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THE PROXIMATE DETERMINANTS OF FERTILITY
IN SUB-SAHARAN AFRICA

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**THE PROXIMATE DETERMINANTS OF FERTILITY
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A B S T R A C T

Rapid population growth has played an important role in producing the poor economic conditions which exist today in sub-Saharan Africa. However, in the past few governments have expressed concern about demographic developments. This is now changing and effective policies are being sought to reduce excessive fertility in order to effect a decline in the rate of population growth. The policy design and implementation of such policies would benefit from an understanding of the socioeconomic, cultural, biological and environmental factors that determine fertility. This paper seeks to provide such an understanding by assessing the proximate determinants of fertility.

The principal proximate determinants of levels and differentials of fertility in sub-Saharan Africa are lactational amenorrhea due to breastfeeding, decreased exposure to conception due to postpartum sexual abstinence and pathological, involuntary infertility due to gonorrhoea. These determinants depend on behaviors that are susceptible to modern influences in Africa, especially those of education and urbanization. Thus, educated urban women, although they tend to delay marriage, generally have shorter periods of breastfeeding and postpartum abstinence. Recourse to contraception could compensate for the positive effects these changes have on fertility, but acceptance of contraception is lagging.

The fertility-inhibiting effects of the proximate determinants are substantial. For example, it is estimated that elimination of breastfeeding and postpartum abstinence would produce a 72 percent increase in fertility. The future direction of fertility levels will depend on the balance of fertility-enhancing (reduced breastfeeding and postpartum abstinence; decline in pathological sterility) and fertility-reducing (rise in age at first union, greater contraceptive use) trends in proximate determinants.

The authors conclude that a rapid decline in fertility is unlikely to occur in the near future, partly because desired family size is very high and partly because upward pressure on fertility levels will result from the erosion of traditional childspacing practices of postpartum abstinence and prolonged breastfeeding or from declines in levels of pathological sterility in response to public health measures.

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1. INTRODUCTION

As measured by most conventional indicators of socioeconomic development, sub-Saharan Africa remains the least developed region of the world. While standards of living in the poorest countries of Latin America and Asia, on average, have been rising, they actually declined in the low income countries of Africa during the seventies when population growth exceeded the small rise in overall economic output. Even if this adverse trend is reversed in the coming decade, it is likely that large parts of sub-Saharan Africa will not be much better off than today for the foreseeable future.

These facts have caused increasing concern among African government officials and policy-makers as well as in international agencies that deal with a range of development issues. However, despite the important role rapid population growth has played in producing the poor economic conditions, there have been few governments that have expressed concern in the past about demographic developments. Vigorous measures to reduce rapid population growth such as those found in a number of Asian and Latin American countries are absent in sub-Saharan Africa. But all this is changing now and a search is under way for effective policies to reduce excessive fertility to bring about a decline in the population growth rate.

The design and implementation of any such policies would greatly benefit from a detailed understanding of the socioeconomic, cultural, biological and environmental factors that determine fertility. It is the objective of this

paper to make a modest contribution to this process by providing a discussion of the proximate determinants of fertility levels and differentials in sub-Saharan Africa.

1.1 The demographic setting

According to recent U.N. estimates sub-Saharan Africa had approximately 338 million inhabitants living in 37 countries in 1980 (United Nations 1982). (Sub-Saharan Africa is defined here to include all countries on the African continent except Egypt, Liberia, Tunisia, Algeria, Morocco and the Republic of South Africa.) Over half the population lived in the five largest countries: Nigeria, (77 mil.), Ethiopia (32 mil.), Zaire (28 mil.), Sudan (18 mil.) and Tanzania (18 mil.). The subcontinent's share of the world's population has increased from 6.2% in 1950 to 7.6% in 1980.

The demographic characteristics of sub-Saharan Africa are unique because the population's rate of growth as well as the birth and death rate are all higher than in any other continent or region of the world. This finding is not entirely unexpected since much of the rest of the world is relatively more developed and hence has progressed further into the demographic transition. It is surprising, however, that a substantial discrepancy between demographic indicators is still found if one restricts the comparison to countries of low levels of income (using the World Bank's definition, low income countries in 1980 had an annual per capita GNP below \$420 (World Bank 1982)). The relevant data are plotted in Figure 1. For the period 1975-80 the birth and death rates of low income sub-Saharan Africa were 48 and 20 respectively yielding an annual population growth rate of 2.8 percent. These figures are virtually the same for sub-Saharan Africa as a whole. In

contrast, the low income countries of Asia and Latin America had a birth rate of 29, a death rate of 11 and a growth rate of 1.8 percent. These statistics for non-African countries are heavily influenced by the remarkable declines in fertility and mortality that have occurred recently in China, but even if China is excluded, the discrepancies shown in Figure 1 would not disappear.

Another notable finding of Figure 1 is the difference in demographic trends between continents. The birth rate in sub-Saharan Africa is stable while it has been declining elsewhere. In fact, during the seventies the birth rate in low income Asia and Latin America declined faster than the death rate so that the growth rate is now also declining. This is not the case in Africa. The constant birth rate, combined with modest reductions in the death rate, has resulted in a population growth rate that is higher than ever *and* still rising. As a consequence, the population of sub-Saharan Africa is expected to reach 627 million in the year 2000 and 1.17 billion in 2025 (United Nations, 1982). Of course, some countries will grow even faster. Kenya, for the moment the world's recordholder with an annual growth rate of 4 percent, is projected to grow from 16.5 million in 1980 to 82.3 million in 2025, a fivefold increase.

1.2 Fertility levels and differentials

The overall level of fertility in sub-Saharan Africa as measured by the total fertility rate is approximately 6.6 births per woman for the period 1975-80. This estimate is an average that conceals a considerable amount of heterogeneity in national fertility levels. In general, fertility is highest in the East and the West and lowest in the central regions (e.g. Gabon, Cameroon, Central African Republic and parts of Sudan, Zaire and Congo). The

total fertility rate actually ranges from a high of 8.1 in Kenya to 4.1 in Gabon. While this is an impressive range, it is not unusual because similar variations in fertility are found in Asia and Latin America. However, Africa is unique in that the lowest levels of fertility have not been achieved through declines in fertility. Countries with relatively low fertility in Latin America and Asia have experienced rapid declines in fertility and these declines are correlated strongly with socioeconomic development. In contrast, no country in sub-Saharan Africa has experienced a significant reduction in fertility and there is no correlation between development indicators and fertility. The processes that gave rise to fertility differentials in sub-Saharan Africa are therefore very different from those found elsewhere.

In addition to variations in fertility between nations, there are large differences between geographic, ethnic and socioeconomic groups within countries. Figure 2 offers a few examples (a comprehensive treatment of all empirical data on this topic is beyond the scope of this report). The upper part of Figure 2 shows that the total fertility rate in Cameroon is 50% higher in the West than in the South-East. Similar and sometimes even larger regional or ethnic differences in fertility have been found in other African countries (Frank 1983). The lower panels of Figure 2 demonstrate that better educated and urban women in general have lower fertility than their unschooled and rural counterparts. It should be emphasized however that more education or an increase in literacy is not necessarily always associated with lower fertility. The rise in the total fertility rate between the women with no schooling and those with 1-3 years of schooling (Figure 2 middle graph) has very important implications because the large majority of women

fall in either of these categories. This subject will be addressed in greater detail in section 3.2.

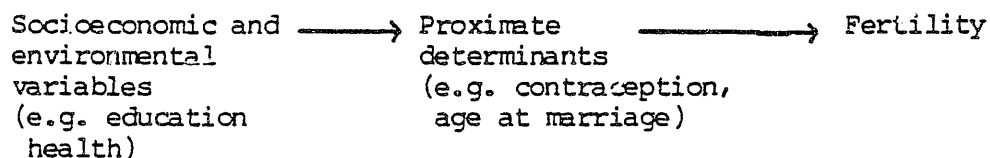
Even greater variation in fertility is found among individual women. In all sub-Saharan African countries for which individual level measures are available, the number of children ever born among women at the end of the reproductive period ranges from 0 to 14 or more. Figure 3 illustrates this with observations from Kenya and Ghana. Although Kenya's total fertility rate is substantially higher than Ghana's (8.2 vs 6.7), the two distributions of completed parities of individual women overlap to a large extent. As a result, a large proportion of women in Kenya still has smaller families than the average Ghanaian woman and, similarly, the average Kenyan family size is exceeded by the fertility of a substantial proportion of Ghanaian women.

Clearly, variations in national, subnational and individual levels of fertility in sub-Saharan Africa are large. This finding is all the more remarkable since only a very small percentage of women use modern means of birth control such as contraception and induced abortion. Explanations for these interesting findings must therefore largely be found elsewhere. This is the task we turn to next.

1.3 The determinants of fertility

Any detailed and comprehensive analysis of factors influencing fertility requires that a distinction be made between two classes of determinants: (a) proximate variables and (b) socioeconomic background variables. The latter include the social, cultural, economic, institutional, psychological, health and environmental variables, and the proximate determinants consist of all biological and behavioral factors through which the background variables must

operate to affect fertility (Davis and Blake 1956, Bongaarts and Potter 1983). The principal characteristic of a proximate determinant is its direct influence on fertility. Socioeconomic variables, in contrast can affect fertility only indirectly by modifying the proximate determinants.



One of the most important advantages of including the proximate variables in the study of the fertility process is that it greatly improves the understanding of the operation of the socioeconomic determinants. In general a socioeconomic variable can have negative fertility effects through one set of proximate variables (e.g. education and contraception use) and positive effects through another set (e.g. education and breastfeeding). The overall net relationship between a socioeconomic variable and fertility can therefore be positive, negative or insignificant depending on the relative contributions of the positive and negative effects of the proximate determinants. These offsetting effects of proximate determinants on fertility levels play an especially crucial role in sub-Saharan Africa, but before considering this subject further, it is necessary to first discuss the proximate determinants in some detail.

The following is a complete list of proximate determinants:

- 1) Proportion of women married or in sexual unions.

This variable measures the degree to which women of reproductive age are exposed to the risk of childbearing.

2) Frequency of intercourse

Frequency of intercourse directly affects the probability of conceiving among ovulating women. Frequent or prolonged spousal separation has therefore a substantial fertility reducing effect.

3) Postpartum abstinence

Prolonged abstinence from sexual relations while a newborn is breastfeeding is found in a number of societies, many of them in Africa.

4) Lactational amenorrhea

Following a pregnancy a woman remains unable to conceive until the normal pattern of ovulation and menstruation is restored. This duration of amenorrhea is determined by the duration, intensity and pattern of breastfeeding.

5) Contraception

Any practice undertaken deliberately to reduce the risk of conception will be considered contraception if its aim is to limit family size and its use depends on the number of children already borne. Breastfeeding and postpartum abstinence which do affect fertility by increasing child spacing are not included as contraception because their aim is primarily the protection of maternal health and child development and they are practiced in all intervals regardless of the number of previous births.

6) Induced abortion

This includes any practice that deliberately interrupts the normal course of gestation.

7) Spontaneous intrauterine mortality

A proportion of all conceptions does not end in a live birth because some pregnancies spontaneously terminate prematurely in a miscarriage or

stillbirth.

8) Natural sterility

Only a small proportion of women are sterile at the beginning of the reproductive years, but this proportion increases with age and reaches 100% by age 50.

9) Pathological sterility

A number of diseases, especially gonorrhoea, can cause primary or secondary sterility. Primary sterility results in childlessness because a sterilizing disease is contracted before childbearing starts. Secondary sterility results in an inability to bear additional children, sometimes very early in the childbearing years, and is due to the onset of disease among women who have already borne offspring.

The importance of each of these proximate variables in determining fertility differentials in sub-Saharan Africa ranges from major (lactational amenorrhoea, postpartum abstinence and pathological sterility) to insignificant (spontaneous abortion and natural sterility). The summary of the proximate determinants provided in the next section will review the relative importance of these variables.

2. PROXIMATE DETERMINANTS AND REPRODUCTIVE BEHAVIORS

The high and constant level of fertility in sub-Saharan Africa overall and the often large differences that it subsumes must in the end be explained by a group of characteristics, behavioral and biological, that alone determine fertility through their combined effects. The behavioral characteristics include marriage patterns, patterns of sexual activity, duration of breastfeeding, and use of birth control through contraception and induced abortion, while the biological characteristics include foetal loss, and both natural and pathological sterility. Together they account for all the proximate determinants of fertility.

Unless otherwise stated, the data for six African countries to which reference is made in the following discussion derive from analyses of World Fertility Surveys of African countries carried out by Lesthaeghe (1984). The country surveys are Lesotho in 1977, Kenya in 1977-78, Cameroon in 1978, Sudan in 1979, Senegal in 1979, and Ghana in 1979.

2.1 Patterns of Marriage and Sexual Unions

Although a woman could in principle bear children throughout her reproductive life, from the age of about 15 to about 45, this is rarely the case, because her overall exposure to childbearing is limited to the total amount of that time during which she is actually cohabiting or in a union (for simplicity, marriage is used here to indicate any such regular sexual union). In any society, the total time spent in unions for all women will

depend on the age at first marriage, the proportion of women who never marry, the frequency of divorce and widowhood, the frequency of remarriage, and the age at which sexual activity comes to an end (if this occurs before menopause). These various factors are summarized by the proportions of all women married at any point in time. In considering the role of marriage in limiting the exposure of women to childbearing, some account must also be taken of the level of extra-marital exposure, by young women before marriage and by older never-married and unmarried (divorced and widowed) women. Finally, even within marriage, the particular forms it takes can affect the translation of marriage into exposure to childbearing, principally through the patterns of sexual activity that tend to be associated with any form. For example, arranged marriages tend to be associated with lower frequencies of intercourse than romantic marriages (Rindfuss and Morgan, 1983), and polygamous marriages tend also to be associated with lower sexual activity (of each woman) than monogamous ones.

All the marriage factors have relevance in the African context, and of the forms of marriage, polygamy is the more important to the explication of fertility in sub-Saharan Africa. The role of polygamy, however, will be discussed under patterns of sexual activity.

2.1.1 Age at first marriage

The average age at which women enter their first union varies regionally from below 17 years to around 22. Overall, age at marriage is at the low end of the range in West Africa, at the high end in Central and parts of East Africa, and intermediate in the coastal areas around the Bight of Benin and

the Gulf of Guinea in the west and the Indian Ocean in the east (see Figure 4). Age at marriage is higher in urban than in rural areas, which is associated with higher levels of education for urban women.

These differentials in age at first marriage seem to reflect true differences in regional and ethnic practices rather than a cross-sectional picture of a continental transition in the age at first marriage, since there is little evidence that age at marriage has substantially increased in African national populations over the last twenty or thirty years. An exception to this is Kenya, where relatively better data at several points in time do show the average age at first marriage rising by over a year and a half, from just over 18 and 1/2 to over 20 between 1962 and 1979. It is also possible that Northern Sudan has experienced some increase in the average age at first marriage.

The Sub-Saharan African range of age at first marriage is somewhat lower when compared to the range in Asia as measured by the World Fertility Surveys in the middle-to-late 1970s, but it also differs in two other important respects. First, there is no African population of a comparable size having as early an age at first marriage (about 16 years) as had Bangladesh in 1975. Second, data for the large majority of Asian countries show that the current levels of ages at first marriage result from fairly widespread increases in age at marriage since the 1950s.

2.1.2 The proportion of women who never marry

By all reports, marriage is for all intents and purposes universal in sub-Saharan Africa. The proportions of women still unmarried is already only

around 5 percent or less in the age groups 25-29, and declines to 3 percent or less thereafter. The proportions of women who are single in the youngest age groups in Africa thus merely reflect the distribution around the average age at entry into their first marriage and bear no relationship to the very low probabilities of permanent celibacy.

2.1.3 The frequency of divorce, of widowhood, and of remarriage

Marital instability due to both voluntary dissolution (divorce) and involuntary dissolution (widowhood) is high throughout sub-Saharan Africa by any standard. However, very high rates of remarriage and good accessibility to husbands through polygamy mean that few women are not in unions at any particular time relative to the incidence of marriage dissolutions. A standard schedule for six African countries shows the average proportions of first marriages having ended in divorce or widowhood by duration of the first marriage for women currently below the age of 50. The schedule, given in Table 1, shows that the proportion of women's first marriages ending in divorce ranges from over 7 percent for very short durations (0 to 4 years) to nearly 20 percent for the longest durations (30 or more years). The incidence of widowhood is much lower for shorter durations (when husbands are younger and have lower mortality), but increases rapidly and reaches the incidence of divorce in the longest durations of marriage. Overall, the combined incidence of divorce and widowhood means that from about 8 percent of women married less than 5 years, to over 40 percent of women married 30 years or more experience the end of a first union. For all durations of that marriage except 30 or more years, which essentially applies to women past

childbearing, divorce is by far the major cause of dissolution, and would therefore be the major reason for any time lost to childbearing associated with an unmarried state.

As a result of high rates of remarriage, however, much fewer women are in @- currently widowed or divorced at any point in time. For the same six countries, only 5 to 10 percent of women aged from 20 to 39, the entire range of peak childbearing years, will be found unmarried at any point in time. Taking into account dissolution of first and of subsequent marriages, remarriage after first and subsequent dissolutions, and based on all forms of conjugal unions, women of all ages in sub-Saharan Africa will spend over 90 percent of their life since their first marriage in a union, or of their entire reproductive life since age at first marriage (see Table 2).

Over time, the incidence of widowhood has probably declined gently with reduced adult mortality. The risks of widowhood among African women are more sensitive to mortality declines at earlier ages of women than in many other regions of the world, because the age differences between spouses are typically large, ranging on average from 4 to 11 years. With any further reductions in adult mortality, the incidence of divorce, which already plays the major role in marital dissolution, will increasingly determine the incidence of marital dissolution, while the current incidence of remarriage would continue to maintain the net balance of unmarried women at any point in time at a very low level.

2.1.4 Extra-marital exposure

Exposure to childbearing outside of marriage, particularly before first marriage, is appreciable in Africa, and must be considered alongside women's formal exposure to childbearing as represented by the portion of their lives during which they are in one or another form of conjugal union. However, the incidence of extra-marital exposure does vary considerably. Although it is therefore difficult to characterize its level for the entire region from available data, it is probable that a range of about 5 to 10 percent of all births are contributed by unmarried women.

In summary, one can characterize the role of African marriage patterns in relation to fertility as follows: women marry well after their reproductive life has begun, they virtually all marry by the peak childbearing years, they experience high rates of divorce and appreciable widowhood, but remarry frequently enough that the vast majority are in one form or another of conjugal union throughout their childbearing years. Childbearing is not entirely restricted to unions, however, and an appreciable proportion of all births occur to women when unmarried.

2.2 Patterns of Sexual Activity

In the previous section, we saw how total time spent in marriage was important in assessing the amount of time a married woman could bear children. Duration of married time, however, is not necessarily equivalent

to the total duration of exposure to pregnancy within marriage. Within marriage, exposure to pregnancy depends on the pattern of sexual activity. The three most important factors here are coital frequency during cohabitation of spouses, abstinence between cohabiting spouses, and separation of spouses.

2.2.1 Coital frequency

There is strong evidence that real differences in coital frequency are associated with marriage forms. Thus polygamously married women have lower fertility than monogamously married women, and lower frequency of intercourse is probably an important determinant. Polygamy lowers fertility not only because time with the husband is shared, but also because polygamously married women beyond the first wife tend to have even older husbands than monogamously married women and because polygamously married women not infrequently each have separate households, sometimes at great distance from each other.

Polygamy is also associated with two other factors which account for lower fertility of polygamous wives. First, they tend to be more often infertile than monogamous wives, because a monogamously married man will more often take a second wife if his first wife is childless than not. This we will discuss in greater detail further down. Second, polygamy facilitates the practice of postpartum abstinence, or abstinence from intercourse following the birth of a baby, which is a major proximate determinant of African fertility.

2.2.2 Postpartum abstinence

Of the various possible types and reasons for sexual abstinence, postpartum abstinence is the notable and most widely practised form in sub-Saharan Africa. Where long periods of abstinence are observed, their duration is generally tied to ongoing breastfeeding, which is recognized as essential to the health and normal development of the infant and young child.

It is possible that at one time a period of abstinence extending throughout lactation, sometimes beyond, was practised in most of Africa. This is supported by frequent reports from groups observing short periods today that the practice was more enduring in the past. From whatever levels declines in the duration of abstinence have occurred, considerable variation in the practice can be recognized in contemporary Africa from information on abstinence in the last twenty or thirty years. However, when mapped geographically by ethnic group, the different durations display a high level of consistency. Such a mapping has been carried out by Schoenmaeckers et al. (1981) who divide the variously reported durations for sub-Saharan Africa into three groups - durations not exceeding forty days to distinguish Islamicized groups following Koranic prescription; durations from 40 days to one year; and durations exceeding one year. Complemented with other sources, the mapping of abstinence durations reveals fairly distinct patterns (see Figure 5).

Reported durations of less than or forty days cluster in the zones lying immediately around Lakes Albert, Edward, Kivu and Tanganyika, and in scattered parts of the Sahel (among some Islamicized west African groups) and of south-eastern Africa. The ethnic groups living around the lake area with

this short postpartum abstinence are the Bayankole in Ankole District of southwestern Uganda (to the south east of Lake Edward), the Rwanda and Rundi (or Banyarwanda and Burundi) of Rwanda and Burundi, and the Bafulero, Bahunde, Bahavu, Chiga and Apur who inhabit North and South Kivu of Kivu Province in eastern Zaire, immediately to the west of Rwanda and Burundi.

Ethnic groups with reported durations exceeding 40 days and up to one year cluster remarkably in eastern Africa, (generally east of the chain of Lakes Albert to Tanganyika and east of Lake Victoria), and in west Africa, they include the Akan groups of central southern Ghana.

Finally, the ethnic groups with reported postpartum abstinence periods of greater than one year (and frequently of two years or more), comprising by far the largest proportion of all reports, cluster in sub-Saharan west Africa, and central Africa.

The potential impact of postpartum abstinence on fertility depends critically on its duration in relation to duration of breastfeeding, which determines when a woman can once again conceive after delivery. In any society where women do not breastfeed, the period of time during which they do not ovulate or menstruate (amenorrhea) averages roughly two months after delivery. Where breastfeeding is prolonged, amenorrhea increases in duration in proportion to the length of breastfeeding. While this lactational amenorrhea will be discussed in detail further in this review, for the purposes of illustrating the impact of abstinence, it is important to note that lactational amenorrhea lasts for about 60 to 70 percent of the duration of breastfeeding where breastfeeding durations are up to one to two years and more.

In assessing the quantitative impact of postpartum abstinence on

duration of exposure, it is useful to introduce the concept of the nonsusceptible period which equals the total duration of absence of risk of conception, whether the protection is provided by lactational amenorrhea or by abstinence. But it is then also necessary to analyze separately the individual and population-level effects. For individual women, postpartum abstinence has an effect on fertility only if it exceeds the lactational amenorrhea duration. The duration of the nonsusceptible period then equals the duration of abstinence. If a woman abstained for a shorter time than the duration of her lactational amenorrhea, then her nonsusceptible period would equal the duration of amenorrhea. On the population level the situation is somewhat more complex. In general, the average duration of the nonsusceptible period will be longer than the average of either the *abstaining of* amenorrhea duration. The reasons for this interesting finding is that in any population there is substantial variation around the mean durations of abstinence and amenorrhea: the positive effect of longer durations adds more to the average nonsusceptible period than the negative effect of shorter durations takes away from it. As a result, a population in which the average abstinence and amenorrhea durations are equal will have a nonsusceptible period that on average is two or three months longer. Even if the average abstinence duration is a few months shorter than the average amenorrhea duration, it will still provide some additional time to the average total time of protection against the risk of conceiving, because there will always be some women who abstain beyond their lactational amenorrhea.

Since breastfeeding in sub-Saharan Africa tends to be far longer than a year in the majority of rural and traditional societies, it is the impact of

the longest durations of abstinence that have the greatest relevance to fertility. In fact, there is ample evidence that it is among groups where abstinence exceeds one year that its duration is purposefully tied to the duration of breastfeeding and customarily lasts at least until weaning (in some groups, such as the Yoruba of Nigeria, abstinence exceeds breastfeeding at all durations). As a result, in the majority of societies practising extended abstinence, women do not begin to be exposed to conception until after their last child is weaned, which can lead to a spacing between successive children of up to around 4 years.

Nevertheless, close scrutiny of the distribution of all durations of abstinence in sub-Saharan Africa, and particular examination of the most recent surveys, reveals quickly that this distribution is not only related to the differentials in customary practices, but also reflects an ongoing process of erosion whose state of advancement varies across the continent. A complete engagement of the erosion process at a national level can be inferred in Tanzania, but its results are possibly best observed in Kenya. In Tanzania in the 1970s, reported durations show varying levels, mixed practices, and rarely exceed 6 months. In Kenya, the Fertility Survey of 1977-78 revealed an average duration of abstinence of about 4 months. The decline of the abstinence duration in Kenya can be presumed to have played a role in the country's overall fertility increase, which will be examined later. Finally, often large differentials between rural and urban practices and between those of educational groups such as found in recent surveys portend other national transitions towards abandonment of the practice, if they indeed indicate (as is strongly suspected) the first step in the engagement of such a process.

2.2.3 Spousal separation

Long periods of separation of spouses can appreciably reduce the women's overall exposure to conception. Such separations are principally due to male labor migration, and predominate in southern Africa. Labor out-migration is a phenomenon of considerable importance in west Africa also, but tends to involve longer-term migration of unmarried men and consequently to have bolstered polygamy rather than to have resulted in widespread spousal separation. In southern Africa, polygamy is less common, and the majority of migrating married men will be absent for several months or even a few years which could effectively reduce the overall frequency of intercourse in a married lifetime quite drastically.

The impact that this reduction in exposure time has on fertility can be strongly tempered by the timing of spousal separation. In some areas it is reported that husbands leave once their wives are pregnant and intend their period of absence to coincide with the pregnancy and the child's early life. Unexpectedly long durations of postpartum abstinence were found in the Lesotho Fertility Survey of 1977 which illustrate this timing effect on a national scale. Because of broadscale labor migration of males to the Republic of South Africa, the surprisingly long abstinence in all probability measures the customary absence of husbands in the postpartum period, rather than abstinence in cohabiting spouses per se.

2.3 Breastfeeding and Lactational Amenorrhea

Because the biological feedback of suckling effectively blocks ovulation for a period of time, the length of breastfeeding has a potentially large impact on the period of time that a woman is exposed to conception.

The period of time during which ovulation is blocked by lactation (lactational amenorrhea) falls short of the total duration of lactation, because frequency and intensity of suckling decline as weaning approaches, but lactational amenorrhea lasts for a major proportion of the period of breastfeeding at all breastfeeding durations. The relationship between the two is illustrated in Figure 6. In the absence of any lactation, a woman is amenorrheic for about 2 months following delivery, while for the longest breastfeeding durations, amenorrheic periods of up to two years have been observed.

For all intents and purposes breastfeeding is universal throughout sub-Saharan Africa. There is, however, substantial variation in its duration between countries that reflects ethnic differences in practice to a large extent, and the negative effects of modern influences to a measurable extent.

The mean duration of breastfeeding ranges over 20 months in Senegal, about 19 months in Lesotho, 18 months in Ghana and about 16.5 months in Sudan and Kenya. The average nonsusceptible periods due to lactational amenorrhea for these breastfeeding durations are about 13 months in Lesotho, 12 months in Ghana, and 11 months in Sudan and Kenya. However, this is the minimal estimate of the average duration of nonsusceptibility since abstinence

effects are not considered (see section 2.2.2). To illustrate, the added effect of abstinence practice would raise the mean nonsusceptible period to 18 months in Lesotho, 17 months in Ghana, 12 months in Sudan, and 13 months in Kenya (Casterline et al, 1983).

2.4 Use of Birth Control

Birth control which is intended to limit family size includes both the use of contraception and the practice of induced abortion.

2.4.1 Use of contraception

The use of contraception as yet still plays a very limited role in determining fertility in sub-Saharan Africa. On the one hand, knowledge levels are very low: the proportion of ever-married women who report never having heard of any method to delay or avoid a pregnancy range from 12 percent in Kenya, 32 percent in Ghana, 35 percent in Lesotho, 40 percent in Senegal, and 49 percent in Sudan to 66 percent in Cameroon. On the other hand, even better levels of knowledge are not necessarily associated with higher use: current use of any method of contraception (including non-modern methods and sterilization) among all currently married women ranges from about 9.5 percent in Ghana to about 6 percent in Kenya, under 6 percent in Nigeria, 5 percent in Sudan and Lesotho, to well below 5 percent in Senegal. Taking account of only women who are currently exposed to conception, the proportions are higher - 12.4 percent in Ghana, 9.2 in Kenya, 7 percent in Lesotho, 6 percent in Sudan and in Nigeria, and 5.2 percent in Senegal - but

a third and more of the respondents are using inefficient methods (in Senegal, the majority).

2.4.2 Induced abortion

Data on induced abortion are very rare in sub-Saharan Africa. Overall, abortion is probably used in a number of urban areas among the very youngest women before marriage, but otherwise the practice is incidental. The urban phenomenon is reported variously to represent an increasing problem of public health, but at the regional level, induced abortion has negligible impact on fertility levels.

2.5 Foetal Loss

Intrauterine mortality includes both spontaneous abortions, which comprise the bulk of pregnancy losses, and stillbirths, which represent mortality after the 28th week of pregnancy.

There are good reasons to believe that overall intrauterine mortality, which is probably as high as 15 or 20 percent at least, is similar in all populations. Stillbirths are probably more frequent in Africa than elsewhere, but constitute so little a proportion of intrauterine mortality that they have a negligible effect on fertility.

There is evidence that epidemic malaria may be associated with higher levels of intrauterine mortality, and since malaria is widespread in Africa, it could affect the overall levels of intrauterine mortality. However, malaria is highly endemic in much of Africa, and its transmission stable,

which may result in a lower overall impact on foetal loss in contrast to regions where it is epidemic. Notwithstanding the absence of data to make a better determination, the effect on fertility is deemed negligible relative to the order of magnitude of expected levels of foetal loss (Lancet, 1983).

2.6 Sterility

Sterility arises from both natural and pathological causes. In the discussion below, the prevalence of sterility is measured by its result, i.e., the level of infertility.

2.6.1 Natural Infertility

The natural maximum duration of reproductive life in women is from menarche to menopause. Each marks a process rather than a well-defined event. The onset of first menstruation is followed by a period during which anovulatory or otherwise incomplete cycles occur with decreasing frequency so that populations of women experience a period of naturally occurring relative infertility for a number of years in the earliest portion of the reproductive span, the actual years of age involved depending on the age at menarche. Average age at menarche has been found to range in the 1960s and 1970s from about 12 to about 19 years for various populations for which there are relevant data. Existing data for Africa range nearly as widely in the same time period: from about 13 years among affluent or urban groups in Uganda and Nigeria to over 17 among rural Huti in Rwanda. Average age at menarche evidently depends on a number of both genetic and nutritional factors,

although the role of any one factor is not well known (Gray, 1979).

The natural infertility of the early reproductive life of women is relatively less important to fertility than the natural infertility of the later reproductive life, since much of its effect is lost through non-exposure and because late age at menarche tends to be associated with later age at marriage.

Menopause is the final point in a process of several years' duration whereby the frequency and regularity of ovulation decline until ovulation ceases. Evidence from a number of studies suggests that in a population of women the process begins in the 30s, half of the women are menopausal by about age 50, and all women are menopausal by the middle to end of the 50s. However it is clear that the onset of infertility precedes menopause by a number of years. This is because in addition to irregular and infrequent, even rare, ovulation, aging of the reproductive system is associated with a higher frequency of early spontaneous abortions, and older women tend to have a lower frequency of coitus. Most importantly, therefore, the process translates into a mean age at last birth in populations who do not intentionally stop childbearing of about 40 (Bongaarts and Potter, 1983).

Although this pattern of onset of menopause is derived from other populations, it is applicable to sub-Saharan Africa. On that basis, the pattern of natural infertility with age provides us with a lowest threshold for expectable levels of infertility that is essential to the analysis of pathological infertility in Africa. Thus, the age at which natural infertility is at its lowest level, 3 percent in the early 20s, provides us with the lowest proportion of women we would expect to be childless for life in a society where virtually all women are exposed to conception in those

years. This standard level of childlessness is confirmed by the lowest proportion of women ending their childbearing years childless (around 3 percent) in a number of populations.

2.6.2 Pathological infertility

The prevalence of gonorrhoea occasions both primary and secondary infertility in many parts of sub-Saharan Africa. For any level of primary infertility or childlessness, there is an accompanying larger proportion of women who have incurred secondary infertility: these women are unable to have additional children, sometimes very early in their childbearing life. The proportion of women childless after the end of childbearing (say, 45-49) allowed one gauge the ultimate weight of primary infertility, and to have a very good indication of the extent of accompanying secondary infertility (see Figure 7).

The highest levels of infertility (20 percent and more of women aged 45-49 definitively childless) are found across a large area of central Africa. Lower levels (between 12 and 20 percent of women 45-49 childless) are found in interspersed areas of central Africa and in east Africa. In general much lower levels, but which still exceed expected infertility (3 to 12 percent of women 45-49 childless), are found across west Africa, although higher infertility is found among a number of Sahelian groups of upper west Africa and in some coastal areas. The relationship between definitive childlessness and total fertility for the sub-populations of 18 countries shows that infertility accounts for about 60 percent of variation in total fertility and that each 9 percent more in the proportion of women 45-49 who

are childless translates into a drop in total fertility of one live birth. Average childlessness for 21 countries of sub-Saharan Africa is as high as 12 percent (weighted for population sizes): this means that, after discounting natural infertility of 3 percent, on average, women have a shortfall of one live birth across these countries, due to pathological infertility alone (Frank, 1983).

2.7 Summary and Prospects

In summary, the principal proximate determinants of the levels and differentials of fertility in sub-Saharan Africa are lactational amenorrhea due to breastfeeding, decreased exposure to conception due to postpartum sexual abstinence, and pathological, involuntary infertility due to gonorrhea whose prevalence is probably associated with levels of marital and sexual mobility (Frank, 1983).

These three proximate determinants depend on behaviors that are susceptible to modern influences in Africa, especially those of education and urbanization. Thus educated, urban women, although they tend to marry later generally abstain sexually for shorter periods after delivery and tend to replace breastfeeding earlier or altogether with alternative milk or solid foods. Recourse to contraception could compensate for the positive effects these changes have on fertility, but uptake of contraception is clearly lagging. In Kenya, for example, fertility is in effect increasing among young, educated, married urban women. The same phenomenon has been observed in several studies in Nigeria, and the Nigeria Fertility Survey confirms that current fertility is higher among women with primary education compared to

women with less or none, and among women with an urban residence (Federal Republic of Nigeria, 1983). Broad extension of education for women in rural areas can bring about these effects at national levels, but some erosion of abstinence and breastfeeding durations can be expected to occur even in the absence of substantial increases in women's education.

Urbanization and education can affect infertility in very different ways. Rapid urbanization without concomitant infrastructural development can foster increased infertility, because the incidence of gonorrhoea is increased by the greater sexual mobility, higher exogamy and higher prostitution in metropolitan areas. On the other hand, the mere greater availability of antibiotics can reduce infertility in some rapidly urbanizing areas with even highly inadequate infrastructure. Women with low levels of education generally have higher levels of fertility than women with no education at all, which may be in part due to lower infertility. While higher levels of education begin to show various other effects on fertility behavior, infertility per se can be expected to decline fairly systematically as women have increased access to, and make more effective use of any health resources with their increased educational exposure. For the majority of rural populations experiencing pathological infertility, however, there is little in present conditions by which to judge the prospects for change.

3. FERTILITY AND THE PROXIMATE DETERMINANTS

3.1 Estimation of the fertility inhibiting effects of the proximate determinants

A convenient approach to quantifying the impact of the proximate determinants is to consider them as inhibitors of fertility. That is, delayed entrance into the first sexual union, marital disruption, breastfeeding, postpartum abstinence and infertility are all factors that reduce fertility to levels below those that would prevail in the absence of the effects of these proximate variables. Their impact on overall reproductive performance can be substantial. For example, prolonged breastfeeding may result in a period of lactational amenorrhea of 18 months. In a population with a mean birth interval of 3 years (not unusual for Africa) this means that half the birth interval and hence half the married life of nonsterile women could be spent within the amenorrhea periods. The impact of breastfeeding in this example is clearly important, but in order to compare it with the fertility effects of other proximate variables, it is necessary to use a mathematical model that quantifies the relationship between fertility and its proximate determinants. A brief summary of the main features of the model used here is provided in an Appendix and a more detailed description can be found in Bongaarts and Potter (1983). This model basically translates a measure of each proximate variable into its proportional effect on fertility as measured in the total fertility rate.

To illustrate an application of this model, we will use the following fairly typical values for the principal proximate determinants in sub-Saharan Africa:

- Proportion of reproductive years not living in union (weighted average): 0.1
- Proportion using contraception among women in union: 0.05
- Duration of postpartum nonsusceptible period: 16 months
- Proportion childless at end of the reproductive years: 0.10
(an indicator of the incidence of pathological sterility)

From these measures the model can estimate the percent increase in fertility that would occur if the fertility inhibiting effect of each of these proximate variables is removed. The results, plotted in Figure 8, indicate that the elimination of breastfeeding and postpartum abstinence would produce a rise of 72 percent in fertility. The effects of the other variables are much smaller: 11 percent for time spent outside unions, 5 percent for contraception and 12 percent for pathological sterility. Expressed in births per woman, the average observed total fertility rate of 6.6 would increase to 11.4 without breastfeeding and postpartum abstinence and if the inhibiting effects of non-exposure to unions, contraception and pathological sterility were also removed, fertility would reach over 15 births per woman. Obviously, the proximate variables, especially the postpartum nonsusceptible period, have a powerful impact on fertility in sub-Saharan Africa.

Figure 8 also contains estimates of the fertility effects of the proximate variables from sets of Asian and Latin American countries. A comparison with the estimates for sub-Saharan Africa indicates that the effects of the marriage or union exposure and contraception are considerably greater in Latin America and Asia. On the other hand in sub-Saharan Africa

the fertility-inhibiting effects of postpartum nonsusceptibility and pathological sterility substantially exceed those observed elsewhere.

3.2 Differentials in fertility and the proximate variables

The variations in fertility among countries, among regions and socioeconomic strata within countries and among individual women discussed in section 1.2 are by definition due to the effects of one or more of the proximate variables. If accurate measures of all proximate variables as well as a complete model were available, all variance in fertility could be explained. Unfortunately, measures of some proximate variables are not available or incomplete. As a consequence, it is not possible here to provide a detailed and comprehensive explanation of the sources of the national, subnational and individual variation in fertility. Instead, a few examples will be given to illustrate the principal causes of some fertility differentials.

3.2.1 National differentials

As was noted earlier, total fertility rates of countries in sub-Saharan Africa range from 8.1 in Kenya to 4.1 in Gabon. Two crucial clues as to the cause of the gap in fertility between these two countries were provided in the earlier discussion of the proximate determinants: Kenya has one of the shortest durations of the postpartum nonsusceptible period found in sub-Saharan Africa and Gabon has very high levels of childlessness, which is indicative of a high prevalence of pathological sterility. To determine to what extent these two factors can account for the difference in fertility between Kenya and Gabon, a simple two-step calculation is made with the model

described in the Appendix. First an estimate is made of the decline in the total fertility that would occur if Kenya's nonsusceptible period were lengthened from its current duration of 13 months to a more typical 16 months. Second, the increase in Gabon's fertility following the elimination of pathological sterility is estimated. The results are plotted in Figure 9. The rise in the nonsusceptible period in Kenya reduces its total fertility rate from 8.1 to 7.4 and Gabon's total fertility rate rises from 4.1 to 7.3 after correcting for the higher prevalence of childlessness. This simple adjustment has cut the fertility difference between Kenya and Gabon from 4 to a negligible 0.1 births per woman. Although there are undoubtedly differences in other proximate determinants between these two countries, it appears safe to conclude that the relatively short duration of the nonsusceptible period in Kenya and the higher incidence of pathological sterility in Gabon are the principal proximate determinants of the large gap in the observed total fertility rates between these two countries.

3.2.2 Sub-national differentials

To carry out a similar exercise on the subnational level requires more detailed measures of the proximate determinants than are currently available, but a few generalizations about the differentials plotted in the earlier Figure 2 can be made:

- The regional differences in Cameroon are largely caused by variation in levels of childlessness, which range from 29% in the South-East to 7% in the West (Frank 1983). The elimination of pathological sterility would, according to the model, produce an increase in the total fertility rate from 4.3 to 7.1 in the South-East and from 6.5 to 6.9 in the West. Thus, after

adjusting for the effect of pathological sterility, fertility levels in the South-East and West of Cameroon are virtually equal.

- The lower fertility rates among better educated and urban women are primarily caused by later age at first union and by a higher prevalence of contraception. However, higher levels of education and living in urban areas are also associated with shorter durations of postpartum abstinence and breastfeeding and perhaps lower levels of pathological sterility. This tends to offset the fertility-inhibiting effects of later marriage and greater use of contraception. In fact, this offsetting effect can be so large as to result in a rise in fertility with increasing education in some strata. This is the most likely explanation for the higher fertility among women with 1 - 3 years of schooling than among women with no schooling (see Figure 2).

3.2.3 Individual differences

As on the national and subnational levels, the proximate determinants are also responsible for the very large variations in children ever born among individual women. The simple fertility model used thus far on the aggregate level is inadequate to account for individual differences. Instead an analysis with highly complex computer simulation models would be required to study this topic in detail, a task that falls outside the scope of this paper (see Bongaarts and Potter 1983 for applications of these simulation models). A few relevant observations can be made however. In general, both behavioral and biological factors are involved in determining the number of children a woman will have. Behavioral variables include the age at first union, the use of contraception, the pattern and duration of breastfeeding, and the frequency of intercourse. These behavioral factors account for some

of the individual variation in fertility, but in the absence of differences in behavior, the number of children ever born would still range from zero to over ten. This points to the crucial role played by biological factors on the individual level. For example, natural sterility which on the aggregate level has little explanatory power is a major cause of variation among individuals, because a woman who is sterile when she enters her first union will remain childless while a woman who remains fertile until age 50 will have several decades of reproductive life which is sufficient to produce ten or even fifteen births. In addition, the spacing between births ranges from about a year to several years even among women with the same breastfeeding and intercourse pattern, because durations of lactational amenorrhea, occurrences of spontaneous abortions and waiting times to conception are to a large extent randomly determined. The role played by chance is one of the most important causes of the large range in the number of children ever born among individual women at the end of the reproductive years in all societies.

4. IMPLICATIONS FOR FUTURE TRENDS IN FERTILITY

The preceding analysis constitutes a basis from which some implications for future fertility trends can be derived. Naturally, any discussion of the demographic future of sub-Saharan Africa has to be in large part speculative due to the absence of reliable measures of current and past trends in fertility and the proximate determinants. The fact that the outlook for economic development is very unclear adds further uncertainty, but we will assume here for simplicity that sub-Saharan Africa will (slowly) follow the general pattern of modernization and development found elsewhere in the world.

The future trend in fertility is entirely determined by trends in the proximate determinants. The proximate determinants can be divided into two general classes: those that can be expected to exert upward pressure in fertility in the future and those that will tend to reduce fertility:

- Fertility enhancing trends: - shortening of breastfeeding and postpartum abstinence
- Fertility reducing trends: - decline in pathological sterility
- rise in age at first union
- higher prevalence and effectiveness of contraception

These are the main variables that are likely to determine the overall trend in fertility even though some other proximate determinants (e.g. induced abortion, frequency of intercourse) may play a significant role in some societies or subgroups. Whether fertility will rise or fall in the near future therefore depends on the balance of the fertility-enhancing and reducing trends in the proximate determinants.

Past fertility trends in sub-Saharan Africa provide an important indication of what might lie ahead. Although most countries have not experienced a significant change in fertility in the most recent decades, there is one crucial exception: Kenya. According to U.N. estimates, the total fertility rate in Kenya has risen from 6.6 in 1950-55 to 8.1 in 1975-80. Although it is possible that the estimate for the earlier period is not entirely accurate, there is virtually no doubt that fertility has increased substantially. This increase occurred despite a rise in age at marriage because the postpartum nonsusceptible period was shortened as traditionally long periods of breastfeeding and postpartum abstinence were shortened (see section 2 for details). Kenya's fertility may eventually decline below its present very high level, but if its past experience is any guide to what lies ahead for other countries, then it will be very difficult to avoid a rise in fertility. This is especially true in countries where the duration of breastfeeding and postpartum abstinence are still long or where the prevalence of pathological sterility is high. Moreover the mere presence of infertility in a society will impede the uptake of contraception, because the risk of becoming sterile makes childbearing uncertain, which in turn deters individuals from acquiring knowledge and interest in controlling their fertility.

Support for a possible upward trend in fertility is found in cross-sectional studies that correlate socioeconomic indicators of regions with levels of fertility and the proximate variables. For example, Lesthaeghe (1984) has collected estimates of three proximate variables (marital exposure, contraception, and postpartum nonsusceptibility) for a large set of regions for which a measure of literacy was also available. As

expected, marital exposure and the duration of postpartum nonsusceptibility were lowest and the prevalence of contraception were highest in the regions with the lowest levels of illiteracy. Using a model to estimate the fertility effect of these trends, Lesthaeghe found that fertility in the most illiterate societies was less than that of societies with higher degrees of literacy for most of the observed range. Only after literacy reached levels above 75 percent did fertility decline as the effect of increasing contraception and later age at first union outweighed the effect of shorter breastfeeding and postpartum abstinence. Although, as Lesthaeghe notes, one cannot simply use such cross-sectional analysis to predict trends over time, this finding confirms that there is a potential for a significant rise in fertility in sub-Saharan Africa.

Yet another demonstration of the formidable changes in reproductive behavior that will be required to achieve declines in fertility can be made with a model that projects future fertility levels from trends in the proximate determinants. To simplify this exercise, we will examine the effect on marital fertility of two crucial proximate determinants for the reduction of fertility, the postpartum nonsusceptible period and the prevalence of contraception. Table 3 provides an illustration of a projection of the levels of contraceptive prevalence required to reach specified reductions in fertility by the year 2000. It is assumed that current contraceptive prevalence among married women of reproductive age is 5% and that the duration of the nonsusceptible period is 16 months. The second column of Table 3 provides estimates of the contraceptive prevalence levels needed to reduce marital fertility by 10, 20 and 30 percent respectively, assuming no change in breastfeeding or postpartum abstinence.

For example, a 20% reduction will then require a contraceptive prevalence of 26 percent in the year 2000. The last column of Table 3 gives the required levels of contraceptive prevalence if the duration of the nonsusceptible period is reduced to 8 months (this may well happen in substantial parts of Africa by the year 2000). In this case, contraceptive prevalence will have to rise to 29 percent just to prevent an increase in marital fertility. A modest 20% reduction in marital fertility will require that no fewer than 45 percent of married women become contraceptive users.

A dramatic rise in contraceptive prevalence is unlikely to occur in most of sub-Saharan Africa before the end of the century. Desired family size is higher in sub-Saharan Africa than anywhere else in the world and there is no evidence that traditional reproductive norms are changing. What little contraceptive use exists is found predominantly among older high parity women because only a very small proportion of low-parity women want to deliberately stop childbearing. Large declines in fertility will not occur until these traditional patterns of reproductive behavior are modified. However, it is worth noting that overall fertility could be reduced significantly even if only high parity women were to stop childbearing. This is due to the fact that a large proportion of women reach very high parities by the end of their reproductive years as is evident from Figure 3. Eliminating births of the highest orders would be a first step towards a sustained fertility decline and its effect could be substantial. For example, if Kenya were to adopt a stop-at-six policy, this would, if completely successful, reduce fertility by 34%. While this still leaves the total fertility rate at 5.4, it would be a clear improvement over the present situation.

In sum, it is difficult to be optimistic about future trends in

fertility in sub-Saharan Africa. Reductions in fertility will only occur in populations or strata where increases in contraceptive use and age at marriage are sufficiently large to outpace the effects of the shortening of breastfeeding and the abandonment of postpartum abstinence as well as any declines in pathological sterility. Urban and well educated women in the more developed African countries are more likely to use contraception or delay marriage and they are therefore also more likely to experience fertility declines. On the other hand, the large majority of women have little or no education and live in rural areas, and their prospects for rapid increase in contraceptive prevalence are not good, at least in the near future. Factors that are obstacles to a rapid change in contraceptive behavior are high levels of illiteracy and infant and child mortality, the large numbers of children desired, the high prevalence of pathological sterility (in some societies) and the lack of access to health and family planning services.

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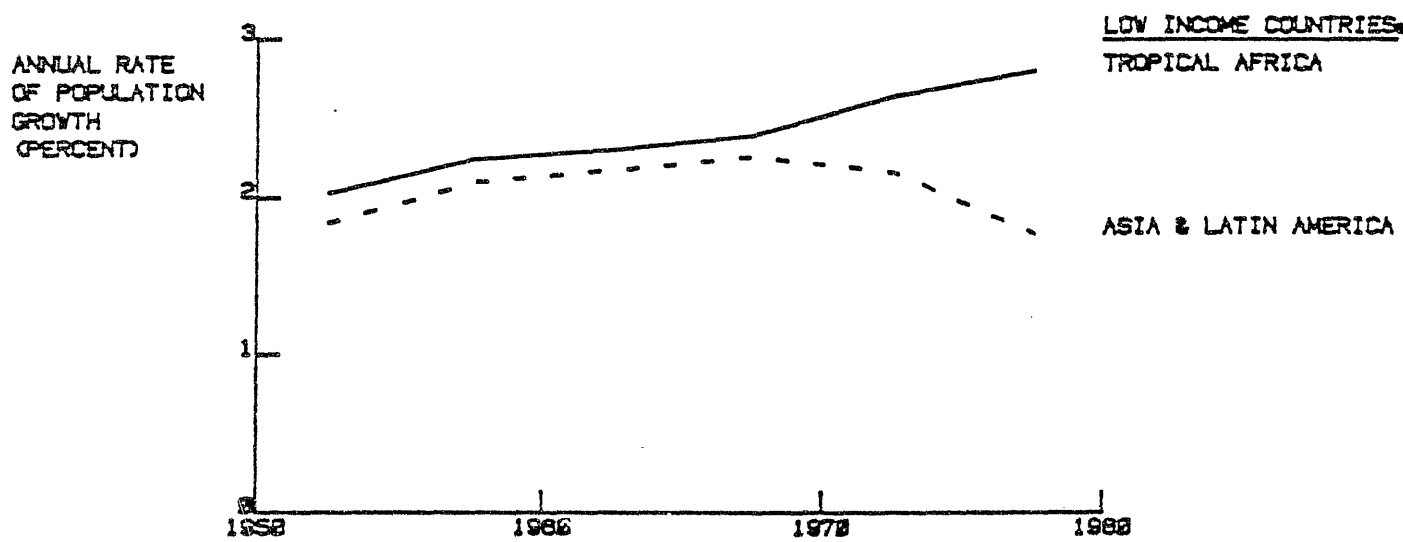
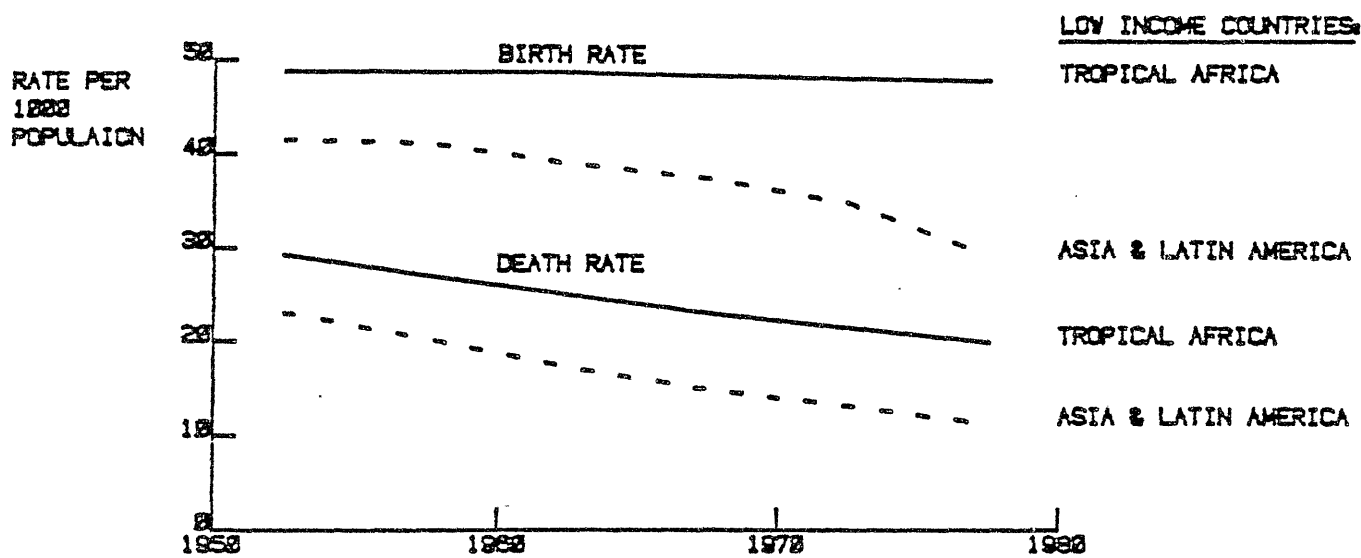


FIGURE 1: BIRTH, DEATH, AND ANNUAL GROWTH RATES OF LOW INCOME COUNTRIES IN TROPICAL AFRICA AND ASIA AND LATIN AMERICA

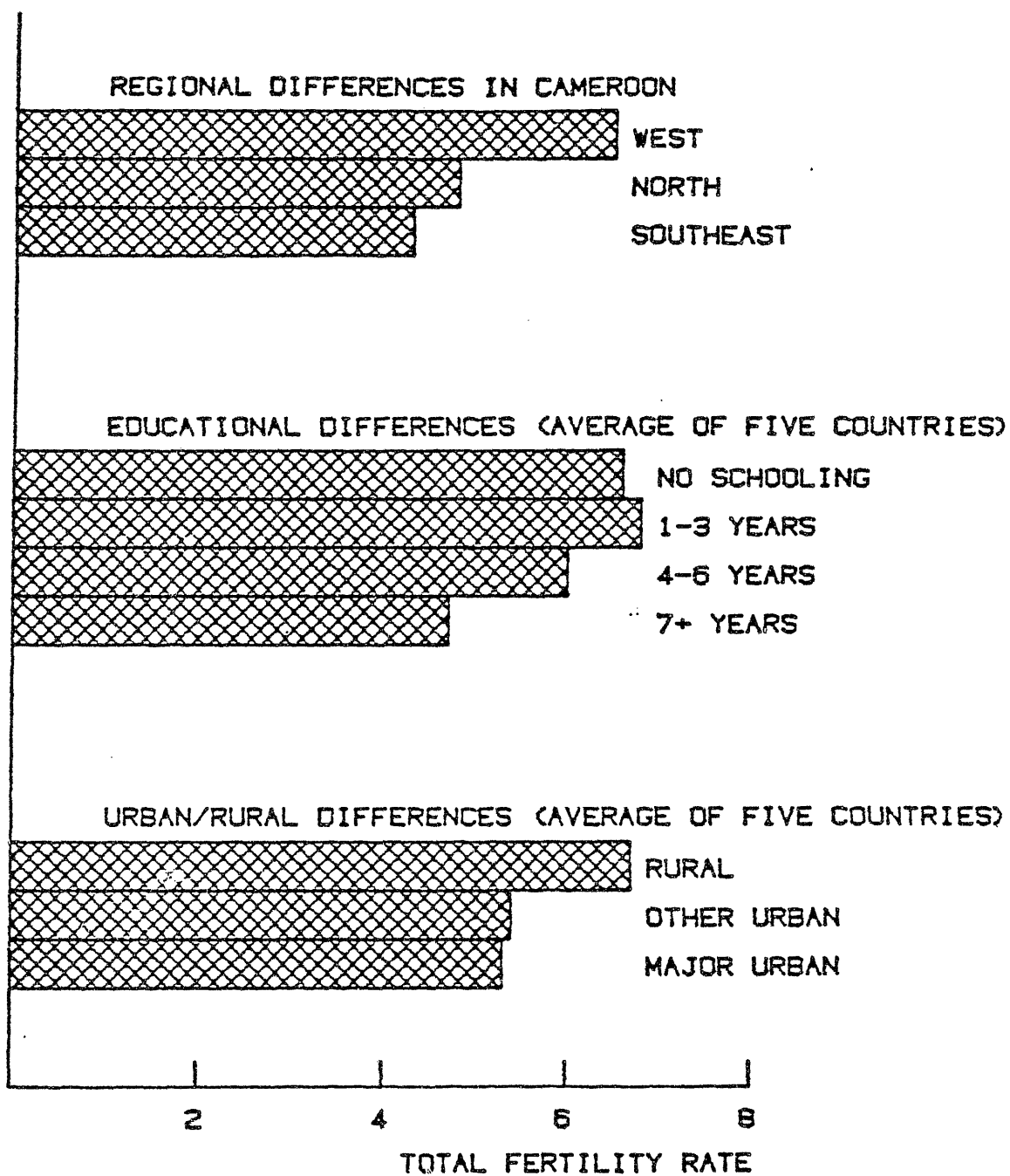


FIGURE 2. FERTILITY DIFFERENTIALS BY REGION IN CAMEROON BY LEVEL OF SCHOOLING AND URBANIZATION (AVERAGE OF GHANA, KENYA, LESOTHO, SENEGAL AND SUDAN). SOURCES: FRANK 1983 AND CASTERLINE ET AL 1984.

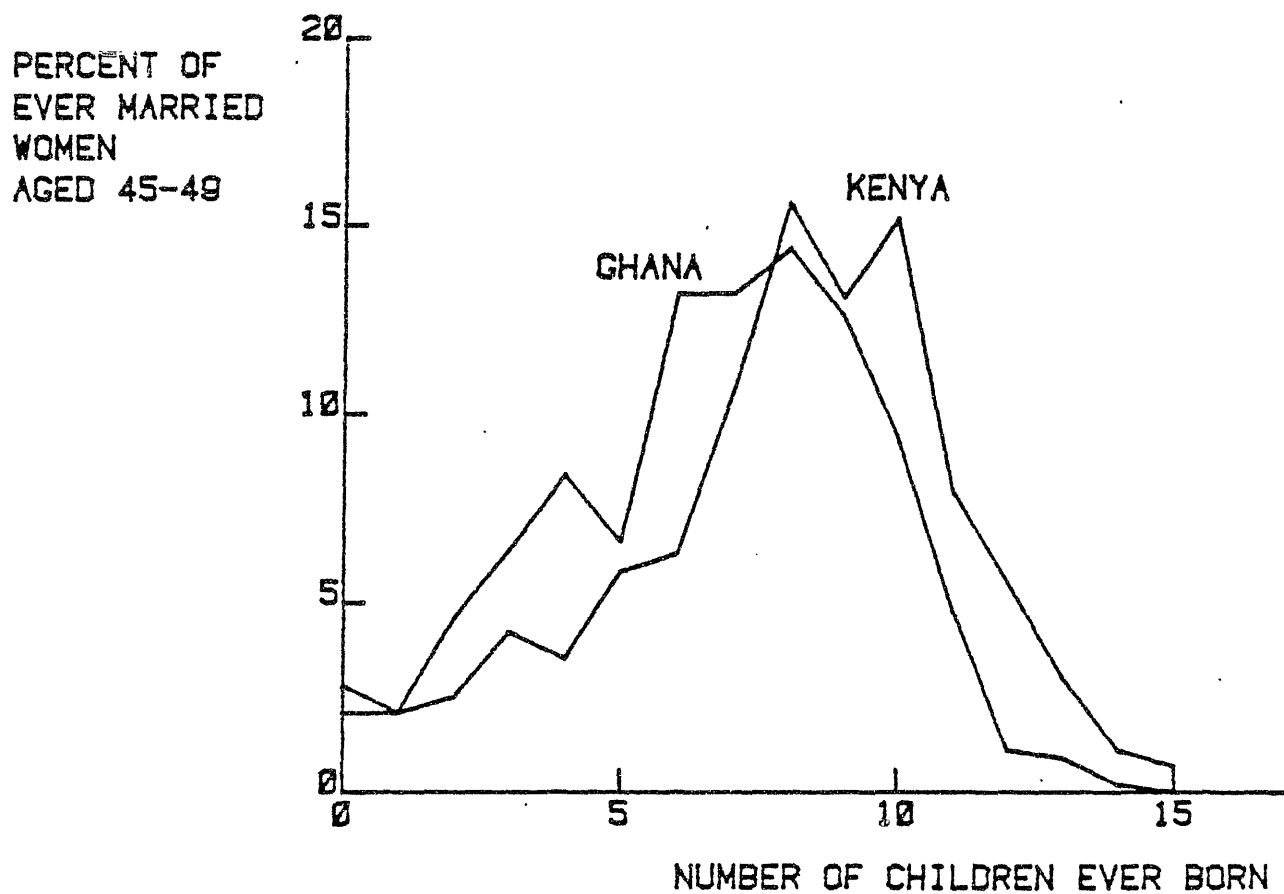
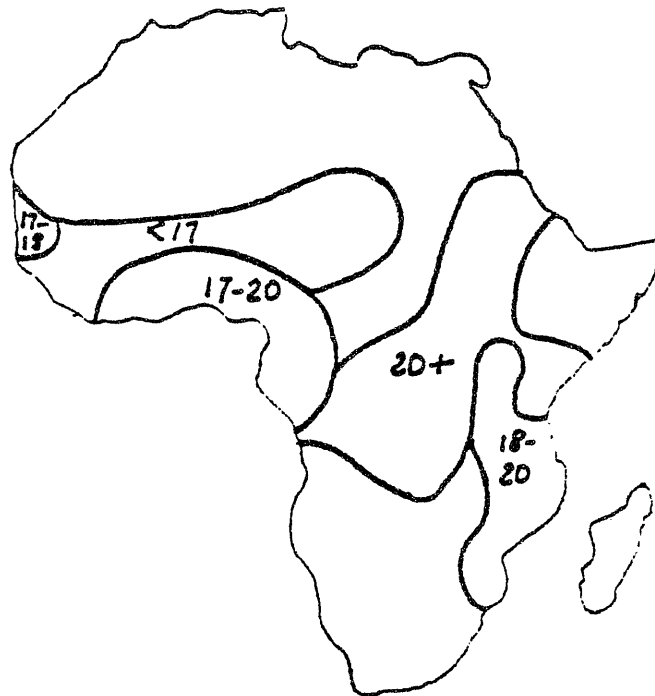


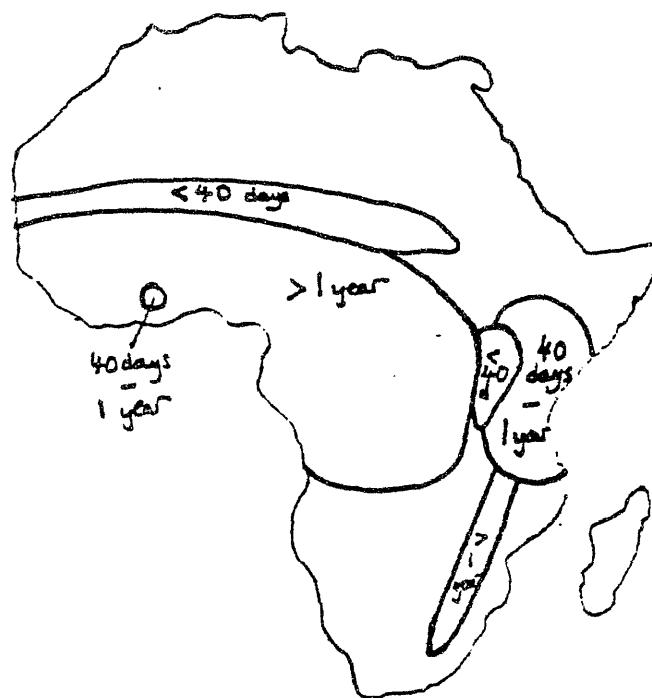
FIGURE 3. DISTRIBUTION OF NUMBER OF CHILDREN EVER BORN AMONG EVER MARRIED WOMEN AGED 45-49 IN KENYA (1977) AND GHANA (1979)

Figure 4: Age at first marriage



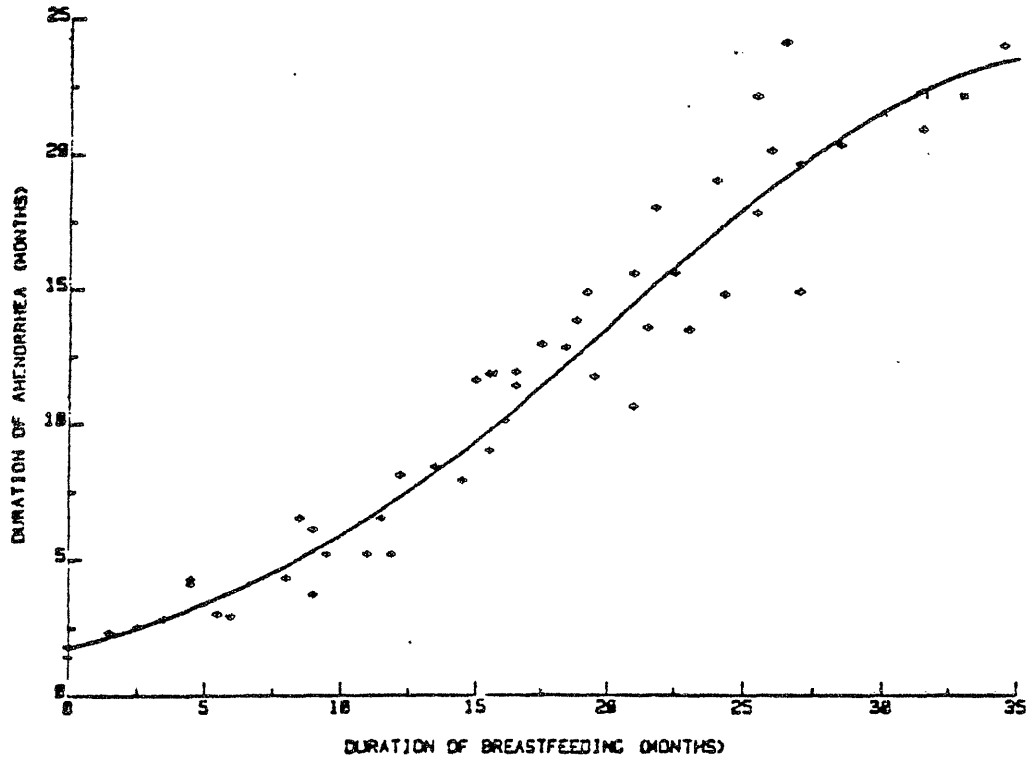
Source: Lesthaeghe (1984).

Figure 5: Postpartum abstinence durations



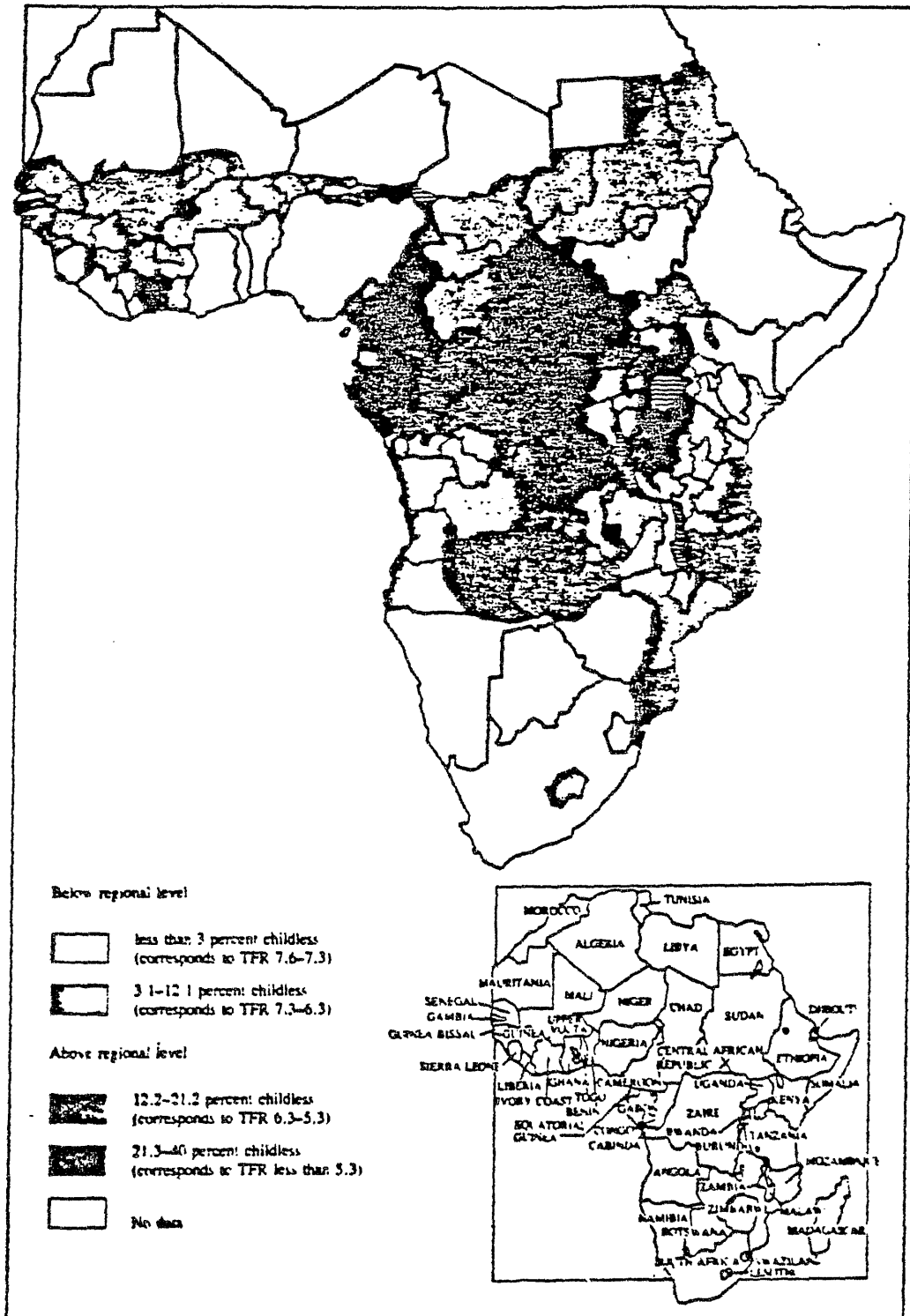
Source: Schoermaeckers et al. (1981).

Figure 6 Mean (or median) duration of postpartum amenorrhea by duration of breastfeeding



Source: Bongaarts and Potter (1983).

FIGURE 7: Levels of childlessness among women aged 45-49 (or closest age group) in 21 countries of sub-Saharan Africa, various years



Source: Frank (1983)

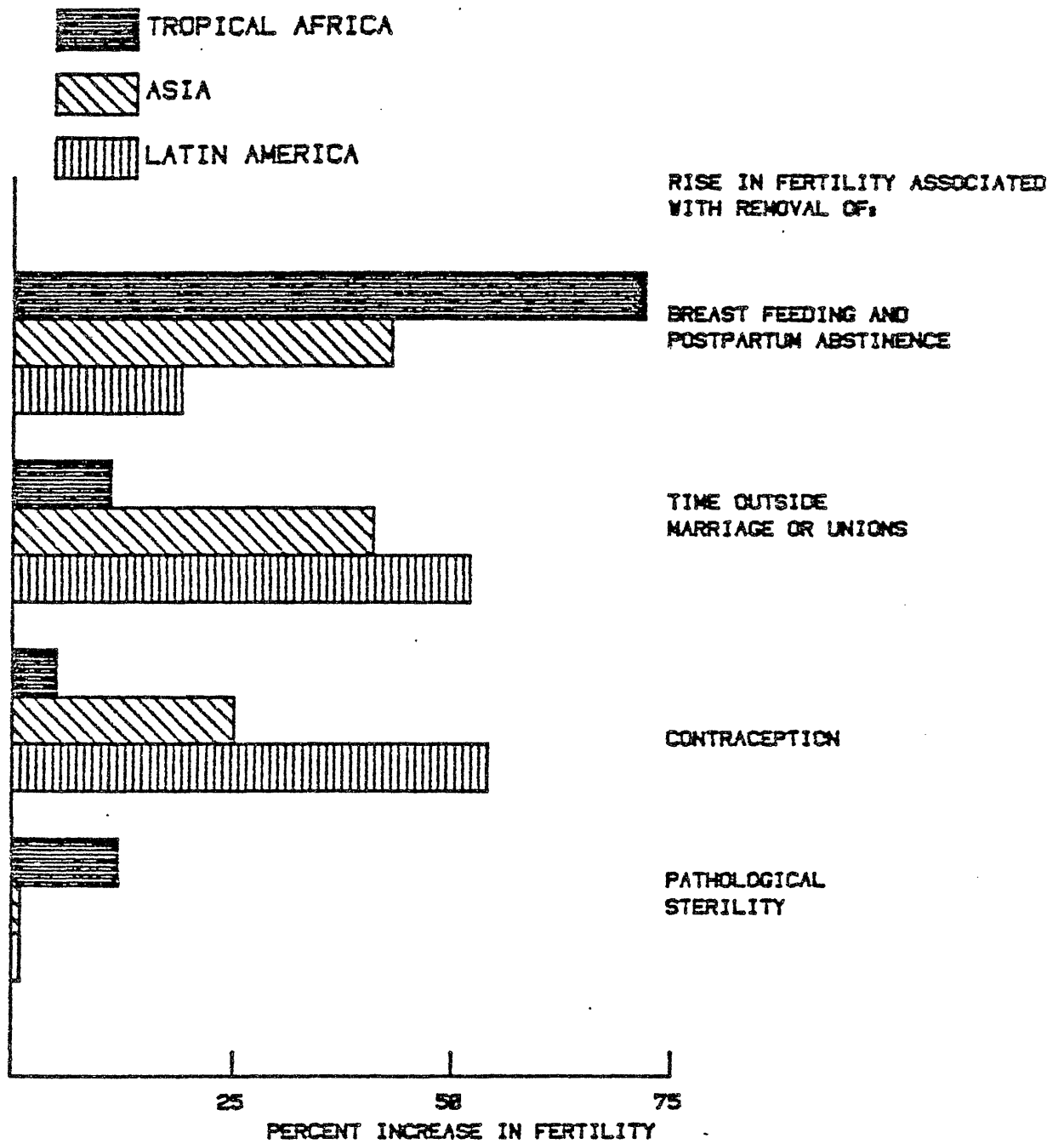


FIGURE 8: ESTIMATED PERCENT INCREASE IN FERTILITY ASSOCIATED WITH REMOVAL OF FERTILITY INHIBITING EFFECT OF DIFFERENT PROXIMATE VARIABLES BY CONTINENT (SOURCE: SEE APPENDIX)

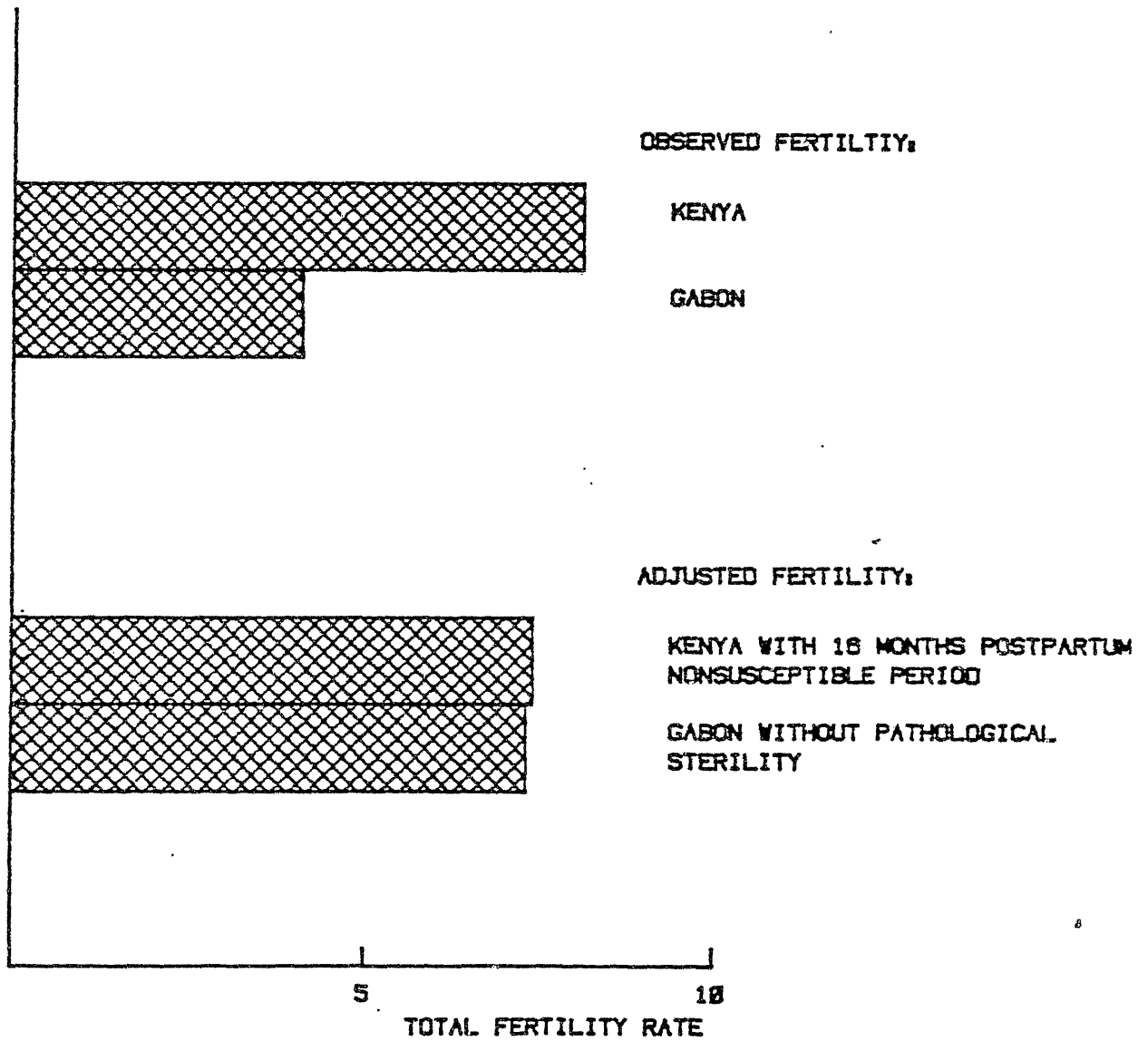


FIGURE 9: OBSERVED AND ADJUSTED FERTILITY RATES IN KENYA AND GABON. ADJUSTMENTS ARE BASED ON MODEL ESTIMATES OF THE FERTILITY INHIBITING EFFECTS OF THE POSTPARTUM NON-SUSCEPTIBLE PERIOD AND PATHOLOGICAL STERILITY (SEE APPENDIX FOR DETAILS)

Table 1: Percentages of first marriages ending in divorce, widowhood, and both by years since first marriage for women aged 15-49: Average schedule for 6 African countries, 1977-79

Years since first marriage	0-4	5-9	10-14	15-19	20-24	25-29	30+
Divorce Schedule	7.4	13.9	16.7	17.1	18.0	18.3	19.5
Widowhood Schedule	0.8	2.1	4.6	8.0	11.5	15.0	21.0
Divorce and Widowhood	8.2	16.0	21.3	25.1	29.5	33.3	40.5

Source: Lesthaeghe (1984)

Table 2, Percentage of all women currently widowed or divorced and mean percentage of time since first marriage spent in sexual union by ever-married women by age: Average schedule for 6 African countries, 1977-79

Age	15-19 ^a	20-24	25-29	30-34	35-39	40-44	45-49
Schedule percent currently divorced or widowed	2.4	5.1	5.6	7.7	10.3	13.9	
Percent time spent in sexual unions	96.8	95.6	95.2	94.2	93.7	92.7	91.4

a <20 for percent time spent in sexual unions.

Source: Iesthaeghe (1984)

Table 3. Model estimates of levels of contraceptive prevalence required to obtain different reductions in marital fertility by the year 2000 for two durations of the nonsusceptible period.

<u>Percent reduction in marital fertility by the year 2000</u>	<u>Required contraceptive prevalence in 2000 (Percent)</u>	
	<u>NSP* = 16 months</u>	<u>NSP* = 8.5 months</u>
0	5	29
10	15	37
20	26	45
30	36	53

*NSP = duration of postpartum nonsusceptible period