Egyptian region of the United Arab Republic indicate that fertility may have been higher among married women residing in urban Governorates than among those living in the rural units. Average numbers of children ever born to currently married women aged 15-49 (standardized for differences in the age distribution of women within this group) ranges from 2.90 to 3.57 among 13 rural Governorates while in the four urban Governorates the range was from 3.57 to 3.98.[38] There are indications, however, that the census was less efficient in the rural than in the urban areas, a fact which could account for the apparent differential. Examination of the fertility of rural and urban marriage cohorts also revealed very high fertility among urban women married for 30 or more years at the 1947 census. However, average completed family size among women in marriages of such long duration was not uniformly higher among the urban than the rural cohorts; in fact, no clear rural-urban differential was apparent.

Comparable fertility measures for currently married women aged 15-49 and for marriage cohorts of 30 or more years' duration have been made available by the 1960 census.[39] The reported average family size of the women aged 15-49 was larger throughout Egypt in 1960 than in 1947, but still it was higher in the four urban Governorates — ranging from 4.22 in Alexandria to 4.39 in Suez — than in the rural Governorates. Average family size in non-urban Governorates ranged from 3.53 to 4.13, except in Damietta for which the figure was 4.34. Again, completed family size, i.e., reported average number of children born per marriage of 30 years or more, was not uniformly higher in the urban than in the rural units. The urban Governorates had a range of averages from 7.74 to 8.06 children per marriage, while the averages were under 7.74 in eight of 13 non-urban Governorates; and in one of them it was above the urban range — 8.68. Evidence of higher urban fertility is stronger in the 1960 than in the 1947 census data, but the difference is not clear cut and it is uncertain whether the rural-urban fertility differential changed during the interval.

Gross reproduction rates for urban and rural areas of seven African countries and crude birth rates for five of these countries based on household survey results, are shown in table 8.4. Except for Congo (Leopoldville) and Gabon, the relationship of fertility to rural-urban residence, as indicated by these rates, conforms to the

[36] The Population Problems Research Council. The Mainichi Newspaper, *Fifth Public Opinion Survey on Birth Control in Japan.* Tokyo, 1959.

[37] *Ibid.*

[38] Egypt, Department of Statistics, *1947 Census of Egypt*, vol. II, Cairo 1953, table 20.

[39] Unpublished papers of M. A. El-Badry, Cairo University, and H. Rizk, The American University at Cairo.

Table 8.4. Crude birth rates and gross reproduction rates for rural and urban areas of selected African countries

Country	Year of survey	Live births per 1,000 population		Gross reproduction rate	
		Urban	Rural	Urban	Rural
Central African Republic: Central Ubangi	1959	...	...	1.8	2.0
Congo (Brazzaville)	1960-61	49	45	2.8	3.0
Congo (Leopoldville)	1955-57	...	...	2.9	2.3
Gabon [a]	1960-61	43	36	2.4	2.1
Guinea	1954-55	52	63	2.8	3.6
Mali [b]	1957-58	52	54	3.0	3.5
Senegal	1957-58	45	46	2.6	2.9

Source: Official publications of the different countries.

[a] Figures designated as " urban " refer to the capital city, Libreville, and those designated as " rural " to the whole country.

[b] Niger Valley.

usual pattern. In Gabon, the differential may have been greater than the gross reproduction rates suggest, since the urban figure (2.4) is for the city of Libreville only, and the figure designated as rural (2.1) is for the country as a whole. Gross reproduction rates of 2.9 and 2.3 have been calculated for urban and rural areas, respectively, of Congo (Leopoldville). In this country, the higher urban fertility may be related to superior socio-economic and sanitary conditions in the urban areas.

In Congo (Brazzaville), the reported crude birth rate was lower among rural residents than among those in urban centres, 45 and 49 per 1,000 population, respectively. The difference in this case was apparently due to a corresponding difference between areas in the age composition of the adult female population, as the gross reproduction rates suggest slightly higher rural than urban fertility, 3.0 and 2.8 for the respective areas.

Rural-urban fertility differentials have also been observed in sample areas of a few countries in eastern and southern Africa. In those instances, higher rural fertility seems to be the prevailing pattern. The crucial questions to which attention has been directed in studies in those countries is whether the rural-urban differential infertility is caused by differences in demographic, biological, health or other factors. Possible differences in the prevalence of constitutional and etiological sterility have been suggested as being closely related to the nature and size of the rural-urban differential in some countries of Africa.[40]

Results of the 1958 census of Zanzibar revealed that the mean number of children born alive to Afro-Arab women aged 46 and over was much lower in Zanzibar town (1.94) than in the remainder of the territory (3.38).[41] It was demonstrated that neither differences in proportions married, voluntary sterility, endemic malaria nor venereal disease could account for the very low average family size of the city women. The percentage of childless among women of completed fertility and those still in the child-bearing ages (15-45) was higher in the town than elsewhere — 38 per cent of each group in Zanzibar Town, and 25 per cent of each age group in the remainder of the island. Childlessness however, declined notably throughout the country between 1948 and 1958, with the larger decreases among women of both age groups occurring in the city. It was suggested that although the size of the rural-urban fertility differential might be due to a higher incidence of physiological sterility in the town, proof of the hypothesis would require considerably more data and analysis.

The trend of fertility among the Asian population of Tanganyika from 1948 to 1957 was marked by a decline in child-woman ratios for both rural and urban areas.[42] In an urban agglomeration, Dar es Salaam, ratios of children aged 0 to 4 years per 1,000 women 15-49 years of age declined from 652 to 586. The remainder of the territory experienced a decrease of from 811 to 700. The decline was noteworthy both in the city and elsewhere, but as it was slightly more pronounced in the rural sections, the differential in child-woman ratios diminished during this period. For reasons noted earlier, child-woman ratios are not very satisfactory indicators of the size of fertility differentials: at the 1957 census, the average reported number of children ever born per ever-married urban woman aged 45 to 49 years was 5.06, compared with 5.53 for the remainder of the country.[43]

An analysis of the fertility of the Bantu living in Alexandria Township of South Africa revealed the effects of a large influx of rural migrants upon the fertility of an urban community. It was observed that Bantu women aged more than 49 years who had lived in the town since birth had, on an average, 4.6 children, while the averages for women of that age who had lived in the town for less than ten years varied from

[40] See, for example, Romaniuk, A., " Fécondité et stérilité des femmes congolaises ". Paper presented to the International Population Conference, New York, 1961.

[41] Blacker, J. G. C., " Population Growth and Differential Fertility in Zanzibar Protectorate ", *Population Studies*, vol. 15, No. 3, March, 1962, pp. 258-266.

[42] Blacker, J. G. C., " Tanganyika Fertility Trends ", *Population Studies*, vol. XIII, No. 1, July 1959, pp. 46-60.

[43] *Ibid.*

5.8 to 6.0.[44] The difference was attributed in part to differences between the two groups in the stability of marriages, particularly of exogamous unions.

Differences between rural and urban communities in the stability of marriages may indeed account to some extent for observed rural-urban fertility differentials in other countries of Africa south of the Sahara. For example, it has been calculated that among the Bantu of Northern Rhodesia (1951-1954), only 47 per cent of a cohort of urban endogamous marriages would remain undissolved by divorce after 20 years of marriage, compared with 69 per cent of a cohort of intra-tribal marriages contracted in rural areas. On the other hand, the probability that inter-tribal marriages would not be dissolved by divorce was much greater in urban than in rural places.[45] Other studies have disclosed the wide prevalence of marital instability, in urban areas particularly, of certain countries in this region.[46] The limited evidence also points to the possible influence of other non-demographic factors upon the observed differentials.

A possible cause of comparatively low fertility among urban and rural women of Congo (Leopoldville), where rural to urban migration has taken place on a large scale, is physiological impairment due to the wide prevalence of venereal diseases.[47] Contrary to what has been observed in Western countries, the rural-urban fertility differential among African populations can hardly be explained by differences between rural and urban couples in the extent of deliberate control of family size. Although post-partum abstinence, abortion and other means of controlling family size are practised in some African countries, authorities on the subject are of the opinion that the combination of values favouring deliberate efforts to keep family size small is not very prevalent in this region.[48]

(b) *Asia*

The necessary data for calculating urban and rural ratios of children to women of reproductive age have been found for four high-fertility countries in Asia (table 8.5): namely, Ceylon, India, the Philippines and Turkey. In all four cases, the rural ratio is higher than the urban, though the difference in India is so small as to have little significance.

For Ceylon, India and the Philippines, and also for Jordan, more refined data are available which permit comparisons of urban and rural fertility in terms of average number of children born per married or ever-married woman of completed fertility as reported in

Table 8.5. Children aged 5-9 years per 1,000 women aged 20-49 in urban and rural areas of four high-fertility Asian countries, recent census years

Country	Census year	Children per 1,000 women		Rural / Urban × 100
		Urban	Rural	Urban
Ceylon [a]	1953	655	741	59
India [b]	1951	600	629	95
Philippines [c] .	1957	809	943	86
Turkey	1950	504	695	73

Source: Official publications of the countries concerned.

[a] Population actually enumerated, i.e., excluding 0.7 per cent adjustment for under-enumeration. Also, excluding non-resident military and shipping personnel.

[b] Data relate children 0-4 years to women aged 15-44. Including data for Sikkim; excluding data for Kashmir-Jammu, the final status of which has not been determined; as well as the Part B tribal areas of Assam; certain Settlements and displaced persons.

[c] Data from the Philippines Statistical Survey of Households.

censuses or household surveys. These data confirm the indications of higher rural than urban fertility in Ceylon and the Philippines while showing no consistent or substantial difference in India, nor in Jordan. In evaluating the figures quoted below, it should be recalled that data of this kind are subject to the possibility of considerable errors due to omissions in reporting of births, which may be greater in rural than in urban areas.

Data from the All-India National Sample Survey show no large rural-urban differences in average number of children born per married couple after a considerable number of years of marriage.[49] The reported averages for women married at age 15 or later were:

	Duration of marriage	
	12 years	22 years
Five major cities	2.96	...
Total urban area	3.34	5.13
Rural areas	3.13	4.96

Likewise only small differences, with no consistent pattern of higher fertility in either rural or urban areas, have been indicated by results of surveys in various parts of India, where data have been obtained on number of children born to women beyond reproductive age who were married at the time of the survey.[50] Such data eliminate the influence of variations in widowhood, a factor tending to depress fertility which is particularly important in India and which might be stronger in rural than in urban areas. In fact, in a survey carried out in Mysore State (southern India) in 1951, appreciably lower fertility was found in rural than in urban areas when the average reported number of children born per ever-married woman (including widowed, divorced and separated women) of completed fertility was used

[44] Mitchell, J. C., " Marriage Stability and Social Structure in Bantu Africa ". Paper presented to the International Population Conference, New York, 1961.

[45] Mitchell, op. cit.

[46] Lorimer, F., ed., *Culture and Human Fertility*, UNESCO, Paris, 1954, Roberts and Tanner, op. cit.

[47] Lorimer, op. cit.

[48] See for example, Sarmento, A. and Henriques, F. F., " Some Observations on Fertility of the Native Women of the Ganda Tribe " (Angola). Paper presented to the International Population Conference, New York, 1961.

[49] Das Gupta, A., *et al.*, *The National Sample Survey*, No. 7: Couple Fertility, Fourth Round, Calcutta, 1955, pp. 38, 40.

[50] See especially: *The Mysore Population Study*, United Nations Publication, Sales No.: 61.XIII.3; V. M. Dandekar and K. Dandekar, *Survey of Fertility and Mortality in Poona District*, Poona (India), 1953; Driver, E. D., *Differential Fertility in Central India*, Princeton (USA), 1963.

as the measure. The averages for ever-married women over age 45 were 5.3 children for Bangalore City, 5.6 for a group of smaller urban areas, and 4.8 for the three rural zones covered by the survey.[51] However, the estimated crude birth rate for a 12-month period preceding the census date was much lower in Bangalore City than in the rural zones.[52]

Reports on the numbers of children born alive to ever-married women of completed fertility in the first census of Jordan (1961) reveal no difference in fertility between rural and urban inhabitants. The averages were 7.78 children for the country as a whole and 7.70, 7.50 and 7.77, respectively, for the cities of Amman, Jerusalem and Zarqa.[53] These data, it should be noted, are not comparable with the figures from the Indian National Sample Survey quoted above, as they include women who were widowed or whose marriages were otherwise dissolved before they reached the end of their potentially reproductive years.

Data corresponding to those for Jordan are also available for Thailand and the Philippines, but they show a different pattern. For Thailand (1960), the reported average numbers of children born to ever-married women 45-49 years of age were considerably smaller in Bangkok and Thonburi, the second largest city of the country, than the national average. For Thailand as a whole, the average was 5.9 children, and the figures for Bangkok and Thonburi were 4.4 and 4.7 children respectively. The same pattern was repeated in the data for older women.[54] Likewise in the Philippines (1956), considerably smaller average numbers of children born per ever-married woman 45 years of age and over were reported in urban than in rural areas (table 8.6).

On the other hand, for Ceylon (1953), there are data similar to those from the Indian National Sample Survey, on children born to married women aged 45 years and over living with their husbands, and in the case of Ceylon these data indicate somewhat higher rural than urban fertility. The recorded averages were 5.5 children for Estate Areas, 6.3 for rural and 5.1 for urban places. When age of the women at marriage is taken into account, no differences can be observed among women married at ages 15-19, but for women married at ages 20-24, the reported average number of children born was 5.3 in urban areas and 6.3 in the remainder of the country.[55]

For China (Taiwan) as of 1958 [56] and 1961,[57] gross

Table 8.6. Number of children ever born alive per ever-married woman aged 45 and over by level of education of women, urban and rural areas of the Philippines, 1956

Level of education	*Place of residence*		
	Manila	*Other urban*	*Rural*
No formal education	6.2	6.7	7.5
Grades 1-4	6.9	6.9	7.9
Grades 5-7	6.4	6.4	7.1
High school grades 1-4	5.4	5.6	6.1
College and higher	3.6	4.3	5.4

Source: Concepcion, M. B., " Fertility Trends and Differentials in the Philippines ". Unpublished Ph. D. dissertation, University of Chicago (USA). Data are from the May 1956 round of the Philippines Sample Survey of Households.

reproduction rates for urban and rural areas have been calculated from registration statistics. These are not comparable either to the data mentioned above for India and Ceylon or to those for Jordan, Thailand and the Philippines; the gross reproduction rates are influenced by the marital-status distribution of the female population in each age group, age at marriage, frequency of non-marriage (as determined by widowhood, etc.) as well as by marital fertility. These rates for China (Taiwan) show an inverse association between fertility and degree of urbanization, more strongly marked in 1961 than in 1958. Fertility decreased in this country during the interim, and the decrease was greater in urban than in rural areas. The rates were as follows:

	Gross reproduction rates		*Per cent decrease*
	1958	*1961*	
Cities	2.65	2.40	9
Towns	2.90	2.74	6
Countryside	3.11	3.00	4

It is of interest that in a study of practices and attitudes towards family planning in Taiwan, only 31 per cent of married women with farm backgrounds were found to have practised birth control, compared with 40 per cent of those with no farm experience. However, there were no differences between these women in the average number of children (3.8) that they desired.[58]

(c) *Latin America*

The child-woman ratios for Latin American countries listed in table 8.7 show universally higher rural than urban fertility in this region, the differences in almost all countries being very large.

Essentially the same conclusion results from comparisons of average numbers of children born per woman past 40 or 45 years of age in rural and urban areas, as reported in the censuses of four Latin American countries (table 8.8). The data for Cuban, Panamanian and Brazilian women in consecutive age groups suggest that the urban-rural differential may have been widening due to fertility decreasing in urban areas more rapidly than in rural areas. It should be noted that the data

[51] *The Mysore Population Study* (op. cit.), p. 111.

[52] *Ibid.*, p. 78.

[53] Jordan, Department of Statistics, *First Census of Population and Housing 18 November 1961.* Interim Reports, No. 2-9, Distribution and characteristics of Population, Amman, 1961-1963.

[54] Das Gupta, A., *et al.* " Population Perspective of Thailand ", January 1963 (unpublished manuscript).

[55] Ceylon, Department of Census and Statistics, *Fertility Trends in Ceylon*, 1953 Census Monograph No. 8, Colombo, 1956, pp. 20-21.

[56] Calculated from data presented in Freedman, R., *et al.*, " Fertility Trends in Taiwan; Tradition and Change ", *Population Studies*, vol. XVI, No. 3, March 1963, p. 225.

[57] Republic of China, Directorate-General of Budgets, Accounts and Statistics, *The Taiwan Economic Indicators*, No. 30, 1962, p. 20.

[58] Freedman, R., *et al.*, op. cit., pp. 232-233.

Table 8.7. Children aged 5-9 years per 1,000 women aged 20-49 in urban and rural areas of selected Latin American countries, recent census years

Country	Census year	Children per 1,000 women		Urban / Rural × 100
		Urban	Rural	
Barbados	1946	384	403	95
Brazil [a]	1950	486	1,038	47
Chile [b]	1952	513	911	56
Costa Rica [c]	1950	534	895	60
Cuba [c]	1953	437	931	47
Dominican Republic	1950	491	919	53
Ecuador [c d]	1950	616	831	74
El Salvador	1950	531	805	66
Guatemala	1950	561	806	70
Jamaica [e]	1960	547	873	63
Nicaragua [c]	1950	580	890	65
Panama [f]	1950	524	970	54
Paraguay [d g]	1950	751	917	82
Puerto Rico [h]	1960	620	985	83
Trinidad and Tobago	1946	392	666	59

Source: Official census publications of the various countries.

[a] Excluding Indian jungle population, numbering 45,244, and also schedules not tabulated by sex and age.

[b] Population actually enumerated, i.e., excluding 5.2 per cent adjustment for under-enumeration.

[d] *De jure* population.

[d] Excluding Indian jungle inhabitants.

[e] Children 0-4 years per 1,000 women aged 15-44.

[f] Excluding data for Canal Zone, and for Indian ungle population, numbering 48,654.

[g] Excluding adjustment for under-enumeration and schedules not tabulated by sex, numbering 50,067 and 12,881, respectively. Data are for 10 departments, or 55.2 per cent of the total population.

[h] *De jure* population, but including armed forces stationed in the area.

Table 8.8. Average number of children ever born alive per woman of specified age — selected Latin American countries

	Rural	Urban	Urban / Rural × 100
Cuba, 1953			
Women aged			
40-44	2.68	4.99	186
45-49	3.01	5.41	180
50-54	3.33	5.74	172
Brazil, 1950			
Women aged			
40-44	4.43	6.81	154
45-49	4.92	7.27	148
Panama, 1950			
Women aged			
40-44	3.02	5.40	179
45-49	3.28	5.48	167
50-54	3.57	5.34	150
Mexico, 1960			
Women aged			
40-49	4.44	5.69	128

Source: Official census publications of the different countries.

refer to all women of the stated ages, and not merely currently married or ever-married women. Thus, the urban-rural differences might be due partly to variations in extent of non-marriage, widowhood, etc., as well as to differences in marital fertility.

Similar differences between rural and urban areas in average number of children ever born per woman of completed fertility were also disclosed by results of recent censuses in two Caribbean countries. The reported average for women aged 45 to 54 years in Jamaica (1960) was 2.5 children in both the city of Kingston and its suburb, and 4.2 in the remainder of the country.[59] Figures for Trinidad and Tobago, referring to women aged 45 to 64 at the 1960 census, reveal the same relationship of fertility to rural-urban residence. The average number of children born was 2.5 in Port-of-Spain proper, 2.9 for women living in the suburbs of the city and 4.1 for those in the rest of the country.[60]

[59] West Indies Population Census 1960, *Bulletin No. 22* (Jamaica), Kingston, 1962, pp. 4-15.

[60] Trinidad and Tobago, Central Statistical Office, 1960 Population Census of Trinidad and Tobago, *Census Bulletin No. 18 A, B and C*, p. A-1-2.

Chapter IX

ECONOMIC AND SOCIAL FACTORS RELATED TO DIFFERENCES IN LEVELS OF FERTILITY

A. Indicators of economic and social development

The purpose of this chapter is to examine relationships between levels of fertility, as measured by the gross reproduction rate in different countries, and various indicators of the degree of their economic and social development. The following twelve economic and social indicators have been selected for this purpose:

Income per head: US dollar equivalent of annual *per capita* income in 1957-1959 [1]

Energy consumption: *per capita* consumption of kilogrammes of coal equivalent according to data for recent years, mostly 1954-1959 [2]

Urbanization: percentage of population residing in localities of 20,000 or more inhabitants, according to recent census data and estimates

Non-agricultural activities: percentage of economically active males engaged in activities other than agriculture, forestry and fishing, according to recent census data and estimates

Hospital beds: number of hospital beds per 1,000 inhabitants according to data for recent years, mostly 1954-1959

Life expectancy: expectation of life at birth (both sexes) in years, according to the most recent available official statistics of satisfactory quality

Infant mortality: deaths under one year of age per 1,000 live births (based on complete registration data or estimates from sample survey or census data)

Early marriage: percentage of women aged 15-19 years either legally or consensually married, according to data of recent censuses

Female literacy: percentage of females aged 15 years and over able to read and write according to recent census data and estimates [3]

Newspaper circulation: annual number of copies of daily newspapers per 1,000 inhabitants according to data for recent years, mostly 1952-1959 [4]

Radio receivers: number of receiving sets per 1,000 inhabitants according to data for recent years, mostly 1950-1959 [4 5]

Cinema attendance: annual cinema attendance per inhabitant according to data for recent years, mostly 1950-1959.[4 5]

While ten of these twelve indicators tend to vary directly with the degree of a country's economic and social development, two of them vary inversely: namely, infant mortality and early marriage. These two can be considered, in general, as negative indicators of the degree of development.

For each of the twelve indicators, the geographic coverage is less extensive than that of the estimated gross reproduction rates. Therefore, in studying the relations of the different indicators to fertility, a varying number of countries is omitted for lack of data. In the case of life expectancy, omissions are greatest for developing countries. In respect to female literacy, the latest available figures are somewhat out of date for countries where nearly universal literacy has been attained since it is no longer considered essential in these to collect such data in the census. Each indicator suffers from its own defects, including varying degrees of inaccuracy and non-comparability of the data. The effects of such defects on the analysis tend to be reduced when data are combined in groups of sufficient size so that errors are partly merged and compensated in the group averages.

Another shortcoming of the analysis of relationships between these indicators and the level of fertility results from giving equal weight to all countries, large and small, as units of observation.[6] Anomalous conditions in a small area may significantly affect the average value of the gross reproduction rate or of one or more

[1] Estimates of the United Nations Statistical Office, in most cases based on official data. In a few instances, the estimate of *per capita* national product was substituted.

[2] United Nations, *Statistical Yearbook*, 1954, 1956, 1960-1962; United Nations, *World Energy Supplies, 1957-1960.*

[3] According to data of recent censuses, where available, or estimates in UNESCO, *World Literacy at Mid-century*. These estimates refer to both sexes combined and are usually given in a range rather than as an exact value of the percentage.

[4] United Nations, *Statistical Yearbook, 1961.*

[5] UNESCO, *Basic Facts and Figures, 1960.*

[6] Within three countries, ethnic or geographical groups are treated as separate units in the analysis of the indicators which could be obtained for such groups; in cases of indicators not obtainable for the separate groups, the countries concerned are treated as single units. The countries and groups in question are: South Africa: Bantu, Coloured, White, Asian; Zanzibar and Pemba: Zanzibar, Pemba; United Kingdom: England and Wales, Northern Ireland, Scotland. In the case of Israel, data for some indicators refer to total population and others to Jewish population.

economic and social indicators for a small country, though they would have a negligible effect on the average for a large country. So, by giving equal weight to all countries, such conditions are over-represented. On the other hand, weighting by size of each country's population would be even less satisfactory, as the analysis would then be dominated by the values of the indicators and gross reproduction rates for a small number of very populous countries.

B. Distributions of countries by levels of fertility and of social and economic indicators

The 125 populations for which information on the fertility level is presented in this report fall into two distinct groups: those with low fertility, having gross reproduction rates below 2.0, and those with high fertility, having rates above 2.0. About two-thirds of the populations (85) fall into the latter group, and one-third (40) into the former. Few populations in the world have levels of fertility near the borderline between these groups. Yet the levels of fertility within each of the two groups are far from uniform. This fact is seen in the histogramme (figure 9.1), which uses a more detailed classification of fertility levels than shown in chapter I.

Likewise for each social and economic indicator, a histogramme has been drawn, as shown in figure 9.2. For those indicators which have exceedingly wide ranges, the logarithms have been plotted instead of the actual values.

The scale in these instances was made to proceed by equal intervals of the logarithms rounded to the first decimal. Class intervals of the logarithm are 0.2 for income, urbanization, hospital facilities and early marriage; 0.3 for energy consumption and cinema attendance; and 0.4 for newspaper circulation and radio receivers. Since adequacy of scale is a matter of degree, the histogrammes cannot be regarded as strictly comparable with one another and inferences from the comparisons are only rough.

Comparison of figures 9.1 and 9.2 indicates that none of the economic and social indicators is so dis-

Figure 9.1. Distribution of 125 countries by level of the gross reproduction rate as of latest dates of available information

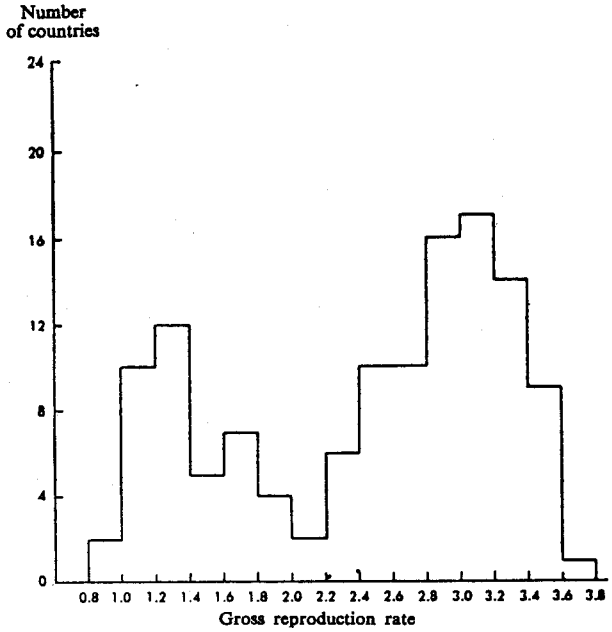
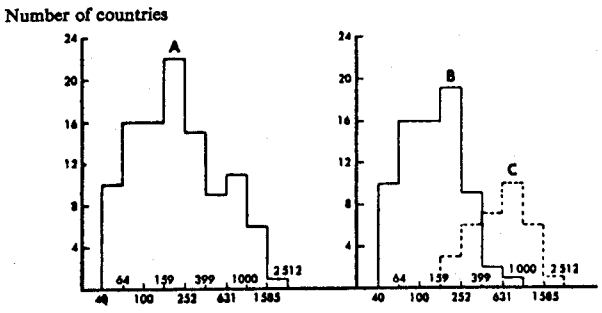
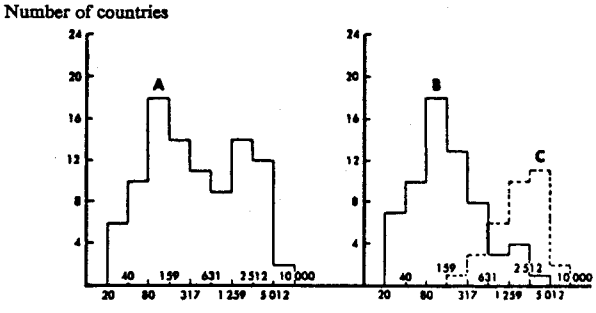


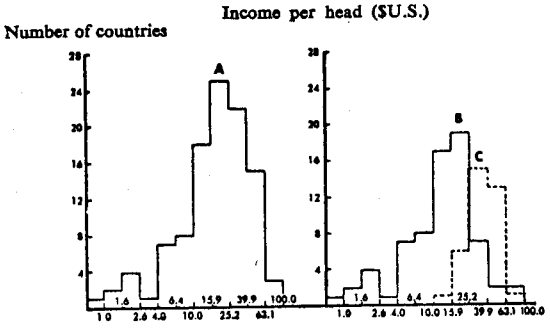
Figure 9.2. Distributions of Countries by Levels of Social and Economic Indicators

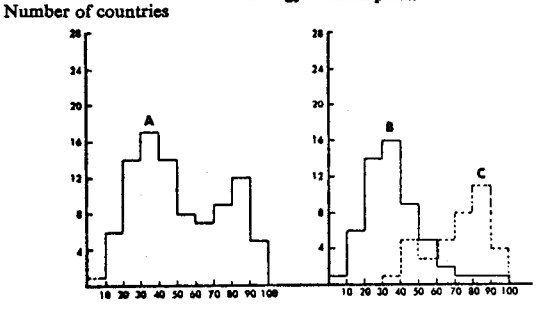
A. All countries for which indicators are available
B. Countries with high fertility. GRR > 2
C. Countries with low fertility. GRR < 2

(See definitions of indicators on page 134)



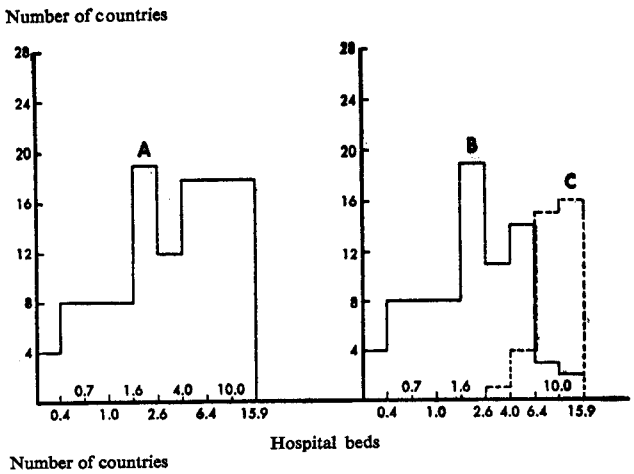




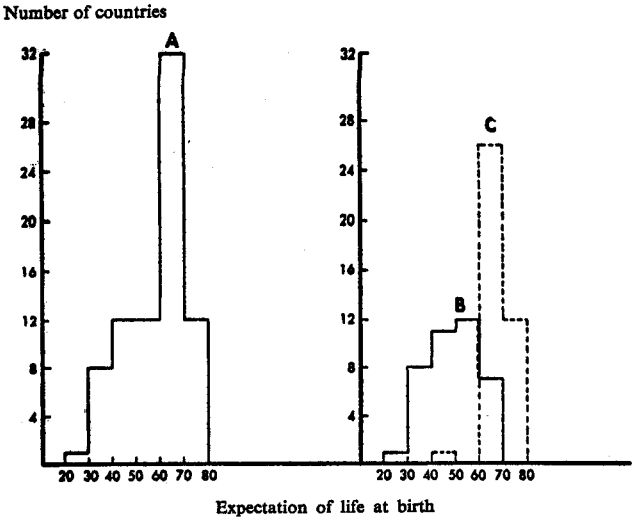


(Figure 9.2 continues overleaf)

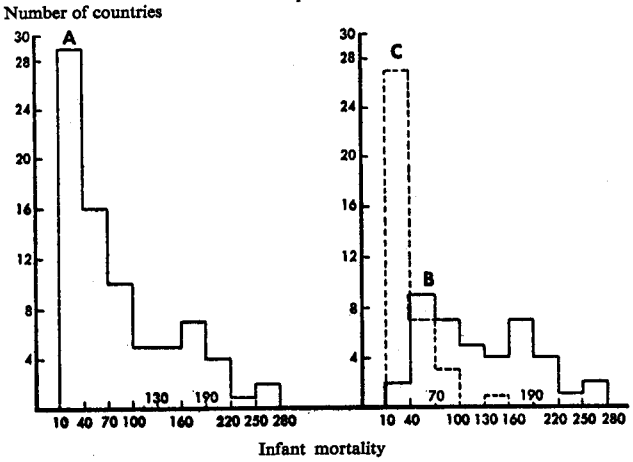
Figure 9.2. *(continued)*



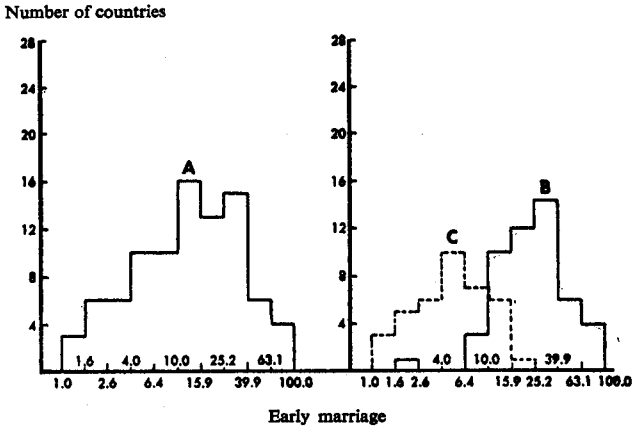
Hospital beds



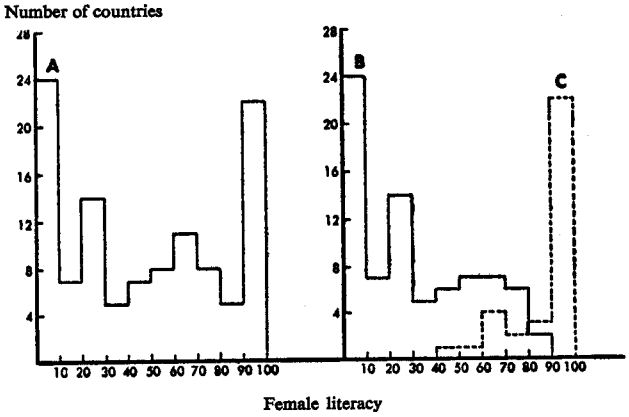
Expectation of life at birth



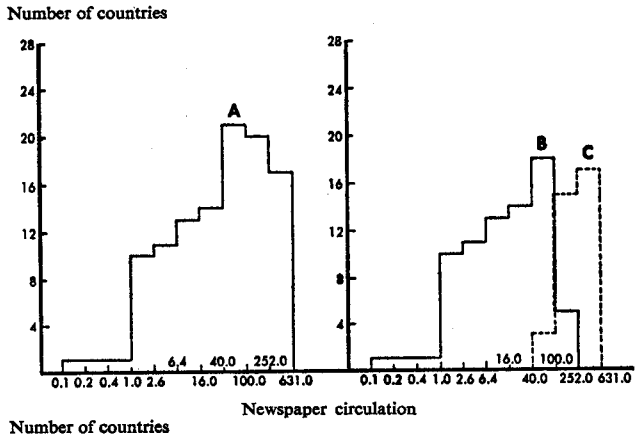
Infant mortality



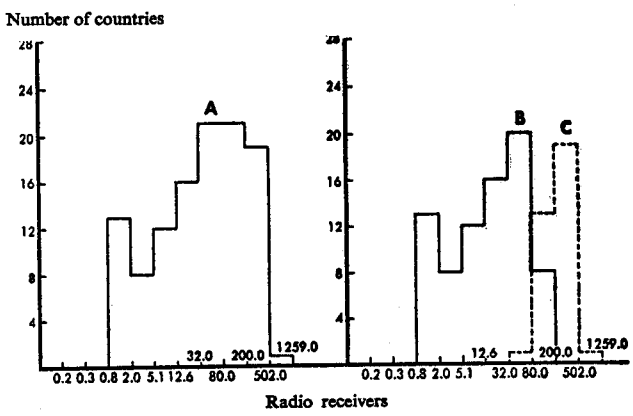
Early marriage



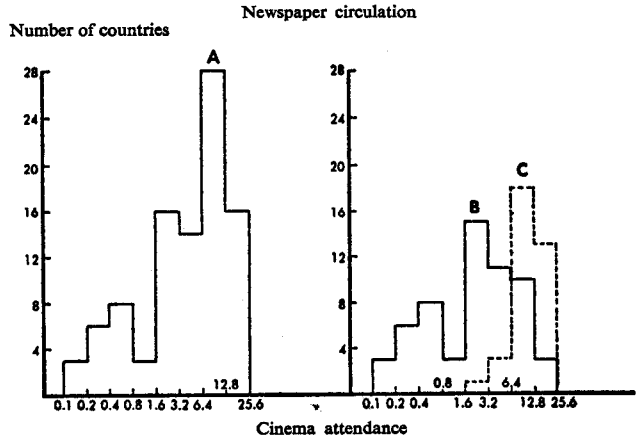
Female literacy



Newspaper circulation



Radio receivers



Cinema attendance

continuously distributed as the gross reproduction rate. The degree of bimodality is considerable only in the case of literacy, though noticeable also in the cases of non-agricultural activities and energy consumption.

Even in the case of literacy, the number of countries at intermediate levels is fairly large and there is no sharp break between mainly literate and mainly illiterate nations. The numbers of countries occupying middle positions with respect to non-agricultural activities, income per head, and so forth, are greater. It seems that at present, no social or economic indicator separates countries as clearly into two sharply differentiated groups as does the measure of fertility.

The histogrammes of figure 9.2 have been drawn separately for the groups of countries with high and low fertility (gross reproduction rates above and below 2.0). While the two distributions for each indicator overlap, higher values of indicators generally prevail in low-fertility countries than in those of high fertility. (As would be expected, the opposite is true of the two negative indicators of economic and social development, early marriage and infant mortality.) This is an initial indication of the association between the levels of the indicators and the level of fertility, which will be analysed in following sections of this chapter.

For further analysis, the values of the gross reproduction rate and of each indicator are classified by six levels, so as to minimize the influence of minor variations which may easily be due to errors of measurement or estimation. The six levels of the gross reproduction rate are defined as follows:

Low-fertility group:

Level I	under 1.30
Level II	1.30 to 1.59
Level III	1.60 to 1.99

High-fertility group:

Level IV	2.00 to 2.49
Level V	2.50 to 3.09
Level VI	3.10 and over

The following are the definitions of levels of the economic and social indicators:

	Level I	*Level II*	*Level III*	*Level IV*	*Level V*	*Level VI*
Income per head (U.S. dollar equivalent, annually)	808 and over	523-807	308-522	163-307	88-162	Under 88
Energy consumption (equivalent kg. of coal annually per head)	3300 and over	1900-3299	900-1899	300-899	100-299	Under 100
Urbanization (percentage of total population in localities of 20,000 or more inhabitants)	45 and over	36-44	27-35	18-26	9-17	Under 9
Non-agricultural activities (percentage of economically active males)	85 and over	70-84	55-69	40-54	25-39	Under 25
Hospital beds (per 1000 inhabitants) ...	10.00 and over	7.50-9.99	5.00-7.49	2.50-4.99	1.25-2.49	Under 1.25
Life expectancy (expectation of life at birth, both sexes, in years)	70.5 and over	68.5-70.4	64.5-68.4	58.5-64.4	50.5-58.4	Under 50.5
Infant mortality (annual number of infant deaths per 1000 live births)	Under 22	22-28	29-42	43-63	64-91	92 and over
Early marriage (percentage of women aged 15-19 years, married)	Under 3	3-4	5-7	8-15	16-32	33 and over
Female literacy (percentage of literates in female population 15 years of age and over)	98 and over	86-97	68-85	44-67	14-43	Under 14
Newspaper circulation (per 1000 inhabitants)	340 and over	205-339	105-204	40-104	10-39	Under 10
Radio receivers (per 1000 inhabitants) ..	261 and over	157-260	80-156	30-79	7-29	Under 7
Cinema attendance (average annual attendance per individual)	14.3 and over	11.3-14.2	8.3-11.2	5.3-8.2	2.3-5.2	Under 2.3

The average GRR's for groups of countries classified according to six levels of each indicator are shown in table 9.4.

Certain standards were adopted for the choice of class limits of the six levels so as to secure some degree of comparability in the scales used for the gross reproduction rate and the different indicators and to minimize the effects of the inevitable arbitrariness of such classifications.[7]

Table 9.1 shows the levels of the gross reproduction rate and each indicator for each of the countries included in the analysis.

[7] For each economic and social indicator except early marriage and infant mortality, level I was taken for the highest and level VI for the lowest value. As a first trial, one-third of the countries for which data were available were assigned to levels I to III and the remainder to levels IV to VI, and the two sets were then sub-divided by equal quantiles. As a next step, to reduce arbitrariness, formulae with constant second difference were sought for class limits approximately consistent with the sub-division by quantiles and the maintenance of fairly rounded figures. Usually, two or several alternative formulae suggested themselves. Finally, the most appropriate formula was selected on the basis of statistical *t*-tests, the criterion of preference being that a low degree of statistical differentiation between successive groups was to be rejected. In the case of hospital beds, calculations were initially made in reciprocal values.

Table 9.1. Levels of fertility and of economic and social indicators: latest available data

Region and country	Gross reproduction rate	Income per head	Energy consumption	Urbanization	Non-agricultural activities	Hospital beds	Life expectancy	Infant mortality	Early marriage	Female literacy	Newspaper circulation	Radio receivers	Cinema attendance
Africa:													
North Africa:													
Algeria (Moslems)	V	IV	V	V	VI	IV	...	...	VI	...	V	V	VI
Libya	V	V	V	IV	IV	IV	...	...	V	VI	VI	V	V
Morocco (Moroccan Moslems)	V	V	V	IV	V	V	...	...	VI	VI	V	V	VI
Sudan	VI	VI	VI	VI	VI	VI	VI	...	...	VI	VI	VI	VI
Tunisia	VI	V	...	IV	V	IV	...	...	VI	V	V	IV	VI
United Arab Republic (Egyptian Region)	V	V	V	III	V	V	V	...	V	VI	V	V	V
West Africa:													
Cameroon (five provinces of Northern Cameroon)	IV	V	VI	...	...	...	VI	VI	VI	VI	VI	VI	...
Central African Republic (Central and West Ubangi)	IV	V	...	...	VI	V	VI	VI	...	VI	VI	VI	...
Congo (Brazzaville)	V	V	...	...	...	IV	...	VI	...	VI	VI	VI	...
Dahomey	VI	...	...	...	...	...	...	...	...	...	...	...	...
Gabon	IV	V	...	...	...	III	...	VI	...	...	...	IV	...
Ghana	V	V	V	VI	V	VI	VI	...	...	V	V	VI	VI
Guinea	VI	VI	...	VI	...	VI	...	VI	VI	VI	VI	V	...
Ivory Coast	V	V	...	VI	...	V	VI	...	VI	VI	VI	V	...
Mali	VI	VI	...	VI	...	VI	VI	VI	...	VI	VI	VI	VI
Niger (sedentary population)	VI	...	...	...	...	...	...	...	...	...	...	...	...
Nigeria	VI	VI	VI	VI	...	VI	...	...	...	VI	VI	VI	VI
Portuguese Guinea	IV	...	...	...	...	...	...	...	...	...	...	...	...
Senegal	V	IV	...	...	...	VI	VI	...	...	VI	V	IV	...
Togo	VI	VI	VI	VI	...	V	...	...	...	VI	VI	VI	VI
Upper Volta	V	VI	...	VI	...	VI	VI	VI	...	VI	VI	VI	...
South and East Africa:													
Angola	V	VI	VI	VI	...	V	...	...	...	VI	VI	V	VI
Basotuland	VI	...	...	...	...	V	...	VI	...	IV	...	VI	...
Bechuanaland	V	...	...	V	...	V	...	...	...	V	...	VI	VI
Burundi	V	VI	...	...	...	...	...	VI	...	VI	...	...	...
Congo (Leopoldville)	IV	VI	...	VI	VI	III	VI	VI	VI	VI	VI	VI	VI
Kenya (Africans)	VI	VI	...	VI	...	VI	...	VI	...	V	VI	VI	VI
Madagascar	IV	V	VI	VI	...	V	...	...	...	V	VI	VI	VI
Mauritius	V	IV	V	III	III	IV	V	V	VI	V	IV	IV	III
Mozambique	V	VI	VI	VI	VI	VI	...	...	VI	VI	VI	VI	VI
Réunion	VI	IV	V	V	...	II	VI	V	...	IV	IV	IV	VI
Rhodesia and Nyasaland, Federation of:													
Northern Rhodesia (Africans)	VI	...	IV	VI	...	IV	VI	VI	...	V	VI	V	...
Nyasaland	...	...	...	...	...	...	...	...	...	...	...	...	...
Southern Rhodesia (Africans)	VI	...	IV	V	...	IV	VI	VI	...	V	IV	V	...
Rwanda	VI	VI	...	VI	...	...	...	VI	...	VI	...	...	...
South Africa:	V	III	II	III	...	III	...	...	...	...	IV	IV	V
Bantu population	V	...	...	...	IV	...	...	...	IV	V	...	...	...
Coloured population	VI	...	...	...	III	...	VI	VI	...	...	...	...	...
White population	III	...	...	...	II	...	III	II	IV	...	...	...	...
Asian population	IV	...	...	...	II	...	V	IV	V	...	...	...	...
Tanganyika (Africans)	V	VI	VI	VI	...	V	...	VI	...	VI	VI	VI	VI
Uganda	V	VI	VI	VI	...	V	...	VI	...	V	VI	V	VI
Zanzibar and Pemba	IV	V	VI	V	...	IV	...	...	...	...	VI	V	VI
Zanzibar	III	...	...	...	...	...	VI	VI	...	...	...	...	...
Pemba	IV	...	...	...	...	...	VI	VI	...	...	...	...	...
Asia:													
South-West Asia:													
Cyprus	III	III	IV	V	II	IV	II	III	IV	IV	III	II	II
Iran	VI	V	V	IV	V	VI	...	...	VI	VI	VI	VI	V
Iraq	VI	V	V	IV	IV	VI	...	...	VI	VI	V	VI	...

Table 9.1. (*continued*)

Region and country	Gross reproduction rate	Income per head	Energy consumption	Urbanization	Non-agricultural activities	Hospital beds	Life expectancy	Infant mortality	Early marriage	Female literacy	Newspaper circulation	Radio receivers	Cinema attendance
Israel	III	II	III	I	II	III	II	...	IV	II	II	II	I
Jewish population	III	...	...	...	...	...	...	II	...	...	...	...	...
Turkey	V	IV	V	IV	V	V	VI	...	V	V	V	IV	VI
South Central Asia:													
Ceylon	V	V	V	V	IV	IV	IV	V	V	IV	IV	V	V
India	V	VI	V	V	V	VI	VI	VI	VI	VI	V	VI	V
Nepal	V	VI	...	VI	VI	VI	...	...	...	VI	...	...	...
Pakistan	VI	VI	VI	VI	VI	VI	...	...	VI	VI	VI	VI	VI
South-East Asia:													
Burma	V	VI	VI	V	V	VI	...	...	VI	V	VI	VI	IV
Cambodia	VI	V	VI	V	V	VI	VI	VI	...	VI	VI	VI	VI
Federation of Malaya	V	IV	V	IV	IV	IV	V	V	VI	V	IV	IV	IV
Indonesia	V	VI	V	V	V	VI	...	...	...	V	V	V	V
North Borneo	VI	...	VI	...	VI	IV	...	...	VI	VI	V	VI	VI
Philippines	VI	IV	V	V	V	VI	...	...	IV	III	V	V	VI
Sarawak	VI	...	III	...	V	V	...	...	V	VI	V	IV	I
Singapore	V	III	IV	I	I	IV	IV	III	V	V	III	III	II
Thailand	VI	V	VI	VI	VI	VI	...	...	IV	IV	VI	VI	...
East Asia:													
China: Taiwan	V	VI	IV	V	IV	VI	III	III	IV	IV	IV	IV	IV
Hong Kong	IV	IV	IV	I	...	IV	...	III	III	IV	II	IV	I
Japan	I	IV	III	I	II	II	III	III	I	II	I	III	III
Korea, Republic of	V	V	V	IV	VI	VI	...	...	I	IV	IV	V	VI
Ryukyu Islands	II	...	V	V	III	...	II	...	I	III	I	...	III
America:													
Middle America:													
Costa Rica	VI	III	V	...	V	III	IV	V	IV	III	IV	IV	...
Cuba	IV	III	IV	III	IV	V	...	IV	V	III	IV	III	III
Dominican Republic	VI	IV	VI	V	VI	IV	...	...	...	V	V	V	VI
El Salvador	VI	IV	V	V	VI	V	IV	V	V	V	IV	V	V
Guadeloupe	V	III	V	V	IV	II	V	V	...	...	V	V	V
Guatemala	VI	V	V	V	VI	IV	VI	V	V	V	V	V	V
Haiti	V	VI	VI	VI	VI	VI	...	...	...	VI	VI	VI	VI
Honduras	VI	IV	V	VI	VI	V	...	...	V	V	V	V	...
Jamaica	V	III	IV	IV	...	IV	IV	IV	...	III	IV	III	V
Martinique	V	III	IV	V	IV	I	V	...	...	III	V	IV	V
Mexico	VI	IV	III	IV	V	V	V	V	V	IV	IV	III	III
Nicaragua	VI	V	VI	V	VI	V	...	...	V	V	IV	V	V
Panama	V	III	IV	III	IV	IV	IV	...	V	III	IV	II	...
Puerto Rico	IV	II	III	III	III	III	III	IV	IV	III	IV	IV	IV
Trinidad and Tobago	V	III	II	III	II	III	IV	IV	V	III	II	IV	III
South America:													
Argentina	II	III	III	I	III	III	IV	IV	III	II	III	II	IV
Bolivia	V	VI	VI	V	V	V	VI	...	IV	V	V	IV	...
Brazil	V	IV	V	IV	V	IV	VI	VI	IV	IV	V	IV	V
British Guiana	V	IV	IV	IV	III	III	V	IV	V	III	IV	VI	IV
Chile	IV	III	IV	I	III	I	V	VI	IV	III	III	III	V
Colombia	V	IV	V	IV	V	IV	VI	...	IV	IV	V	IV	V
Ecuador	VI	V	V	V	V	V	...	VI	V	IV	V	V	V
Paraguay	V	V	VI	IV	V	V	...	...	IV	IV	V	IV	...
Peru	VI	V	IV	IV	V	V	...	...	IV	V	IV	IV	IV
Uruguay	II	...	...	...	...	...	...	...	...	...	...	...	...
Venezuela	VI	II	II	I	IV	IV	...	...	V	IV	IV	III	III
Northern America:													
Canada	III	I	I	II	II	I	II	II	IV	II	II	I	IV
United States	III	I	I	I	I	II	II	II	IV	I	II	I	II

Table 9.1. (*continued*)

Region and country	Gross reproduction rate	Income per head	Energy consumption	Urbanization	Non-agricultural activities	Hospital beds	Life expectancy	Infant mortality	Early marriage	Female literacy	Newspaper circulation	Radio receivers	Cinema attendance
Europe:													
Northern and Western Europe:													
Belgium	I	I	...	II	I	II	II	III	II	II	II	I	III
Denmark	I	I	II	I	II	I	I	I	III	I	I	I	III
Finland	I	II	III	III	IV	II	III	I	II	I	I	I	IV
France	II	I	II	III	II	I	I	II	II	II	II	II	IV
Ireland	III	III	II	III	IV	I	II	III	I	I	II	II	I
Luxembourg	I	I	...	III	II	I	III	III	I	II	I	I	II
Netherlands	II	II	II	I	I	II	I	I	I	I	II	I	V
Norway	II	I	II	IV	III	I	I	I	II	I	I	I	III
Sweden	I	I	I	II	II	I	I	I	I	I	I	I	III
United Kingdom	II	I	I	...	...	...	...	...	...	I	I	I	III
England and Wales	II	...	...	I	I	I	I	I	III	...	...	...	...
Northern Ireland	III	...	...	II	II	I	II	II	I	...	...	...	...
Scotland	II	...	...	I	I	I	II	II	III	...	...	...	...
Central Europe:													
Austria	I	II	II	II	II	I	III	III	II	I	II	I	I
Czechoslovakia	I	II	I	IV	II	II	I	II	III	II	II	II	II
Germany:													
Eastern Germany (including East Berlin)	I	...	I	II	...	I	III	III	II	...	I	I	II
Federal Republic of Germany	I	I	I	I	I	I	II	III	I	...	II	I	III
Hungary	I	II	II	II	III	III	III	IV	IV	II	III	II	II
Poland	II	III	II	III	IV	III	III	IV	IV	II	III	III	IV
Switzerland	I	I	II	III	II	I	I	I	I	I	II	I	IV
Southern Europe:													
Albania	VI	V	V	V	...	IV	...	V	V	IV	IV	V	V
Bulgaria	I	IV	III	IV	IV	II	III	IV	V	III	III	II	II
Greece	I	IV	IV	II	IV	III	III	III	III	IV	III	IV	IV
Italy	I	III	III	IV	II	II	III	IV	II	III	IV	II	I
Malta and Gozo	III	III	IV	...	I	II	II	III	III	IV	III	II	II
Portugal	II	IV	IV	V	IV	III	IV	V	II	IV	IV	III	V
Romania	I	IV	III	IV	IV	III	IV	V	IV	III	III	III	IV
Spain	II	IV	IV	III	IV	IV	IV	IV	I	III	IV	III	II
Yugoslavia	II	IV	IV	IV	V	IV	IV	V	IV	IV	IV	III	IV
Oceania:													
Australia	III	I	I	I	II	I	II	I	III	I	I	II	I
Fiji Islands	VI	...	V	...	V	IV	...	...	V	IV	VI	...	III
New Zealand	III	I	II	I	II	I	I	II	III	I	I	II	I
Union of Soviet Socialist Republics:													
U.S.S.R.	II	II	II	III	III	II	III	III	IV	II	III	II	I

As the sample (i.e., number of countries for which data are given) is small and not fully representative and the data are defective in various ways, it is not possible to discern clearly the interactions of these factors with fertility and with each other. Nor can the data show to what extent variations in fertility are the result of variations in income, health, education, etc., or the latter are the result of variations in fertility. Most likely, the causal relationships work in both directions, and other causes also are likely to be present, simultaneously affecting fertility and industrialization, education, etc. (One of the indicators, early marriage, unquestionably has a direct causal bearing on the level of fertility, but even in this case, observed associations between the indicator and the fertility level are not necessarily explained wholly nor even chiefly by this causal relationship.) The fact that the social and economic indicators are interrelated with one another [8] should also be kept in mind in intepreting the association of each indicator with fertility.

[8] The correlations among the indicators are considered in section E below.

C. Variations of economic and social indicators among countries classified by levels of fertility

The first step in the analysis is to compare average values of the twelve economic and social indicators for countries classified by the six levels of fertility.

The unweighted average values of the indicators for countries at the different levels of fertility are shown in table 9.2 for the indicators pertaining most directly to economic and industrial development, table 9.3 for those which pertain to health, longevity, and marriage, and table 9.4 for those which pertain to education, communication, and entertainment media. It is worth repeating that, since all countries are given equal weight regardless of population and varying numbers of countries are omitted for lack of data, the averages for the different indicators are neither strictly comparable nor representative of conditions in the world as a whole.

For every indicator, the average values differ greatly between the high- and low-fertility groups of countries. Moreover, there is in every case a wide gap between the average values for countries at fertility level III and those at level IV (that is, between the top of the fertility range for the low-fertility group and the bottom of the range for the high-fertility group). Thus, income per head is typically between $150 and $225 in high-fertility countries and between $600 and $1,000 in low-fertility countries. Energy consumption is ordinarily the equivalent of 300 to 500 kilogrammes of coal in the former countries, and 2,000 to 3,000 in the latter. Typically, one-sixth of the population of a high-fertility country is urbanized, as against nearly two-fifths in a low-fertility country. Non-agricultural activities typically engage one-third of the male labour force in the one instance, and two-thirds in the other. On the average, the low-fertility countries have three times as many hospital beds, 19 more years of expectation of life at birth, one third as high an infant mortality rate, and one-fourth as many women married at ages 15-19 years, as the high-fertility countries do. Literacy is nearly three times as great in the low-fertility countries, cinema attendance about three times as frequent, and newspaper circulation and the number of radio receivers per head about eight times as large, on the average.

The variation of average values of the indicators at different levels of fertility within both the high- and low-fertility groups is much less pronounced than the difference between the two group averages. In fact, the differences between the averages for adjacent levels of fertility within either the high or the low group are seldom of a high order of statistical significance; in many cases, they might easily be due merely to chance variations in the relatively small sample of observations. Among these differences, the ones with the highest orders of statistical significance (80 per cent or higher probability of real difference existing, not due merely to chance) are listed below: [9]

Indicator	*Pairs of adjacent fertility levels other than III and IV showing most significant differences*
Income per head	II and III
	V and VI
Urbanization	IV and V
	V and VI
Non-agricultural activities	II and III
	V and VI
Hospital beds	IV and V
Infant mortality	V and VI
Early marriage	II and III
Cinema attendance	I and II
	II and III
Radio receivers	I and II
	II and III
	V and VI

Differences having a fair degree of statistical significance seem to occur somewhat more frequently between levels II and III and V and VI than they do between levels I and II and IV and V.

In contrast, almost all the differences between average indicator values for countries at fertility levels III and IV are highly significant, with 96 per cent or more assurance of not being due to chance; the sole exception is urbanization. The probability is only about 60 per cent that

[9] The probabilities were estimated by means of the *t*-test.

Table 9.2. Unweighted averages of economic indicators in countries classified according to level of fertility

(See definitions of indicators on page 137)

Fertility level	*Gross reproduction rate*		*Number of countries*	*Income per head ($US)*	*Energy consumption (kg.)*	*Urbanization (per cent)*	*Non-agricultural activities (per cent)*
	Range	*Group average*					
I	Under 1.30	1.15	16	674	2,329	35.5	70
II	1.30-1.59	1.40	13	583	2,008	35.7	66
III	1.60-1.99	1.78	11	971	3,028	43.5	79
IV	2.00-2.49	2.32	13	223	486	33.0	50
V	2.50-3.09	2.82	38	166	343	16.9	39
VI	3.10 and over	3.31	34	154	328	12.8	30
Combined groups:							
I-III	Under 2.00	1.41	40	719	2,391	37.4	71
IV-VI	2.00 and over	2.94	85	170	353	16.9	37

the apparently higher degree of urbanization of group III than of group IV countries is not merely a consequence of variations of sampling.

So far as the differences between the group averages of indicators for high- and low-fertility countries are concerned, it can be considered as virtually certain that they are not due to chance.

In summary, high-fertility and low-fertility countries differ greatly in every aspect of economic and social advancement represented by the indicators, while within each of these groups, the differences in average values of the indicators according to particular levels of fertility are comparatively slight and often of doubtful statistical significance.

Still, the configuration of the data in tables 9.1, 9.2 and 9.3 suggests strongly that some association does exist between fertility and the whole complex of interrelated economic and social indicators, not only between the high- and low-fertility groups, but also within the high-fertility group. The existence of some such association is implied by the consistency of the patterns of variation of the indicator averages from one level of fertility to another within the high-fertility group, in spite of the smallness and the low statistical significance of most of the differences considered separately. With few exceptions, the higher the gross reproduction rate, the lower is the average degree of economic and social development shown by the indicators. Exceptions are found in the figures for expectation of life and infant mortality, both of which show the level V countries to be somewhat better situated, on the average, than either those at level IV or VI. While these exceptions might be due to chance (only the difference between levels V and VI in average infant mortality rates has an 80 per cent probability of not being due to chance), it is most unlikely that chance variations would produce the observed configuration of averages for all the other ten indicators. The inference might be either that the countries where fertility is highest have suffered some disadvantage on that account in their economic and social development, by comparison with countries of more moderate fertility; or else that a very low level of economic and social development is conducive in some degree to exceptionally high fertility.

Among the low-fertility countries, by contrast, the pattern of variation of the indicator averages is not so straightforward. The countries which appear to be most advanced, on the average, according to the majority of economic and social indicators are not the countries of lowest fertility (level I) but those of highest fertility

Table 9.3. Unweighted averages of indicators pertaining to health and early marriage in countries classified according to level of fertility

Fertility level	*Gross reproduction rate*		*Hospital beds*	*Expectation of life (years)*	*Infant mortality*	*Early marriage (per cent)*
	Range	*Group average*				
I	Under 1.30	1.15	9.7	68.4	35	6.0
II	1.30-1.59	1.40	8.2	67.8	43	5.8
III	1.60-1.99	1.78	10.1	67.2	39	7.8
IV	2.00-2.49	2.32	4.6	46.5	124	23.5
V	2.50-3.09	2.82	2.7	50.8	104	28.5
VI	3.10 and over	3.31	2.2	47.1	134	29.2
Combined groups:						
I-III	Under 2.00	1.41	9.3	67.9	38	6.4
IV-VI	2.00 and over	2.94	2.8	49.0	120	28.1

Table 9.4. Unweighted averages of indicators pertaining to education, communication and entertainment in countries classified according to level of fertility

Fertility level	*Gross reproduction rate*		*Female literacy (per cent)*	*Newspaper circulation*	*Radio receivers*	*Cinema attendance*
	Range	*Group average*				
I	Under 1.30	1.15	91.7	284	241	11
II	1.30-1.59	1.40	84.4	224	184	9
III	1.60-1.99	1.78	88.2	264	327	14
IV	2.00-2.49	2.32	40.8	56	42	6
V	2.50-3.09	2.82	31.6	33	34	4
VI	3.10 and over	3.31	29.5	26	23	4
Combined groups:						
I-III	Under 2.00	1.41	88.4	261	244	11
IV-VI	2.00 and over	2.94	31.4	33	31	4

within the low-fertility range (level III). On the whole, it is the countries at fertility level II which seem least advanced in economic and social development among the low-fertility group, though there are quite a few exceptions. On several indicators (life expectancy, infant mortality, literacy, and newspaper circulation), level III countries rank slightly lower on an average than those at level I, and in expectation of life, level III also averages a bit lower than level II. Another exception is in urbanization, which is lower for level I than for level II. Still, the dominant pattern to which the values for most indicators conform would hardly occur as a result of chance variations.

The interpretation of the position of the level III countries is of particular interest. According to one plausible interpretation, their relatively favoured economic position and consequent advantages in such fields as health services, communication and recreation facilities are conducive to a comparatively liberal attitude in regard to the size of families. Various other interpretations also are possible; for example, in the countries of overseas European settlement included in this group, comparatively high fertility might be related to attitude and behaviour patterns inherited from frontier times as well as to present economic and social circumstances.

If level III is disregarded, the averages fall in an unbroken sequence throughout the whole range from level I to VI for every indicator except life expectancy, infant mortality and early marriage. (For life expectancy and early marriage, the level III averages follow the sequence but deviations occur at other levels of fertility.) But by far the most impressive feature is the sharp cleavage of the indicator averages along the dividing line between the high- and low-fertility countries—between fertility levels III and IV. The differences between these levels are far greater than others in the sequence and as already mentioned, there is little possibility (with one exception) of their being due to chance.

These findings are consistent with what can be called the "threshold" hypothesis as to the role of economic and social development in bringing about a transition from high to low fertility. According to this hypothesis, in a developing country where fertility is initially high, improving economic and social conditions are likely to have little if any effect on fertility until a certain economic and social level is reached; but once that level is achieved, fertility is likely to enter a decided decline and to continue downward until it is again stabilized on a much lower plane. The present distribution of countries by levels of fertility (with the sharply divided groups of high and low fertility and few countries in an intermediate position) would be interpreted under this hypothesis as a result of one group of countries having completed the transition to low fertility, another group not yet having attained the threshold level of economic and social development, and few if any countries being found at present in the process of transition from high to low fertility.

While the findings are consistent with this hypothesis, they are not sufficient to prove its validity. Other hypotheses, also consistent with these findings, can be put forward. Furthermore, the "threshold" hypothesis in the form stated above is open to *a priori* objections on the ground that, in its preoccupation with the supposed effects of economic and social development on fertility, it neglects the possible recipropal effects of fertility on economic and social development and — perhaps more important — neglects the role of other factors which may condition the interactions of fertility with economic and social change.

The logical converse of the hypothesis would be the argument that the transition from high to low fertility is mainly the cause rather than the consequence of economic and social development. By lightening the burden of dependent children on the shoulders of the adult population and diminishing the share of income that needs to be spent on "demographic investments", it would be argued, lowered fertility clears the way for large, quick economic and social gains. The wide differences in average values of the indicators between fertility levels III and IV would then be interpreted as results of a "take-off" in economic and social development where fertility has dropped low; the threshold would be seen as a level in the fall of fertility rather than a level in the improvement of economic and social conditions. But this interpretation seems unrealistic in attributing so much importance to the fertility level as a dominant factor in economic and social development. Moreover, it leaves open the question of the main cause of the shift from high to low fertility; if the cause is not to be found in social and economic changes, it is not apparent in what realm it should be sought.

In a realistic interpretation, it must be recognized that the transition to low fertility and the improvement of economic and social conditions are interacting processes, and that their interaction does not take place in a vacuum, but in the setting of other factors which may play an important part in determining the result. Among such other factors, the characteristics of national culture and especially the system of values probably deserve emphasis. It is perhaps no coincidence that most of the countries where fertility is low and economic and social development comparatively advanced at present are in Europe and European-settled regions. To be sure, it is manifestly impossible to ascribe their present combination of demographic, economic and social circumstances uniquely to a European cultural tradition. Japan exhibits a similar combination, while many of the Latin American countries, which share the heritage of European culture, have high fertility and are less advanced in economic and social development. Nevertheless, it is apparent that the high-fertility and low-fertility countries in the world at present are set apart by important differences in culture as well as in economic and social conditions. The wide differences in fertility levels might not be due only to one group of countries having crossed a threshold of economic and social development which the other group has yet to reach, but also at least partly to culturally determined circumstances affecting the interactions between fertility and economic and social changes.

D. Variations of fertility among countries classified by levels of economic and social indicators

Turning the analysis about, we shall now examine differences in average fertility levels of countries classified according to the levels of the twelve economic and social indicators, as shown in table 9.5. At this stage, the method of analysis is analogous to the methods commonly used in studying differential fertility of economic and social groups of the population within countries. It should be mentioned again that the measures used for the present analysis suffer in comparability and comprehensiveness from the fact that the averages are unweighted and from the gaps in the data.

Because of inevitable arbitrariness of scaling, the comparability of the average gross reproduction rates for the different levels of the various indicators is poor. By and large, the average gross reproduction rate rises consistently from level II to level V of each indicator (except for slight reversals at level III of life expectancy and newspaper circulation and at level IV of cinema attendance). Between levels I and II and levels V and VI the average rate rises slightly for some indicators and drops slightly for others. Again, the data confirm the view that variations in economic and social conditions, as long as the conditions remain relatively advanced or relatively backward, bear little or no consistent relation to fertility although, at some intermediate level, the relationship may be decisive.

On the whole, fewer sharp contrasts appear here than in the analysis in the preceding section; a more clear-cut view of the relationships between fertility and the indicators seems to be obtained by comparing the average indicator values for countries grouped by fertility levels, than by turning the comparison about as done here. This observation may have some implication for the methodology of studies of the relationships between fertility and economic and social characteristics of population groups within countries. As already mentioned, such studies are usually made by comparing fertility measures for population categories defined in terms relevant to social and economic status. In some cases, it might be of interest instead to see how social and economic characteristics vary among groups defined in terms of fertility.

In the preceding section, the largest differences in average indicators were invariably found between fertility levels III and IV. In the present analysis, the differences in average gross reproduction rates are greater between levels III and IV than between other levels for some indicators but not so for others. In part, this finding may be due to non-comparability in the scaling of indicators, but it is owing mainly to the fact that the economic and social indicators are not distributed in the same dichotomous manner as the gross reproduction rate; many countries are relatively advanced in respect of some indicators and yet relatively backward in respect of others. As a result, there are various overlaps between levels of indicators and levels of the gross reproduction rate, so that the average rates at the middle indicator levels have very little statistical stability.

Because of the overlaps in the observations, it must be concluded that the variations of any one indicator would rarely suffice to determine whether the gross reproduction rate would be greater or less than 2.0. Several, or possibly all, indicators would probably have to change substantially before the mould of traditions maintaining high fertility would break.

One possible clue to the question, which indicator has greatest relevance in this respect, is to observe the greatest absolute difference in average gross reproduction rates between any two levels of each indicator. The greatest difference amounts to 1.73 for urbanization, 1.72 for radio receivers, 1.70 for newspaper circulation and 1.65 for literacy; on the other hand, it is no more than 1.46 for cinema attendance, 1.47 for infant mortality, 1.49 for non-agricultural activities and 1.53 for hospital beds.

Another clue may be obtained by examining the variations of the gross reproduction rates about their

Table 9.5. Unweighted average gross reproduction rates of countries at six levels of economic and social indicators

Indicator	*Level I*	*Level II*	*Level III*	*Level IV*	*Level V*	*Level VI*
Income per head	1.40	1.66	2.28	2.45	2.94	2.94
Energy consumption	1.40	1.72	1.78	2.34	3.03	2.92
Urbanization	1.79	1.31	1.94	2.48	2.82	3.04
Non-agricultural activities	1.62	1.55	2.03	2.21	2.99	3.04
Hospital beds	1.53	1.61	2.02	2.77	2.92	3.06
Life expectancy [a]	1.34	1.63	1.32	2.29	2.74	2.91
Infant mortality	1.33	1.63	1.63	1.88	2.66	2.80
Early marriage	1.50	1.29	1.55	2.30	2.91	2.92
Female literacy	1.46	1.34	2.31	2.57	2.99	2.98
Newspaper circulation	1.34	1.55	1.56	2.67	3.04	2.95
Radio receivers	1.32	1.58	2.02	2.82	3.04	2.94
Cinema attendance	1.81	1.52	1.94	1.89	2.76	2.98
Unweighted average of twelve indicators	1.49	1.53	1.86	2.39	2.90	2.96

[a] Developing countries are under-represented in the data for this indicator.

averages for different levels of each indicator. The average of the standard deviations amounts to 0.40 for life expectancy, 0.44 for newspaper circulation, 0.45 for radio receivers, and 0.47 for both literacy and early marriage. It is as high as 0.65 for cinema attendance, 0.57 for energy consumption, urbanization and non-agricultural activities, 0.55 for income, 0.54 for hospital beds, and 0.52 for infant mortality.

A combination of the two criteria — somewhat resembling the statistical *t*-test — is made by dividing the greatest absolute difference between level averages of the gross reproduction rate by the average of within-level standard deviations. An approximate index of relevance is then obtained which works out as follows:

Life expectancy	3.96	Energy consumption	2.87
Newspapers	3.88	Hospital beds	2.85
Radio receivers	3.83	Infant mortality	2.83
Literacy	3.52	Income	2.82
Early marriage	3.48	Non - agricultural activities	2.63
Urbanization	3.03	Cinema attendance	2.26

While, admittedly, the argument is tenuous, it suggests that factors of information, health and education might have somewhat greater relevance in this respect than factors associated with economic, industrial or urban development. But even if this is true, it remains undetermined whether the association of a particular factor with fertility is more of a causal or of a consequential nature.

E. Correlations of indicators with fertility and among themselves

A measure of the association between fertility and each of the social and economic indicators can be obtained by calculating simple correlation coefficients. The use of more refined methods of analysis such as multiple and partial correlations, analysis of variance and factor analysis is discouraged by the smallness of the sample and inaccuracy of measurements.

Correlation coefficients (r) were calculated on the basis of 2×2 contingency tables combining levels I to III and IV to IV of fertility and each economic and social indicator. For each pair of factors, such a table shows in how many countries both are high, both are low, or one is high and the other low. As a check on reliability of the correlation coefficients, χ^2 values have also been calculated from the same contingency tables. The χ^2 values indicate the degree of assurance that an apparent correlation does exist and is not due merely to chance variations.[10] Where the degree of this assurance is high, the χ^2 values tend to become measures of the minimal assured degree of correlation.

[10] With one degree of freedom, as applicable for 2×2 contingency tables, a χ^2 of 3 indicates a 95 per cent confidence that the apparent association of factors is not a mere accident of the sample; a χ^2 of 7 corresponds to a confidence of 99 per cent; with χ^2 still larger, the existence of the association can be regarded as virtually certain.

The coefficients of correlation of each indicator with the gross reproduction rate and with each other indicator are listed in table 9.6. Table 9.7 shows the mean values of the correlation coefficient and of χ^2 for the gross reproduction rate and each indicator as related to all other factors in the set.

In the ranking of factors by mean values of r and χ^2, newspaper circulation and fertility (as measured by the gross reproduction rate) stand at the head of the list. In other words, fertility is one of the factors most strongly correlated, on the average, with other factors in the system. It should be recalled that the correlations measured here relate only to the dichotomy of high or low fertility (and high or low values of each indicator), not to the particular levels of fertility (and of the indicators) within the high or low category.

The indicators with which high or low fertility is most strongly correlated are radio receivers, newspaper circulation and life expectancy (values of r approximating 0.8 or higher). Fertility also has high coefficients of correlation with early marriage, hospital beds, infant mortality, energy consumption and literacy (values of r in the vicinity of 0.7). Fertility outranks all the other factors in the strength of its correlations with radio receivers, newspaper circulation and early marriage, and it ranks second or third among all factors in its correlations with life expectancy, hospital beds and infant mortality.

The indicators which have the lowest coefficients of correlation with high or low fertility are cinema attendance ($r = 0.54$), urbanization, non-agricultural activities and income per head (r in the vicinity of 0.6). Cinema attendance, urbanization and non-agricultural activities have relatively low coefficients of correlation, not only with fertility, but also with other indicators on the average. Income per head and urbanization are the only indicators having a lower coefficient of correlation with fertility than their average with other indicators. These observations suggest that the association of income per head, urbanization, and industrialization with fertility may be mainly indirect, operating through the influence of other variables with which these three are linked more directly. Education and the development of means of communication are among the factors which might play such a role as intermediaries. It is consistent with this interpretation that income per head, urbanization and non-agricultural activities are more highly correlated with literacy and newspaper circulation than they are with fertility, while the correlations of literacy and newspaper circulation with fertility are strong, as already noted.

Correlation coefficients have also been calculated from 6×6 contingency tables showing the combinations of the six levels of fertility with six levels of each economic and social indicator. In addition, the coefficients have been calculated separately for countries of high and low fertility, from 3×6 contingency tables showing the combinations of the three levels of high fertility and three levels of low fertility with six levels of each indicator. The results are shown in table 9.8.

Table 9.6. Coefficient of correlation (r) of each indicator with the gross reproduction rate and with each other indicator and χ^2 in 2 × 2 contingency tables

Radio receivers with	r	χ^2	*Newspaper circulation with*	r	χ^2	*Early marriage with*	r	χ^2
GRR	*0.84*	73.8	*GRR*	*0.83*	71.7	*GRR*	*0.70*	41.0
Newspaper circulation	0.75	58.3	Life expectancy	0.77	39.4	Infant mortality	0.63	21.0
Income per head	0.73	51.9	Infant mortality	0.77	36.8	Hospital beds	0.60	27.8
Female literacy	0.72	51.4	Radio receivers	0.75	58.3	Newspaper circulation	0.58	26.0
Energy consumption	0.69	42.4	Non-agricultural activities	0.74	44.3	Life expectancy	0.57	18.2
Cinema attendance	0.64	35.6	Hospital beds	0.73	54.4	Radio receivers	0.54	21.6
Urbanization	0.63	37.0	Energy consumption	0.69	44.4	Non-agricultural activities	0.47	16.8
Life expectancy	0.63	25.6	Female literacy	0.68	45.0	Urbanization	0.47	15.6
Non-agricultural activities	0.61	28.7	Income per head	0.68	44.3	Female literacy	0.46	15.5
Hospital beds	0.60	36.8	Urbanization	0.68	43.8	Income per head	0.43	12.9
Infant mortality	0.56	19.7	Cinema attendance	0.58	29.2	Energy consumption	0.43	12.6
Early marriage	0.54	21.6	Early marriage	0.58	26.0	Cinema attendance	0.37	8.6

Life expectancy with	r	χ^2	*Hospital beds with*	r	χ^2	*Infant mortality with*	r	χ^2
Infant mortality	0.82	41.6	Female literacy	0.78	60.3	Life expectancy	0.82	41.6
GRR	*0.79*	46.6	*GRR*	*0.73*	58.6	Newspaper circulation	0.77	36.8
Newspaper circulation	0.77	39.4	Newspaper circulation	0.73	54.4	*GRR*	*0.68*	34.5
Energy consumption	0.70	28.3	Energy consumption	0.73	47.2	Early marriage	0.63	21.0
Hospital beds	0.63	28.2	Income per head	0.68	45.5	Urbanization	0.61	22.4
Radio receivers	0.63	25.6	Non-agricultural activities	0.66	36.4	Radio receivers	0.56	19.7
Income per head	0.61	23.3	Life expectancy	0.63	28.2	Income per head	0.55	18.7
Female literacy	0.59	22.1	Urbanization	0.61	36.0	Non-agricultural activities	0.53	14.3
Non-agricultural activities	0.57	19.6	Radio receivers	0.60	36.8	Cinema attendance	0.48	12.1
Early marriage	0.57	18.2	Early marriage	0.60	27.8	Hospital beds	0.47	14.4
Urbanization	0.55	19.1	Infant mortality	0.47	14.4	Energy consumption	0.47	11.4
Cinema attendance	0.53	15.4	Cinema attendance	0.36	10.8	Female literacy	0.40	9.5

Energy consumption with	r	χ^2	*Cinema attendance with*	r	χ^2	*Female literacy with*	r	χ^2
Hospital beds	0.73	47.2	Radio receivers	0.64	35.6	Hospital beds	0.78	60.3
Female literacy	0.70	41.7	Newspaper circulation	0.58	29.2	Income per head	0.78	58.1
Life expectancy	0.70	28.3	Non-agricultural activities	0.56	22.1	Radio receivers	0.72	51.4
GRR	*0.69*	44.4	*GRR*	*0.54*	25.1	Energy consumption	0.70	41.7
Newspaper circulation	0.69	44.4	Income per head	0.54	24.1	*GRR*	*0.69*	49.0
Radio receivers	0.69	42.4	Urbanization	0.53	23.5	Newspaper circulation	0.68	45.0
Income per head	0.67	38.0	Energy consumption	0.53	23.1	Urbanization	0.64	36.9
Urbanization	0.63	30.3	Life expectancy	0.53	15.4	Non-agricultural activities	0.63	31.3
Non-agricultural activities	0.59	25.5	Infant mortality	0.48	12.1	Life expectancy	0.59	22.1
Cinema attendance	0.53	23.1	Female literacy	0.45	16.0	Early marriage	0.46	15.5
Infant mortality	0.47	11.4	Early marriage	0.37	8.6	Cinema attendance	0.45	16.0
Early marriage	0.43	12.6	Hospital beds	0.36	10.8	Infant mortality	0.40	9.5

Non-agricultural activities with	r	χ^2	*Income per head with*	r	χ^2	*Urbanization with*		χ^2
Newspaper circulation	0.74	43.3	Female literacy	0.78	58.1	Income per head	0.70	45.6
Income per head	0.70	37.5	Radio receivers	0.73	51.9	Newspaper circulation	0.68	43.8
Hospital beds	0.66	36.4	Urbanization	0.70	45.6	Female literacy	0.64	36.9
Female literacy	0.63	31.3	Non-agricultural activities	0.70	37.5	Radio receivers	0.63	37.0
Urbanization	0.62	30.1	Hospital beds	0.68	45.5	Energy consumption	0.63	30.3
GRR	*0.61*	32.8	Newspaper circulation	0.68	44.3	Non-agricultural activities	0.62	30.1
Radio receivers	0.61	28.7	Energy consumption	0.67	38.0	Hospital beds	0.61	36.0
Energy consumption	0.59	25.5	Life expectancy	0.61	23.3	Infant mortality	0.61	22.4
Life expectancy	0.57	19.6	*GRR*	*0.60*	35.8	*GRR*	*0.58*	33.2
Cinema attendance	0.56	22.1	Infant mortality	0.55	18.7	Life expectancy	0.55	19.1
Infant mortality	0.53	14.3	Cinema attendance	0.54	24.1	Cinema attendance	0.53	23.5
Early marriage	0.47	16.8	Early marriage	0.43	12.9	Early marriage	0.47	15.6

Table 9.7. Mean coefficients of correlation (r) and χ^2 for gross reproduction rate and each indicator as related to each other factor in 2 × 2 contingency tables

Indicator	*Mean value of r*	*Mean value of χ^2*
Newspaper circulation	0.70	41
Gross reproduction rate	0.69	45
Radio receivers	0.64	39
Life expectancy	0.64	26
Hospital beds	0.63	37
Income per head	0.63	35
Energy consumption	0.62	32
Female literacy	0.63	35
Urbanization	0.60	30
Non-agricultural activities	0.60	28
Infant mortality	0.58	22
Early marriage	0.52	19
Cinema attendance	0.50	20

The correlation coefficients obtained from the 6 × 6 tables for all countries are somewhat higher, on the whole, than those from the 2 × 2 tables shown in table 9.6. Especially the correlations of fertility with female literacy, early marriage, income per head, non-agricultural activities, urbanization and cinema attendance are enhanced by taking account of the six levels rather than the simple dichotomy of high and low.

When either the high or the low fertility countries are considered separately, only low coefficients of correlation are found between the particular levels of fertility and the levels of the various indicators; and these coefficients are generally of little or no significance in view of the standard errors. Among the low-fertility countries, even the directions of the apparent correlations vary in a seemingly haphazard fashion. If any relationships exist between fertility levels and economic and social conditions of countries in the low-fertility group, such relationships do not show up in the results of these calculations. In the case of the high-fertility countries, on the other hand, some significance may be read into the consistency of direction of the low correlations between the fertility level and all twelve indicators. In each case, the correlations for the high-fertility countries show a slight tendency for the highest gross reproduction rates to be associated with relatively poor economic and social conditions in the country, and vice versa. Thus the findings of the analysis in sections C and D above appear again in a different form.[11]

F. "Threshold" values of indicators for initiation of a decline of fertility

According to the "threshold" hypothesis stated in section C above, in a high-fertility country undergoing economic and social development, fertility would be likely to begin falling when social and economic indicators reached certain critical levels. Even though the hypothesis may be over-simplified, it is of interest to see what inferences can be drawn from the data of the present study, with regard to values of the indicators that might correspond to such a threshold.

In the first place, it is pertinent to note the lowest values of various indicators recorded for countries of low fertility (gross reproduction rate below 2.0) and the highest levels for countries of high fertility. For example, on the scale of female literacy, all countries of low

[11] Dr. Irma Adelman, in an article, "An econometric analysis of population growth", *American Economic Review*, vol. LIII, June 1963, pp. 314-339, has presented results of a multiple correlation analysis of age-specific birth rates, income per head, an index of education, and population density, for 37 countries. The results differ in some details from the general pattern of findings of the present study.

Table 9.8. Coefficients of correlation between gross reproduction rate and economic and social indicators for all countries in 6 × 6 contingency tables and for high- and low-fertility countries separately in 3 × 6 contingency tables

Indicator	*All countries*		*Low-fertility countries*		*High-fertility countries*	
	Correlation coefficient (r)	*Standard error* [a]	*Correlation coefficient (r)*	*Standard error* [a]	*Correlation coefficient (r)*	*Standard error* [a]
Radio receivers	0.81	0.03	0.07	0.17	0.11	0.11
Newspaper circulation	0.80	0.03	0.04	0.17	0.11	0.11
Life expectancy	0.78	0.04	0.02 [b]	0.16	0.12	0.15
Female literacy	0.76	0.04	0.01	0.17	0.15	0.11
Hospital beds	0.75	0.04	0.04	0.16	0.28	0.10
Early marriage	0.75	0.04	0.25	0.15	0.13	0.14
Energy consumption	0.72	0.05	0.05	0.17	0.16	0.12
Infant mortality	0.70	0.05	0.05 [b]	0.16	0.19	0.15
Income per head	0.68	0.05	0.07 [b]	0.17	0.16	0.11
Non-agricultural activities	0.68	0.05	0.14 [b]	0.16	0.35	0.11
Urbanization	0.63	0.05	0.10 [b]	0.16	0.31	0.10
Cinema attendance	0.60	0.06	0.21 [b]	0.16	0.11	0.12

[a] Standard errors calculated by the formula, $\frac{1-r^2}{\sqrt{n-1}}$

[b] Direction of correlation for low-fertility countries opposite to the direction for all countries taken together.

fertility included in this study have rates of 48.1 per cent or higher and all those of high fertility have rates of 85.8 per cent or lower. This observation suggests that the threshold of female literacy for initiation of a shift from high to low fertility might lie in the zone between 48.1 and 85.8 per cent. Corresponding indications of the lower and upper limits of threshold zones for other indicators are shown in table 9.9.

Two reservations should be stated immediately. First, the data give no assurance that a shift from high to low fertility could not occur in a country where female literacy, for example, was below 48.1 per cent nor that such a shift would necessarily take place wherever this indicator rose above 85.8 per cent. In fact, such shifts may have occurred in the past at levels of female literacy outside the threshold zone indicated by present data; and even if they had not occurred outside this zone in the past, they might still do so in the future as a result of changes in other circumstances. The indications in this respect provided by the data of this study are not definitive but merely suggestive. Second, as already mentioned, it is unlikely that the level reached in any one indicator would determine the movement of fertility; the initiation of a shift from high to low fertility would probably depend, if the hypothesis were valid, on the levels of several indicators.

For many of the indicators, the threshold zones so identified are wide, even approximating in some instances the full width of the range of values of the indicator for all countries of high and low fertility combined. In terms of the six levels of the indicators defined in section B of this chapter, the threshold zones for urbanization, non-agricultural activities, early marriage, and cinema attendance extend from level V to level I. In other words, some low-fertility countries stand as low as level V on the scales of these indicators, while some high-fertility countries stand as high as level I. The threshold zones indicated for life expectancy and infant mortality extend from level VI to III, for hospital beds from level III to I, for energy consumption from level V to II. Narrower and less eccentric threshold zones in terms of indicator levels are found in the cases of income per head, newspaper circulation, and radio receivers, ranging from level IV to II. The narrowest in these terms is the threshold zone of female literacy, comprising only levels IV and III.

These observations underscore the fact that the general association of high fertility with a relatively low level of social and economic development, and of low fertility with a relatively advanced level of development, does not hold uniformly in respect of every aspect of the social and economic development of every country. Some high-fertility countries stand quite high, and some low-fertility countries quite low, on the scales of some indicators. But it should be taken into account that such extreme variations are infrequent in the case of some indicators and more frequent in others. Indicator values near the extremes of the threshold zones may be due in some instances to errors of estimation, and in some other instances they may result from non-comparability of the values of the given indicator for different countries. For example, so far as the urbanization indicator is concerned, the significance of a given percentage of population in cities of 20,000 or more inhabitants is not the same in countries where the social and economic conditions of such cities differ radically; the significance of average income per head varies with the distribution of income, and so forth.

It is pertinent, therefore, to consider what would be the limits of the threshold zones shown by the data for each indicator if infrequent extreme values were left out of account. For this purpose, the top ten per cent

Table 9.9. " Threshold " values of social and economic indicators for a shift from high to low fertility

Indicator (1)	*Range of values* (2)	*Threshold zone* [a] (3)	*Reduced threshold zone* [b] (4)	*Percentage of countries*	
				In threshold zone [c] (5)	*In reduced threshold zone* [d] (6)
Income per head (U.S. dollars)	47—2,148	200—667	230—339	35	12
Energy consumption (kg.)	20—8,013	272—2,558	360—1,012	39	16
Urbanization (per cent)	0.2—94.0	14.0—94.0	16.0—33.0	66	35
Non-agricultural activities (per cent)	8.1—94.0	35.1—93.2	44.7—61.0	67	20
Hospital beds (per 1,000 inhabitants)	1—15	3—15	5—6	50	4
Life expectancy (years)	26—73.5	42.8—67.8	62.4—62.9	50	4
Infant mortality (per 1,000 live births)	259.0—16.5	157.0—30.5	77.5—44.3	58	22
Early marriage (per cent)	79.4—1.1	18.8—2.5	15.3—11.4	49	12
Female literacy (per cent)	0.3—98.5	48.1—85.8	61.7—74.9	31	11
Newspaper circulation (per 1,000 inhabitants)	0.1—514	56—223	80—89	28	4
Radio receivers (per 1,000 inhabitants)	1—948	78—159	87—88	16	3
Cinema attendance	0.1—22.8	2.9—22.8	6.3—9.7	66	26

[a] Minimum value for countries of low fertility and maximum value for those of high fertility (gross reproduction rate above and below 2.0, respectively). Vice versa for infant mortality and early marriage.

[b] Threshold zone obtained after elimination of extreme observations as explained in the text.

[c] Percentages calculated on base of the total number of countries for which the given indicator is available.

[d] Percentages calculated on the base of the number of countries remaining for each indicator after elimination of extreme observations as explained in the text.

of the high-fertility countries and the bottom ten per cent of the low-fertility countries on the scale of each indicator have been discarded.[12] With these cases eliminated, the limits of the " reduced " threshold zones as shown in table 9.9 are found.

For some indicators, this elimination of infrequent extreme values reduces the threshold zone to a fairly narrow range containing only a rather small percentage of the total number of observations. Such are the cases of hospital beds, life expectancy, newspaper circulation, radio receivers, and to a lesser extent, female literacy, income per head and early marriage. On the other hand, for urbanization, non-agricultural activities, infant mortality and cinema attendance, the threshold zone is still rather wide and contains a substantial percentage of the observations. By this criterion, it appears that the threshold hypothesis is less well substantiated by the data for the latter than by those for the former indicators.

The results of this analysis pertinent to the threshold hypothesis (assuming it to have some validity, although admittedly the degree of its validity is questionable) can be summed up as follows. The data of the present study suggest that, under the conditions existing in the world at present, the levels of social and economic development at which fertility would be likely to shift from high to low would be roughly represented by the ranges of indicator values in the " reduced " threshold zones, as shown in table 9.9. The analysis has brought out some reasons for believing that the levels reached in indicators pertaining to means of communication, health and education may be more pertinent than the levels of the other indicators in this respect. But for any of the indicators, there is obviously nothing immutable about the values that would correspond to such a threshold of declining fertility; these values could be greatly changed under the influence of changing conditions in the world. Indeed, they have undoubtedly changed greatly in the past. In regard to the expectation of life, for instance, fertility declines occurred in the past in countries where life expectancy was considerably less than it is at present in many of the less developed countries where fertility remains high. So far as radio receivers are concerned, the conditions of the past were evidently in no way comparable to those of the present. Equally great changes in the pertinent circumstances may also occur in the future.

G. Time-perspective in the interpretation of findings

The foregoing picture of fertility levels and their associations with the economic and social conditions of countries represents a cross-sectional view of phenomena that have changed considerably in the course of time. It refers to the dates of most recent information for the different countries, in most cases about 1960 or a few years earlier. If the analysis could be repeated with data for periods around 1930 or earlier (as it is unfortunately not possible to do for lack of adequate statistical sources, especially for the less developed countries), different results would be obtained; and it is likely that the picture will again be different ten or twenty years hence.

In the recent period to which the foregoing analysis relates, the levels of fertility throughout the world have been, on the whole, more stable than they were during earlier decades. The present group of low-fertility countries has been formed by a process of transition from much higher fertility levels. The transition began in the different countries at various times over a period of more than a century and continued in most cases during several decades. Although the most recent statistics show the downward trend still continuing in a few of the low fertility countries, it seems in the majority of cases that the transition may now have run its course, and that fertility may have become at least temporarily stabilized at more or less low levels. Meanwhile, the launching of new countries upon the transition from high to low fertility seems to have been temporarily halted; with a few possible exceptions, there is little sign of decided downward trends having begun in the remaining countries of high fertility. It is partly for this reason that the two groups of high- and low-fertility countries are so sharply divided at the present time. If comprehensive data on levels of fertility around 1930 and earlier were available, no doubt they would show a less sharply bi-modal distribution of countries than is apparent at present.

The associations between fertility levels and economic and social conditions of countries would also present a different appearance at a time when many countries were in the process of transition to low fertility. In general, the countries where the transition began earliest, and which had the lowest reproduction rates at any given time in the past, were those in the vanguard of industrialization and related economic and social developments. Countries which followed after them in the time-table of economic and social development also lagged, in general, in the decline of fertility. Thus an inverse correlation would be found between the momentary levels of fertility and of economic and social indicators among countries undergoing the transition to low fertility. In fact, such correlations were noted in international studies of fertility levels and trends prior to World War II and their time-bound character was not always recognized.

The pattern of differences in fertility levels among low-fertility countries that has taken form now, with the process of transition seemingly completed, contrasts with the pattern as it appeared during the 1930's. At that time, fertility was lowest in Western Europe and in the European settlement areas overseas, considerably higher in Southern and Eastern Europe and higher still in Japan and the Soviet Union. The positions are now largely reversed, fertility being lowest in Japan and almost as low throughout most of Europe but comparatively high in the Soviet Union, Northern America, Australia and New Zealand. The results of the analysis in preceding sections of this chapter imply that it is necessary

[12] For infant mortality and early marriage, the bottom ten per cent for high-fertility and top ten per cent for low-fertility countries.

to look beyond the realm of economic and social factors for an explanation of this new pattern among the low-fertility countries, and also for the variations of fertility levels within the high-fertility group.

Economic and social factors would seem to be pertinent mainly to the initiation of a transition from high to low fertility while having rather little to do with the level of fertility before or after the transitional period. The factors of principal importance in the latter connection should perhaps be sought in the different characteristics of national culture as conditioned by national experience in the recent and earlier past, and possibly in ecological factors related to density of population, climate, etc. As already noted, such cultural and other factors might also play important parts, along with social and economic factors, in the transition to low fertility.

It is pertinent in this connection to note a certain resemblance between the present pattern of fertility differences among low-fertility countries and the pattern which seems to have existed before their transition to low fertility. In Northern and Western Europe during the eighteenth and early nineteenth centuries, the typical range of birth rates seems to have been about 30-35 per 1,000 population so far as it can be estimated from data now available. Japan's birth rate also seems to have been about that level prior to the industrialization and modern social transformation of that country. Nineteenth century birth rates in central and southern Europe were somewhat higher, clustering mainly about 40 per 1,000. Russian fertility was much higher; the birth rate in the Russian Empire near the end of the nineteenth century was near 50, and equally high or even higher rates prevailed among the population of European extraction in the United States, Canada, Australia and New Zealand during the early periods of settlement. In other words, it seems that the present variations of fertility levels in these parts of the world reproduce roughly, at a much lower level, the pattern which prevailed before the transition to low fertility began. (A deviation is apparent, to be sure, in the case of the Southern and Eastern European countries and other differences in details of the pattern would be found in considering the positions of particular countries.)

When the present gross reproduction rates of low-fertility countries are compared with roughly estimated levels of the rates in the same countries prior to the transition, a curious and possibly significant fact appears. In general and subject to exceptions, it seems that the effect of the transition has been to cut the gross reproduction rates approximately in half. Thus, gross reproduction rates of the order of 1.0 to 1.25 are found at present in a majority of countries where the pre-transition rate seems to have been in the vicinity of 2.5 if not less; while the present rates are in the range of 1.6 to 1.95 in most countries where they were previously above 3. Before the transition, the expectation of life at birth in many of these countries appears to have been little more than 30 years: i.e., under such conditions only one-half of each generation of births, or possibly even fewer, survived to the middle adult years of life. At present, with expectation of life approaching or exceeding 70 years, nearly 95 of every 100 children born survive to those ages. Halving of the gross reproduction rate together with this doubled chance of survival means roughly a restoration of the former net rate of reproduction. In short, therefore, it is approximately correct to state as a rough rule of thumb that the populations in which a large decline of fertility has occurred, now tend to reproduce at about the same rates which prevailed previously.

Undoubtedly this generalization is subject to many reservations and exceptions; yet it seems that the factors governing the relative levels of fertility, both when fertility is high and when it is low, may have considerable permanence and may reassert themselves after a prolonged interlude of enormously changing economic and social circumstances and declining fertility.