Fertility and its Proximate Determinants in sub-Saharan Africa : The Record of the 1960's & 70's

R. LESTHAEGHE
VRIJE UNIVERSITEIT BRUSSEL

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FERTILITY AND ITS PROXIMATE DETERMINANTS IN SUB-SAHARAN AFRICA: THE RECORD OF THE 1960'S AND 70'S

R. LESTHAEGHE

1. Introduction

This paper essentially provides a summary of the main tendencies with respect to fertility and its components found in selected African regions during the last two decades(1). Obviously, one cannot give an adequate interpretation of the current situation without drawing information from earlier sources, and hence brief reconstructions of the historical record are added in various sections(2).

Most of the results reported here come largely from the WFS-round of fertility surveys, held between 1976 and 1980, and from small scale and local surveys that measured important proximate fertility determinants in the early and mid-1970's. Information on fertility levels, marital status characteristics and subfecundity or sterility is available from the mid-1950's onward through the analysis of age distribution and patterns of recent versus life time fertility, gathered in the first African censuses and colonial fertility surveys.

Another advantage of the more recent surveys is that they gathered information on the socio-economic background variables as well, so that not only fertility itself can be studied by education of husband or wife, ethnic group, urban versus rural residence etc., but also all other intermediate fertility variables such as length of breast-feeding and lactational amenorrhoea, postpartum abstinence, use of contraception by method. The study of differentials with respect to the latter set of variables proves to be crucial : not only are they the props of the traditional African child-spacing pattern, but they are also reacting to forces of social, economic and cultural change with highly different elasticities. In this process, older props of more traditional fertility patterns may erode away (e.g. postpartum abstinence) while new methods to achieve spacing (i.e. contraception) are not yet capable of stemming the fertility increasing impulse produced by the decline of the traditional spacing methods. As a consequence, differentials with respect to both levels and trends in fertility, cannot be explained properly unless levels and trends in the proximate determinants are analysed and weighed up against each other.

Sub-Saharan Africa is by all criteria a highly heterogeneous continent, and so, more than one regime of marriage and fertility exists. This implies that the paper will not only devote attention to differences between individuals in the same socio-economic or cultural setting, but that aggregate patterns for regions or ethnic groups will be compared as well. An additional underlying motivation for both individual-level and aggregate-level analysis is that along individual rationality and motivation, there also exists a societal or institutional rationality in patterns of family formation, procreation and family dissolution. These societal patterns have of course deep ethnic and historical roots, but they

can also be altered or, more surprisingly at first sight, being reinforced by current conditions. The link between high polygyny levels in the Sahelian zone and labour outmigration of younger males will be presented as an example of such an interaction.

Alongside the individual-aggregate distinction runs the difference between "supply" and "demand"-side variables in fertility. On the supply side we shall analyse patterns of formation and dissolution of sexual unions affecting fertility through overall exposure time, patterns of non-marital fertility among currently single, widowed or divorced women, and the ingredients of natural fertility (i.e. fertility unchecked by parity-dependent forms of behaviour), such as sterility or subfecundity, lactational amenorrhoea and postpartum abstinence. On the demand side we shall introduce preference patterns for additional children and current contraceptive use. Both the supply and demand type variables can further be integrated in a more general picture through the Bongaarts' summary indices. All of that can be done on a national level, by ethnic group and by level of female education, especially in countries that participated in the W.F.S.-round. On the whole, there will be more information for West Africa than for the rest of the continent, but the W.F.S.-surveys in Sudan, Kenya and Lesotho can redress the balance to a considerable extent.

2. Overall fertility trends and regional differences

Before considering trends, it may be useful to return to the fertility map of sub-Saharan Africa as it was constructed from early censuses and surveys and published in the Princeton volume of 1968 (Brass et.al.) and amended by Page and Coale (1972). The map shows total fertility rates (TFR), mostly estimated from age structure information and

population growth (i.e. stable and quasi-stable population estimates), but use was also made of the confrontation between life time fertility (i.e. children ever born, average parity) and recent fertility (e.g. births in the last 12 months) using the Brass-technique. It should be emphasized that the TFR-estimates are very uneven in quality : the Kenyan estimates are probably far less subject to error than those for Nigeria, Sudan or the then Portuguese territories. The map is also constructed for fairly large populations or areas, meaning that the TFR's can be mere averages between levels of two or more rather different sub-populations.

Despite these pitfalls, these early estimates of overall fertility levels reveal that sub-Saharan Africa is a mosaic with an impressive range : in many areas of Central Africa, TFR's of less than 4 live births are found, whereas certain areas in Western and Eastern Africa exhibit levels of twice as much. The map itself is reproduced in Figure I, using four shadings instead of the original eleven.

Figure I about here

The existence of a zone of very low fertility (4 live births),stretching from Gabon through Cameroon, the Central African Republic, South-West Sudan, North-West Zaire and Congo (Brazzaville), confirmed the finding of earlier reports pointing in the direction of a high incidence of childlessness, primarily caused by venerial disease. Other zones of low fertility associated with the same problem are found along the Coast of the Indian Ocean, in parts of Uganda and of the Sahel. Childlessness levels are, however, generally lower than in the Central African region, where levels of childlessness are reached between 30 and 50 percent for women with long enough exposure to have at least 3 children. The regression equation produced by Frank (1983) for 146 sub-populations in

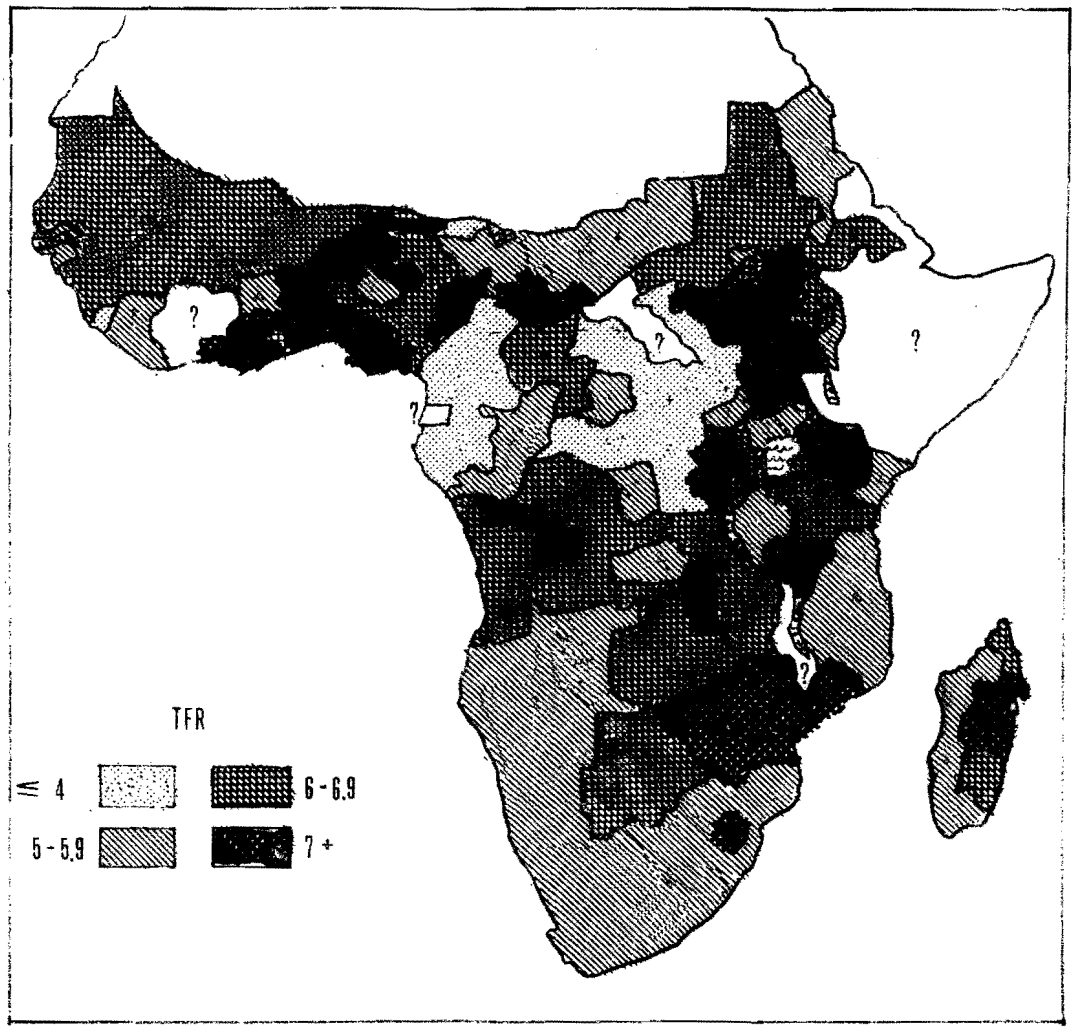


Figure I : Total Fertility Rates in Regions of sub-Saharan Africa; Data from Sources prior to 1967 (source : mainly from H. Page and A.J. Coale, 1972).

18 countries shows that to every 10 percentage point increase in definitive childlessness corresponds a drop in the TFR of 1 live birth. The issue of childlessness and subfecundity will be taken up in greater detail.

Another striking feature of the early map is the existence of a high fertility ridge in Eastern Africa, originating in the Southern half of Sudan and moving South via a Western branch (Kivu in Zaire, Malawi) and an Eastern branch (Lake Victoria Basin in Kenya, Southern Tanzania) to Zimbabwe. At that time there was no explanation for this ridge, but shortened periods of postpartum abstinence in East Africa may account, at least partially, for it. A second zone of high fertility also exists : it is located in West Africa along the Atlantic forest belt, from the Cameroon coast to the Ivory Coast. Here the explanation based on shortened lactational amenorrhoea or faster resumption of sexual intercourse after a birth does not hold; if anything, several of these populations are reknown for their long abstinence and breast-feeding patterns (e.g. the Yoruba of South-West Nigeria). Low sterility is more likely to be a contributor.

Information on fertility levels after the 1955-65 stems from a second round of censuses, from some national demographic surveys (e.g. Kenya, Tanzania), but essentially from the W.F.S. The geographic coverage of this material is, however, far from complete and the quality, although better in the W.F.S.-set, is still uneven. At one extreme, Kenya has had a steady succession of censuses, interspersed with surveys of relatively high quality, which allows for a fairly accurate reconstruction of the fertility history by province and even by district till as recent as 1979. Other countries have not been able to build up a tradition of this kind for a variety of reasons, and the original estimates of the Princeton-group are all we have. As a result, many blanks remain when it comes to studying

trends.

For 7 countries (or major parts thereof) we have been able to locate estimates of the TFR for two points in time. For another 9 countries, such information is also available but then restricted to a national level or to just a single region. On the basis of these, a summary table was produced (Table I), showing countries and regions which have experienced an apparent increase in the TFR.

Table I about here

In many instances, however, the estimates involved are not based on identical estimation techniques(3). Nor is the raw material of comparable quality. As a result, an apparent rise can easily be attributed to an improvement of data quality. In setting up Table I we have considered a change of the TFR of less than 0.5 live births in either direction as essentially no change; a change of 0.5 to 0.9 births as the possibility of a real increase, and an increment of 1 live birth or more is accepted as more trustworthy evidence of a genuine increase. Judged by these, admittedly rough rules of thumb, no decline occurred in any of the 57 cases spread over 16 countries. The only instance where the more recent TFR-estimate was below the earlier one is Swaziland, but the order of magnitude is not yet convincing. In 33 other regions an increase of equally unconvincing magnitude was found and in 12 others a slight to moderate increase occurred involving the national level of Senegal and the overall level of West Zaire. In the remaining 11 instances an increment of at least 1 live birth was found. The location in time of the take-off of this upward trend is a speculative issue hinging again on differential data quality.

Table I : Regions for which a Fertility Increase is suspected

Country	Dates	No. of Regions	Regions with increase of TFR by :	
			i) 0.5 - 0.9	ii) 1.0 or more
Senegal	60-78	1	Senegal	-
Gambia	63-73	1	-	Gambia
N. Sudan	55-79	4	Darfur	-
Mali	57-80	1	Inland Niger Delta	-
Ghana	60-79	8	Northern & Upper, Volta	-
Cameroon	60-78	4	North	South East (Littoral, Central South, East)
Congo	60-74	1	-	-
W. ZAire	55-75	10	Cataractes Kwilu Kinshasa W. Zaire	Bas Zaire Mai-Ndombe Equateur Tshuapa
Burundi	52-71	1	-	-
Rwanda	52-78	1	-	Rwanda
Kenya	62-78	8	Coast	Central Province Eastern Rift Kenya
Tanzania	57-73	9	Tanga	-
Botswana	64-71	1	-	-
Mozambique	50-70	1	-	-
Swaziland	66-76	5	-	-
Lesotho	66-78	1	-	-
Total		57	12	11

The instances of a clear fertility increase include the national levels for Kenya, Rwanda and Gambia. In Kenya, the presumed magnitude is 1.5 live births, which sets the TFR at a maximum for African national levels. Equally noteworthy is that the two areas in Zaire, reknown for high childlessness (i.e. Equateur and Tshuapa) have had an increase of the TMFR of 2 live births between 1955-57 and 1976 accompanying a reduction in sterility among younger women (Tabutin et.al., 1981).

Obviously, this short review of trends is fraught with problems of measurement and interpretation, but it can safely be assumed that the trend is essentially horizontal with a good possibility of an increase in major areas, corresponding to improved health conditions or some progress in economic and social development; an initial fertility increase is not a mysterious riddle, as will be shown in the next sections(4).

3. The props of African reproductin systems

Any demographic regime has a number of control mechanisms that insure it against negative growth via high mortality, but that also reduce fertility levels well below its biological capacity, averaging 13 or more live births per woman. If such fertility levels are combined with life expectancies at birth of a mere 30 years, population growth rates of 4 percent or more would pevail. Hence, such controls on the biological capacity to reproduce constitute "preventive checks" in the true sense of Malthus' terminology. These checks can, however, be located at a number of control points, depending on whether they operate via the starting pattern of reproduction (affecting age at entry into a sexual union), the spacing pattern (producing large gaps between successive births) or the stopping pattern

(early ending of child-bearing due to non-remarriage of widows, permanent abstinence associated with grand-maternal status etc.). At this point, very major differences between societies emerge, mostly in function of their pattern of social organization (see for instance Lesthaeghe, 1980). The nature of the control and its impact on fertility can again best be appreciated through the measurement of the various proximate determinants.

Of direct relevance for sub-Saharan Africa are the following:

i) The overall length of the exposure period is often less than the 35 year span from menarche to menopause, and obviously largely conditioned by age at first union. There are, however, substantial variatins in the latter variable. It is also conditioned by the incidence of union disruption and the chances of remarriage. Union disruptions are by no means restricted to widowhood alone, but in many regions divorce, separation or desertion are of major importance. All of these patterns are connected with polygyny, which itself is an expression of a particular type of social organization involving lineages and male gerontocracies.

ii) Exposure to risk is not restricted to being in a regular sexual union or marriage: pre-marital fertility before age 25 among single women and non-marital fertility after age 25 among widows and divorcees can be of major importance. The non-married, which form a minority in the age bracket between 15 and 50, can be responsible for a substantial share of the total annual number of births.

iii) The sterility or subfecundity factor is also connected to the organizational pattern of some African systems of reproduction and

marriage, particularly through its links with polygyny.

iv) Child-spacing through lactational amenorrhoea and the postpartum taboo on sexual intercourse constitutes a major prop of the preventive checks. Through their health-related functions, these two phenomena can be interpreted as expressions of a cultural adaptation to an environment fraught with nutritional and health hazards; and through its social function, postpartum abstinence proves to be an essential element in the maintenance of a particular pattern of social organization.

v) Early stopping with child-bearing (for other reasons than primary or secondary sterility), finally, is traditionally no expression of having reached the desired size, but again an element that is part of the societal arrangement around "preventive checks".

Each of these factors on the supply side of fertility will now be discussed in greater detail.

4. The functions and patterns of child-spacing

The central feature of reproduction in sub-Saharan Africa has been its reliance on a pattern of child-spacing operating through prolonged breast-feeding, or more accurately, through prolonged lactational amenorrhoea in combination with postpartum abstinence. As J.C. Caldwell put it once, somewhat methaphorically, the historical Western European long celibacy period has been cut up in segments and these were inserted between two successive births in Africa. In studying the Yoruba of South-West

Nigeria, Caldwell & Caldwell (1977) showed that the metaphore corresponded to reality and that the sum of the postpartum abstinence periods weighted by natural fertility avoided at the various ages, came to much the same as the celibacy period weighted by natural fertility in the Western European countries of the 18th and 19th centuries. They thereby confirmed what other Nigerian demographers had argued (P.O. Olusanya, 1969, P. Ohadike, 1968).

The health function of prolonged breast-feeding and postpartum abstinence is easily appreciated : in environments which tend to produce protein-deficient diets, breast-milk constitutes an essential ingredient, not only for the very young infant, but also in the diet of children beyond 5 or 6 months. Continued lactation also implies that the woman remains in good health. Hence, when menstruation is braking through despite breast-feeding, and this occurs in the majority of cases where breast-feeding is prolonged beyond 6 months, the mother has to be protected against a new pregnancy and the already born child against precipitated weaning. As a consequence, the postpartum abstinence practice, ideally lasting for as long as the child is not completely weaned, upheld both maternal and child health.

Characteristic of the African setting is, however, also the observation that populations with more ready access to vegetable or animal protein equally engaged in abstaining postpartum. This brings out the importance of the second function : the separation of spouses for a period that was traditionally at least a year maintains the large psychological and social distance between spouses and strengthens the dominance of kinship control. Violations of the taboo produced economic transactions, often in favour of the woman's kinship group, and religious rites to

appease the ancestors. All of this hints at the fact that more was at stake than the mere health of two individuals.

The geography of the postpartum taboo is also of interest, as we had indicated earlier. In accordance with the "nutrition-theory" senso stricto, it was postulated that the practice was closely linked with protein deficiency of diets as is typical for forest populations relying heavily on tuber (yams, cassava) cultivation, and ought therefore to be found along the Atlantic Coast in West Africa and in much of Central Africa (Whiting, 1964). A scanning of earlier anthropological literature (Saucier, 1972; Schoenmaeckers et.al., 1980) and a survey among East African anthropologists who obviously had established contacts with village elders (Molnos, 1973) showed that the practice was far more widespread, and was probably once a universal trait for the entire sub-Saharan triangle. What seemed to have occurred, however, was an erosion process, admittedly starting from heterogeneous levels, but progressing at a highly varied pace depending on region.

The maps by Schoenmaeckers et.al. drawn up for about 140 ethnic groups, relying on such anthropological information, are reproduced here (Figure II). The dates of the references used are heterogeneous and some go back to the beginning of this century, but on the whole the maps capture the process about mid-way (most references are for the 1950's and 1960's). The durations of postpartum abstinence are classified in three categories: no abstinence or abstinence of 40 days as Coranically prescribed, a short taboo for more than 40 days but less than a year, and a long taboo for one year or more (see panels A, B and C in Figure II). The picture is quite clear:

Figure II about here

i) Western and Central African populations are overwhelmingly located in the long taboo category, the major exceptions being Sahelian groups (where, however, a mixture exists ranging from 40 days to over 2 years) and the Akan groups in Ghana;

ii) Populations of the Lacustrine zone (including those on the West bank of Lake Tanganyika and Lake Albert), of Eastern and Southern Africa are distributed over all three categories. Here, the date of reference was directly associated with the stated duration (Schoenmaeckers et.al., table III), while many of the references gathered by Molnos in the late 1960's stated that the taboo used to be observed by older women.

The regional differences described by these anthropological references were largely confirmed by the surveys of the post-1975 period, as can be seen in the Basic Indicator File (BIF) given in the Appendix(5). The only major surprise was the W.F.S.-finding in Lesotho: where a short period was expected, a long abstinence pattern of 16-18 months was discovered. But, as there is an excess of 70 percent of females aged 15-49 to males in that age bracket due to the vast labour export to the RSA, much of that abstinence measures absence of husbands.

The causes of differential erosion of the postpartum taboo can be traced to a variety of factors. None of these provide, however, a sufficient or a necessary condition. It is for instance true that the period of abstinence has been reduced to the prescribed 40 day minimum

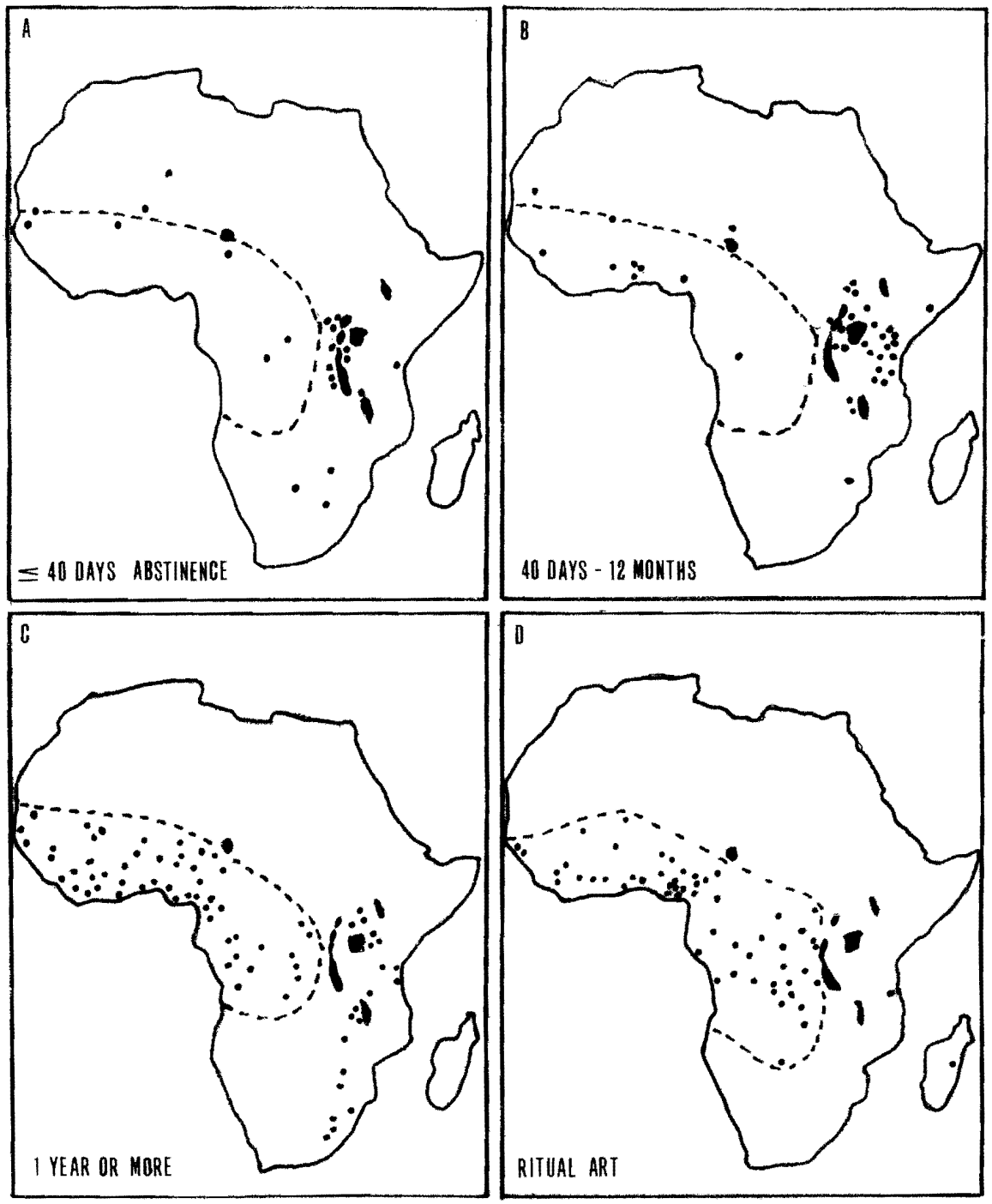


Figure II : Location of Ethnic Groups According to the Duration of Postpartum Abstinence as stated by Anthropological References; Comparison with Production of Ritual Art (source : R. Schoenmaeckers et al, 1980)

among many islamicized ethnic groups, but the record from Mali to Sudan shows that many other groups have maintained a longer taboo. Muslims of Northern Ghana for instance have very long taboos of about 2 years (but this is again facilitated by a skewed sex ratio and male outmigration), while Muslim women in ethnic groups which are half islamicized, half Christianized invariably display the longer abstinence (partly in function of low educational levels).

The effect of Christianity also goes in the same direction: the separation of spouses did not fit the Western notions of a nuclear family with strong conjugal bonds (see for instance the excerpts of the reports of Rijckmans Commission for the Belgian Congo in 1930, quoted in Schoenmaeckers et.al., 1980). But again, the Christianity factor falls considerably short in providing an adequate explanation. For one, it cannot explain the large difference between Christians in West and in East Africa respectively.

Climatic and nutrition factors, brought to prominence by Whiting, explain to some extent differences between farmers and cattle-keepers in Rwanda, Burundi, Kenya or the Sahel, but it also predicted a forest-savannah contrast which isn't there.

A more promising track leads not to a single corroding factor but to a resistance factor. Societies with a strongly ritualized culture, reflected for instance in a rich heritage of ritual art (masks, fetishes as opposed to weaponry, ornaments, jewelry) are almost exclusively confined to the area located to the West of the semi-circular line pictured in the 4 maps of Figure II. Any anthology on African ritual art would produce a map similar to the one given in panel D of Figure II. The coincidence is

probably not fortuitous: the production of ritual art and the taboo on intercourse have similar social functions, namely the maintenance of a high degree of social integration around a particular pattern of social structure.

Yet, the story is far from complete : even in areas where the long taboo prevailed, large differentials are currently found between rural and urban and above all between educational groups(6). We shall obviously document these points in a later section, but the feature clearly indicates that a high level of social integration via a cohesive cultural code may have produced a substantial lag for Western Africa, but also that this historical factor is not capable of stemming the strong downward trend. At the current pace, it may well be that abstinence durations beyond 12 months will disappear in much of the region during the 1980's.

The story of the postpartum abstinence period provides only a partial view of the current changes in child-spacing. Lactational amenorrhoea is involved as well. Before turning to variations in the latter, we shall first study their respective contribution to the overall postpartum non-susceptible period. After all, it is the length of this period that matters.

The postpartum non-susceptible period is defined for individuals as whichever is longer, lactational amenorrhoea or abstinence. The mean length of the non-susceptible period is, however, not equal to the mean duration of abstinence nor to the mean of amenorrhoea. The reason for this is that, given short abstinence, there are always individuals for whom abstinence still lasts longer than amenorrhoea. Conversely, given short amenorrhoea, there are always individuals with longer amenorrhoea than abstinence.

The value for the mean duration of the non-susceptible period can easily be obtained if the data for individuals on the components are available on tape, but for other populations with separate averages, use can be made of the relationship exhibited in Figure III.

The amount by which the mean of amenorrhoea ($\bar{X}$Amen) is an underestimate of the mean of the non-susceptible period ($\bar{X}$Nsp) is a function of the difference between $\bar{X}$Abst and $\bar{X}$Amen. If abstinence is shorter than amenorrhoea, only a small amount (LE 2.7 months) has to be added to $\bar{X}$Amen; if abstinence exceeds amenorrhoea, the amount will substantially grow. The data for Lesotho, Ghana, Kenya and Kinshasa in Figure III were obtained by the creation of the non-susceptible period for individuals, while those for Cameroon and Sudan were obtained through a more involved procedure(7). The latter are added in for comparison only.

Figure III about here

One of the implications of the decline in abstinence is that the mean length of amenorrhoea will become the larger of the two, meaning that the net abstinence-effect, even if $\bar{X}$Abst. GT 10 months, will rapidly shrink. The juxtapposition of the two means is therefore of major importance.

The most recent data on postpartum abstinence and lactational amenorrhoea pertain to the period 1976-80 and the two means are plotted against each other in Figure IV for 44 regions in 8 countries. The information in the Figure can be read as follows:

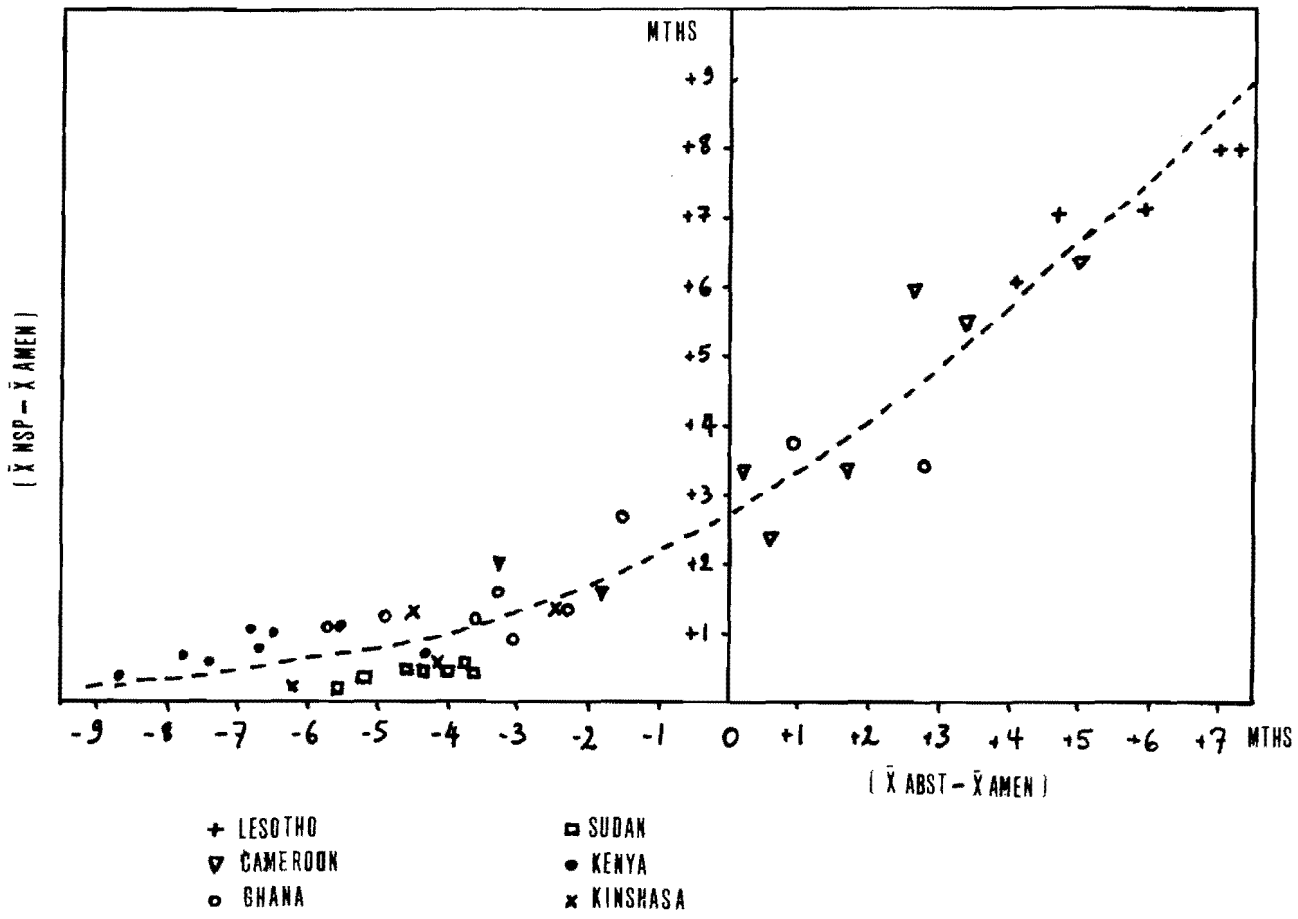


Figure III : Estimation of the Amount by which the Mean Length of Postpartum Non-susceptibility exceeds the Mean Length of Lactational Amenorrhoea on the Basis of the Difference between the Means of Postpartum Abstinence and Lactational Amenorrhoea.

Figure IV about here

i) Below the diagonal (A) the length of the taboo is still in excess of that of amenorrhoea and the populations benefit from a net-abstinence effect that grows with the distance to the diagonal.

ii) Striking contrasts emerge when comparing the various clusters. Kenya and Lesotho have similar durations of lactational amenorrhoea but the non-susceptible period is 6-7 months longer in the Lesotho cluster on account of abstinence. In Senegal, amenorrhoea is about 4 months longer than in Lesotho, but in terms of the non-susceptible period Lesotho is the winner by a few months. In fact, Senegal and Lesotho use essentially contrasting strategies to arrive at similar results with respect to child-spacing.

iii) Very large contrasts are found within a single country: three regions in Ghana (Northern, Upper, Volta) have a marked spacing pattern through long amenorrhoea and an abstinence bonus, while three other regions (Greater Accra, Western and Central) nearly have an East-African pattern, with amenorrhoea already below a year and no abstinence bonus. Important, but less exaggerated contrasts are also provided by the Cameroon areas.

iv) Finally, the plot is not centered around the diagonal but around a line (B) with a smaller slope: at present there is much more variation in the postpartum abstinence durations than in the amenorrhoea ones. For the time being lactational amenorrhoea provides more and more the only safety net to uphold a part of the child-spacing tradition. And as we shall see later on, this net is being lowered as well.

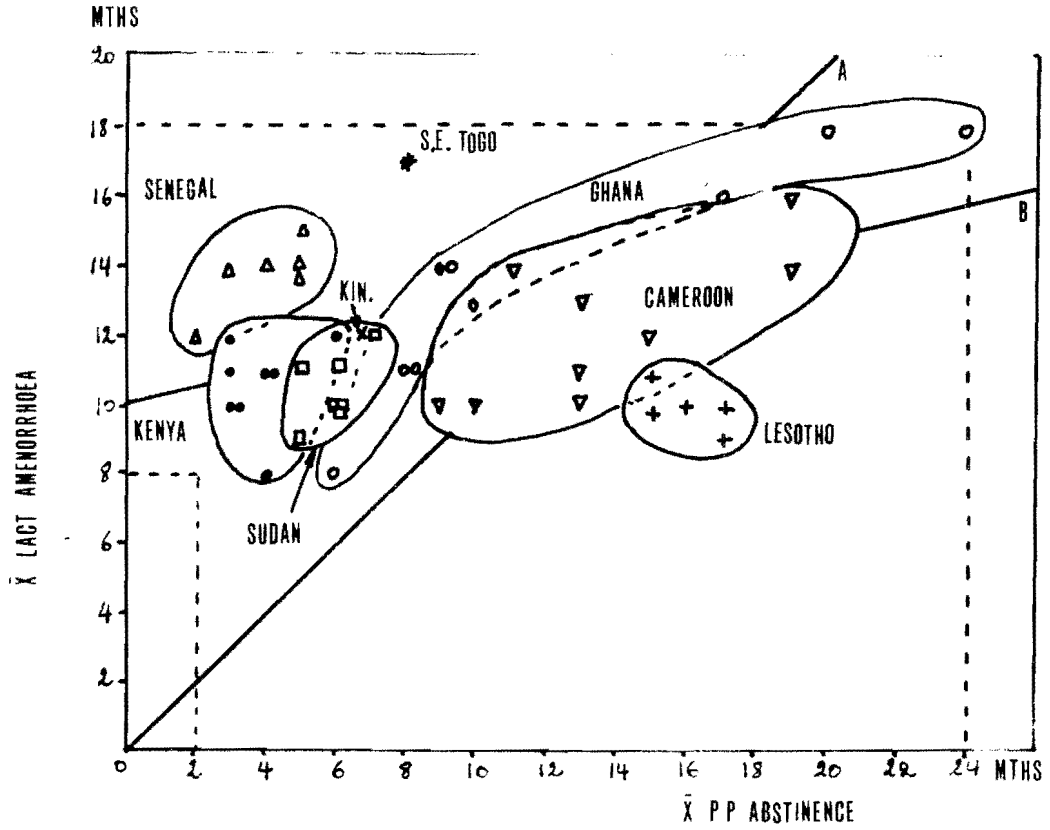


Figure IV : Patterns of Child-spacing produced by Reliance on Lactational Amenorrhoea versus Postpartum Abstinence; Data from Recent Surveys, 1974-79.

5. Formation and Dissolution of Sexual Unions and the Overall Exposure Period

The second cluster governing the supply side deals with variables that are equally interwoven with the African kinship organizations. It comprises the overall length of the reproductive period through starting and stopping patterns and takes account of exposure time lost due to the dissolution of sexual unions in between. In contrast to the spacing pattern which acts as a preventive check, the marriage-cluster is designed as a support for high fertility. This does not imply that procreation starts at menarche and that no years are lost subsequently.

The set of features characteristic for this cluster - many of which were already outlined by van de Walle (1968) in a classic article - can be summarized as follows:

i) Marriage is virtually universal for women, definitive celibacy is less than 3 percent.

ii) The age at entry, whether measured through age at first marriage or age at first conception varies much more widely, with mean ages ranging from less than 15 to more than 22 years.

iii) Dissolution of sexual unions is a frequent event. With marked age differences between husbands and wives, ranging from 4 to 11 years on <u>average</u> for populations of major regions, and life expectancies commonly below 55, widowhood is frequent after age 30. Moreover, divorce, separation and desertion often affect larger numbers of women than widowhood, and they affect them also much earlier.

Regional differences are again very substantial.

iv) Despite a high incidence of union disruptions, the prevalence of widows or divorced women at any given time is rather low: remarriage corrects for union instability. Regional differences are again of major importance.

v) Fertility among the non-married contributes commonly 5 to 10 percent to the total annual number of births.

vi) Polygyny remains present - and sometimes very prominently so - in most of sub-Saharan Africa. It affects from 10 to 50 percent of all currently married women in the age bracket from 15 to 50.

vii) Polygyny has more than a single effect on fertility, some of which tend to lower it, some others tend to increase it. We shall devote a special section to the polygyny phenomenon.

viii) Factors other than union dissolutions or sterility leading to the end of child-bearing exist. For instance, exposure to risk may be substantially reduced within marriage when women reach grand-maternal status. This factor is of importance in certain cultures which have early ages at marriage and where grand-mothers are young (from 33 onward), but we still know very little about the incidence of the rules.

ix) Male outmigration or seasonal migration produces a loss of exposure time, but some of its effect can be neutralized by a high incidence of polygyny.

x) On the male side, finally, age at marriage is much higher and also noticeable proportions single beyond age 30 exist. Again labour migration and polygyny enter the picture here.

The most important of these items will now be taken up in greater detail.

5.1. Entry into a Sexual Union

Age at entry can be measured through classic marital status data on proportions single or ever-married by age or from retrospective questions on age at marriage or first birth (pregnancy)(8). Mean ages at first birth are usually less than 9 months larger than mean ages at marriage in Africa, pointing at the existence of pre-marital fertility, but in the context of patterns of age at entry, the difference hardly matters: regional, ethnic, educational differentials are much larger.

We shall restrict ourselves here to two simple measures of nuptiality:

i) the proportion of single women aged 15-19;
ii) the median age at marriage from retrospectively reported age at first marriage by cohort.

The proportion single 15-19 is readily available from censuses or household surveys and it has the advantage of capturing the behaviour of the most recent cohorts of women(9). As one is, however, more used of thinking in terms of ages at marriage instead of in percentages single, we have also converted the percentage single 15-19 into an estimate of the singulate age at marriage (SMAM), using an empirical relationship between the two

measures in 101 sub-Saharan sub-populations.

The geographical pattern of nuptiality can be studied in Figure V for 23 countries and numerous subregions (failing that, ethnic groups are used). The vast majority of data sources pertain to the 1970's. A classification of the populations has been made into 4 groups:

i) early marriage pattern (percent single 15-19 LT 30; SMAM LT 16.7 yrs)
ii) medium-low percentage single (30-49.9; SMAM from 16.7 to 17.9)
iii) medium-high percentage single (50-69.9; SMAM from 18.0 to 19.6)
iv) late marriage pattern (percent single 15-19=70+; SMAM=19.7+)

Figure V about here

A number of observations can be made on the basis of the 4 maps of Figure V:

i) Early marriage and percentages single below 30 are exclusively found among populations of the Western Sahel, from Senegal to Chad. The marriage pattern in the Eastern Sahel, equally a Muslim area, falls in the opposite category (Northern Sudan, Somalia region of Banadir, Bay and Shebelle);

ii) West African populations are again well represented in the next category with medium-low percentages single (national levels for Togo, Benin, Upper Volta, Senegal);

iii) The two maps with percentages single of 50+ and SMAM of 18+ contain the Central, Eastern and Southern African populations. Western

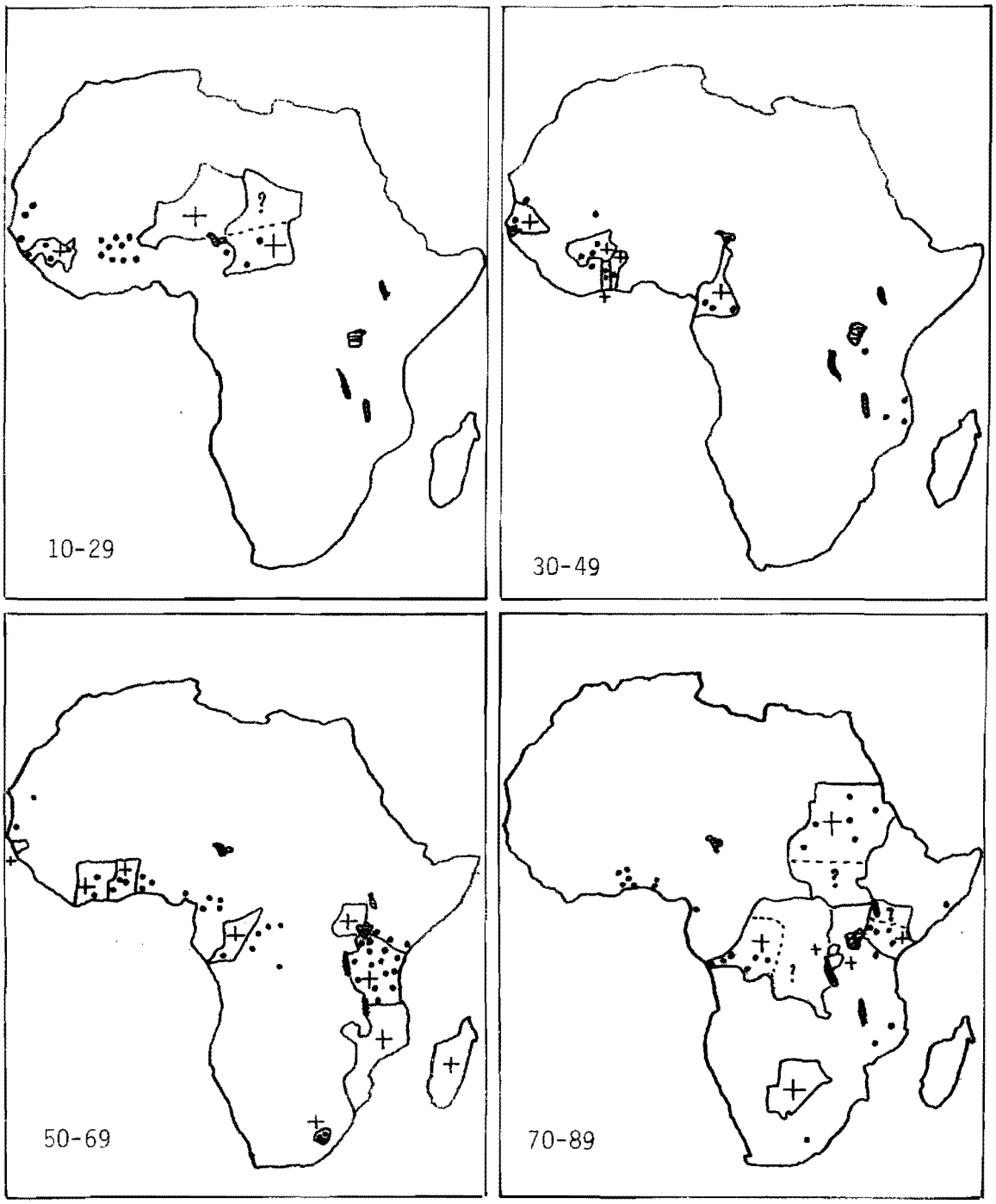


Figure V : Regional Patterns of Percentage Single among Women 15-19
Note : National levels are indicated by (+), regional levels by (.)

populations in these categories are located south of the Sahel and form a semi-circular band along the Benin Gulf.

iv) High ages at marriage are almost exclusively found in Central, Eastern and Southern Africa. Populations with 80 percent single or more, implying SMAM-values of 21 years or higher, are found in Rwanda, Burundi, the regions adjacent to Khartoum (Nile, Gezira) in Sudan, the Central Highlands of Kenya, Kilimanjaro district of Tanzania and among Kikongo-speakers in West Zaire. Apart from the Sudan, where late marriage is a recent development, all other areas just mentioned have population densities or schooling levels for women that are well above the national averages.

v) Mean ages at marriage around 20 in West Africa are confined to urban areas (Accra, Lagos, Ibadan, Douala for instance) or to adjacent areas with high schooling levels.

It should, however, be pointed out that there are many blanks on the map corresponding to regions without recent information (e.g. Ethiopia, Zambia, Malawi, Zimbabwe, Angola...), so that the pattern described above is only provisional. Yet, the geography of early marriage shows that two major sets of factors are at work: a set of traditional factors that form an older substratum for regional and ethnic differentiation, and a set linked with socio-economic aspects of modernization. There is possibly a third factor at work within countries, namely high population density and pressure on agricultural land associated with it, but this should be considered as a tentative hypothesis only, since many of these areas are also the ones with more advanced levels of economic development.

Changes over time can only be studied for a subset of the populations considered above, because of a lack of comparable data. In the first instance, one can compare proportions single in the age groups 15-19 or 20-24, and in the second, quartiles from cumulative distributions of ages at marriage stated by ever-married women can be used. Material of the first kind is given for 3 Kenyan censuses in Table II and for more or less comparable sources for Western Zaire, Rwanda, Burundi and Ghana. In Kenya a noticeable increase in the proportions single below age 30 has taken place in the period 1962-79, pushing up the singulate mean age at marriage from 18.6 to 20.3 years. In Western Zaire, an increase has also occurred between 1956 and 1976, but the change is less than half the Kenyan shift. In Ghana and Burundi, no apparent increase in age at marriage has occurred, but in Rwanda proportions single rose to the level of those in Burundi despite a very late marriage pattern to start with.

Table II about here

Data of the second type are available for Tanzania and the countries participating in the W.F.S.-round. They are presented in Table III. The first quartile, indicating the age by which the first 25 percent of the female population is already married in each cohort, shows a small increase in Ghana, a larger one in Kenya and a major upward shift in Northern Sudan. For the latter two countries this is also reflected in a corresponding increase in the median age at marriage for the age group 20-24, whereas in all other countries listed, hardly any change had occurred. Finally, the age at which only 25 percent still remain single (third quartile) does not show any sign of alteration, except maybe in the Sudan, if we accept that older cohorts have overestimated their age at marriage, a feature which is very likely and occurs readily by massive

Table II : Proportions single by Age and Singulate Mean Age at Marriage for Female Populations in Countries with Data for at least two Periods

	Kenya			Western Zaire	
	Census of 62	Census of 69	Census of 79	Survey of 55-57	Survey of 75-77
15 - 19	.57	.64	.72	.64	.75
20 - 24	.13	.19	.25	.15	.20
25 - 29	.05	.07	.09	.05	.04
30 - 34	.03	.04	.05	.02	.02
35 - 39	.02	.03	.03	.01	.01
40 - 44	.02	} .03	.03	.01	.01
45 - 49	.02		.02	.01	.01
SMAM	18.6 yrs	19.2 yrs	20.3 yrs	19.2 yrs	19.9 yrs

	Ghana		Burundi		Rwanda	
	Survey 71	Survey 79(WFS)	Survey 60	Survey 70-71	Survey 70	Census 78
15 - 19	.68	.69	.82	.88	.82	.85
20 - 24	.16	.15	.36	.34	.18	.30
25 - 29	.05	.03	.15	.07	.02	.07
30 - 34	.01	.01	.07	.03	.00	.01
35 - 39	.01	.01	.03	.02	.00	.01
40 - 44	.01	.01	.02	.02	.00	.01
45 - 49	.00	.00	.01	.01	.00	.01
SMAM	19.6	19.5	21.9	21.7	20.1	21.0

Sources : Kenya : K. Hill et al (1981); Zaire : Tabutin et al (1978); Ghana : GFS-First Country Report (1982); Burundi : van de Walle (1968) and Enquête Démographique 70-71; Rwanda : Enquête Démographique 70 and first census report (1982).

rounding to age 20.

Table III about here

The impression from these data is that a transition to later marriage during the 1970's has been rather restricted, with Kenya and especially Sudan (Northern half) being documented exceptions. Of course, this conclusion may be altered as soon as more W.F.S.-data become available (Ivory Coast, Benin, Mauritania and especially Nigeria) and as the census materials for the period 78-81 are published.

5.2. Marriage Instability

Marriage instability in sub-Saharan Africa is a force to be reckoned with. As already stated, widowhood is frequent when the combination of high mortality and of substantial age differences between spouses exists. The true incidence of widowhood cannot be ascertained from proportions currently widowed since such figures capture more the occurrence of remarriage than that of widowhood itself. The same holds for divorce.

Retrospective questions about the survival of the first marriage are available for the W.F.S.-countries by time since first marriage. The timing patterns of each of these events follows a typical pattern across countries and regions, so that a standard can be extracted. This standard, simply the average for 6 African W.F.S.-countries, is given in Table IV. The final intensity of first divorce in this standard is nearly 20 percent and that of first widowhood is just over 20 percent for women below age 50 (and marrying before age 20 in order to reach durations of 30 or more years

Table III : Quartiles of Age at First Marriage by Cohort in 7 African Countries, 1973 through 1979.

Cohort aged :	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1st Quartile (25%)							
Senegal 1978	14.9	14.8	14.7	14.4	14.6	14.5	15.1
Cameroon 1978	15.4	(15.1)		(14.9)		(15.2)	
Kenya 1977-78	16.4	(14.9)		(14.7)		(15.0)	
Ghana 1979	16.5	(15.4)		(15.0)		(15.3)	
Sudan 1979	17.9	14.9	14.3	13.9	13.9	13.4	14.3
Lesotho 1977	17.2	17.0	17.0	16.9	17.2	16.7	16.7
Median (50%)							
Senegal 1979	16.6	16.7	16.3	15.6	15.6	15.6	16.1
Cameroon 1978	17.1	17.1	17.0	16.6	17.4	17.1	18.3
Kenya 1977-78	-	18.7	17.5	17.1	18.1	17.2	17.8
Ghana 1979	-	17.7	17.8	17.5	17.4	17.7	17.8
Sudan 1979	-	18.6	17.0	15.7	16.2	15.9	16.2
Tanzania 1973	-	17.6	17.5	16.9	17.2	17.2	-
Lesotho 1977	-	17.7	18.2	17.9	18.2	18.2	17.8
3rd Quartile (35%)							
Senegal 1979	-	19.7	19.2	18.2	17.4	17.8	18.2
Cameroon 1978	-	(19.4)		(19.8)		(21.2)	
Kenya 1977-78	-	(19.7)		(18.9)		(19.6)	
Ghana 1979	-	(19.7)		(19.5)		(19.8)	
Sudan 1979	-	-	20.4	19.1	19.6	19.7	20.0
Lesotho 1977	-	-	20.9	20.6	20.9	21.0	20.6

since first marriage). In the regional data set, ratio's between observed duration specific proportions ever-widowed or ever-divorced and the corresponding proportion of the standard timing schedule, were essentially stable, so that their average can be taken as a measure of intensity relative to that of the standard. The measures of intensity are given in Table V. It turns out that the 3 West-African populations (Ghana, Cameroon, Senegal) have again high values of first marriage dissolution by age 50 (45 to 53 percent). In Ghana and Senegal, more than half of this intensity is produced by divorce. In Northern Sudan, Kenya and Lesotho, the intensity of dissolution is less than that of the standard (i.e. 40 percent by age 50), and the contribution of divorce is comparable to that of widowhood in the former two. Lesotho, with low divorce figures has high widowhood, but in a country where such a substantial portion of the male population is absent, it is possible that divorce intensity is underreported and widowhood intensity overreported. Finally, given that the timing pattern of divorce is much earlier than that of widowhood (see standard schedules in Table IV), divorce tends to be the most important cause of lost exposure time to the risk of pregnancy.

Tables IV and V about here

Corrections through remarriage are equally important. The statistical procedure of establishing a standard pattern of remarriage timed by years since first marriage and calculating duration-specific ratio's could be maintained here as well. The standard schedule is given in Table VI, and the intensity ratio's are reported in Table V. Of all those experiencing a first dissolution before age 50, about 60 percent had already remarried by that age in the reference population. This figure rises to 92 percent in Senegal, but drops to a mere 17 percent in Lesotho.

Table IV : Percentages of First Marriages ending in Divorce, Widowhood and Divorce or Widowhood by Years since First Marriage for Women aged 15-49 : Average Schedule for 6 African WFS-surveys, 1977-79.

Years since First Marriage	0-4	5-9	10-14	15-19	20-24	25-29	30+	All
Divorce Schedule	7.4	13.9	16.7	17.1	18.0	18.3	19.5	12.6
Widowhood Schedule	0.8	2.1	4.6	8.0	11.5	15.0	21.0	6.5
Divorce+Widowhood Schedule	8.2	16.0	21.3	25.1	29.5	33.3	40.5	19.1

Note : 6 countries are Ghana 79, Senegal 79, Cameroon 78, Sudan 79, Kenya 77-78 and Lesotho 77.

Table V : Average Ratios of Observed Duration Specific Percentages of First Marriages ending in Divorce or Widowhood to Percentages in the Standard Schedules (Table IV); Average Ratios of Observed Duration Specific Percentages of Dissolutions leading to Remarriage to the Percentages in the Standard Schedule (Table VI); WFS-surveys 1977-79.

	Divorce		Widowhood		Dissolution		Remarriage	
	Ratio	Intensity	Ratio	Intensity	Ratio	Intensity	Ratio	Intensity
Ghana 79	1.60	31%	.64	13	1.23	50	1.25	76
Senegal 79	1.40	27	1.01	21	1.30	53	1.51	92
Cameroon 78	1.02	20	1.19	25	1.10	45	1.04	64
Sudan 79	.80	16	.84	18	.84	34	1.01	62
Kenya 77-78	.72	14	.70	15	.71	29	.90	55
Lesotho 77	.48	9	1.32	28	.79	32	.29	18
Standard	1.00	20	1.00	21	1.00	41	1.00	61

Note : The average is established for ratio's pertaining to the following duration groups : divorce ($\geqslant 5$); widowhood ($\geqslant 10$); dissolution ($\geqslant 10$); remarriage ($\geqslant 5$).
The intensities give the percentage experiencing the stated event prior to age 50 given an age at marriage below 20 years.

Also the other countries listed here follow the gradient from high remarriage in West Africa to moderate and low remarriage intensities in East and Southern Africa.

Table VI about here

The overall (or net) effect of the dissolution-remarriage sequences can be appreciated from the classic age specific proportions currently widowed or divorced. In order to allow for a succinct presentation, we have again taken the average of the same six countries as a point of reference (see Table VII). However, the age patterns themselves for proportions currently widowed + divorced cannot be reduced to a typical pattern, so that ratio's can only be calculated between the summed proportions (from 15-44)(10). This ratio has the following interpretation: assuming a horizontal age distribution in the interval 15-44, the total number of currently widowed and divorced in the observed population would be a multiple (=ratio) of the number in the reference population. Horizontality of the age distribution is, however, required because of the differences in age patterns. Despite this assumption, typical for summed rates in cross-sections, a clear picture emerges with respect to the region in Africa. This is shown in Figure VI using the following 4 categories:

Table VII and Figure VI about here

i) small proportions of currently widowed + divorded (ratio LT .60)
ii) medium low (.60-.89)
iii) medium high (.90-1.19)
iv) high proportions (1.20+)

Table VI : Percentages of Disrupted First Marriages leading to Remarriage by Years since First Marriage for Women aged 15-49 : Average Schedule for 6 African WFS-surveys 77-79

Years since First Marriage :	0-4	5-9	10-14	15-19	20-24	25-29	30+	All
Remarriage Schedule	32.0	60.6	62.3	64.8	61.2	60.1	58.1	59.4

$\bar{X} = 61.1$

Table VII : Percentage of All Women currently Widowed or Divorced by Age : Average Schedule for 6 African WFS-surveys 1977-79

Age :	15-19	20-24	25-29	30-34	35-39	40-44	
Schedule currently Wid+Div.	2.4	5.1	5.6	7.7	10.3	13.9	(Σ = 45.0)

Table VIII : Mean Percentage of Time since First Marriage spent in a Sexual Union by Ever-Married Women - Average Age Pattern for 6 WFS-surveys and Deviations in Percentage Points, 1977-79

	Current Age						
	< 20	20-24	25-29	30-34	35-39	40-44	45-49
Average Pattern :	96.8	95.6	95.2	94.2	93.7	92.7	91.4
Deviations							
- Senegal	+.1	-.9	+.3	+.5	-.3	+1.7	+3.0
- Ghana	-2.6	-2.7	-.1	-.7	+.7	+.4	+1.1
- Kenya	-1.7	-.2	+.1	+.7	+1.7	+1.5	+1.5
- Cameroon	+1.4	+1.4	-.3	+.4	-1.0	-.3	-2.9
- Lesotho	+1.4	+1.0	-.5	-1.9	-1.7	-3.3	-3.1
- Sudan	+1.2	+1.2	+1.0	+.8	+.7	-.2	+.1

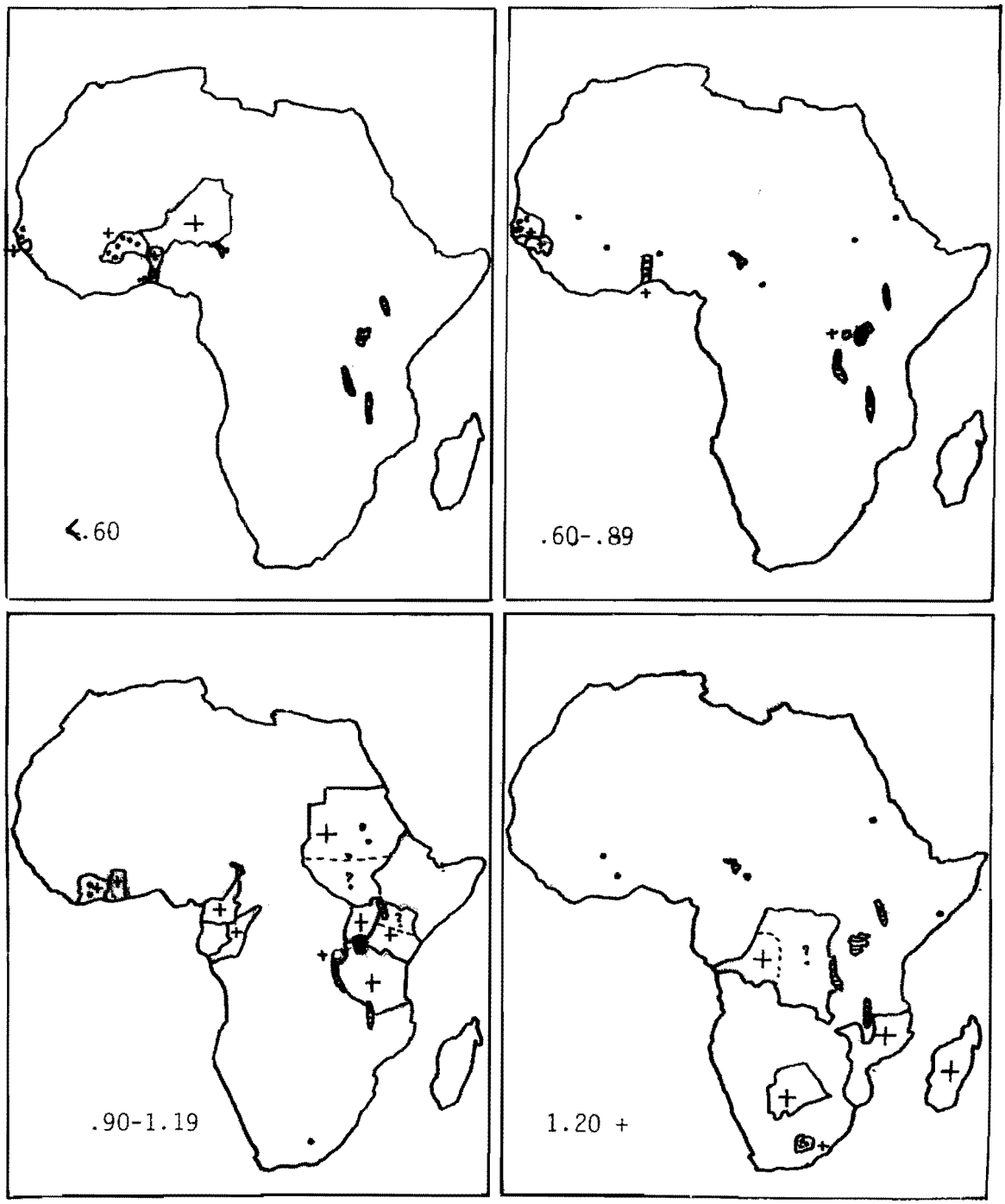


Figure VI : Patterns of Relative Presence of Currently Widowed and Divorced Women aged 15-44.
Note : National levels are indicated by (+); regional levels by (.); for definition of ratio see text.

The populations of the Western Sahel are found in the two lowest categories and have often less than half the number of women currently widowed and divorced than the reference population. These populations, then, compensate to a remarkable degree for their high levels of union instability by intensive and fast remarriage. The contrast with them is again provided by Southern Africa with much less divorce, but with very high proportions currently widowed or divorced due to much less remarriage (ratio's as high as 1.60). The contrasts among other West African, Central and Eastern African groups or regions existing with respect to marriage dissolution, tend to shrink with respect to the net balance of disruption and remarriage (ratio's now cluster around unity in many of them).

The story can also be told with more direct reference to fertility by inspecting the age schedule of time spent in a sexual union. These percentages are given in Table VIII in the form of an average pattern and deviations from it (in percentage points difference). The average schedule shows that loss of exposure rises with age, but that by the end only about 10 percent has been reached. In Senegal and Ghana, two high divorce countries, the loss is higher than in the reference schedule at younger ages, but this is also true for Kenya with lower widowhood. Cameroon and Lesotho, on the other hand, have more considerable loss past age 30 as a result of high widowhood. Northern Sudan, finally, does better than average in curtailing loss of exposure across the entire age range.

Table VIII about here

In assessing trends with respect to loss of expoure time and proportions currently out of a union, one can only be confident about one point: as life expectancy increases and as the age gap between spouses is

not likely to widen, widowhood as a source of fertility reduction will slowly become of lesser importance. Hence trends with respect to divorce and remarriage for both divorcees and widows will dominate the overall trend. Unfortunately, data sources based on proportions ever-widowed, ever-divorced and subsequently remarried are scarce and limited to one point in time. All we can get is the balance between union dissolution and remarriage in the form of percentages currently out of a union.

Data of this kind have been brought together in Table IX for a few countries. In Western Zaire, the percentages out of union have increased in the ages below 35 and decreased among older women during the period 1956-76. Here, the effect on overall fertility of a reduction in widowhood has been neutralized by an increase in divorce and/or a decrease in remarriage, so that overall exposure declined. In Kenya, a clear increase in proportions currently out of a union among ever-married women is reported by K . Hill et.al.(s.d.) for the period 1962-69, which must again be attributed to a considerable increase in divorce. In the last intercensal decade 1969-79 percentages currently widowed continue to decline below age 40. The percentages currently divorced, however, decline below age 25 (presumably the effect of later first marriage), but increase thereafter. Taking widowhood and divorce together, less exposure time seems to be lost below age 25 in 1979 than 1969, and from 25 onward the pattern has stabilized as a result of opposite movements in percentages currently divorced and widowed. On the whole, however, also the Kenyan picture seems to correspond with a trend of declining widowhood and a trend of increasing divorce.

Table IX about here

Table IX : Percentage of All Women Currently Divorced or Widowed by Age; Comparison of Trends

Age :	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Kenya (2 censuses)							
Divorced 69	1.9	4.1	4.2	3.8	3.4	(3.3)	
79	1.1	3.4	4.4	4.7	4.4	4.1	3.7
Widowed 69	0.3	1.1	2.0	4.2	6.6	(13.2)	
79	0.2	0.7	1.6	3.8	6.1	10.3	14.8
Div+Wid 69	2.2	5.2	6.2	8.0	10.0	(16.5)	
79	1.3	4.1	6.0	8.5	10.5	14.4	18.5
West Zaire (2 surveys)							
Divorced 55-57	0.4	2.4	3.3	4.2	(4.5)		-
76	2.3	7.8	8.2	7.3	(6.8)		-
Widowed 55-57	0.1	1.0	2.5	4.7	(11.6)		-
76	0.1	0.6	1.3	2.6	(6.5)		-
Div+Wid 55-57	0.5	3.4	5.8	8.9	(16.1)		-
76	2.4	8.4	9.5	9.9	(13.3)		-

On the basis of trends in just two countries, one can of course not claim that divorce is on the increase in all of sub-Saharan Africa. In certain settings with high levels of sterility, one would expect that a lowering of sterility would reinforce marriage stability and hence that divorce would decline. In other areas where the sterility problem is not so dominant, there are reasons to expect an opposite trend: with the weakening of lineage controls and changes in the value system (Westernization) introduced by mass media and schooling, major changes have occurred with respect to sex role differentiations, the economic position of women, the mobility of the population and expectations in general. In this phase of cultural and structural transformation, divorce can easily become more rather than less common, even if the original levels were high to start with. But, as stated earlier, to measure the trend one would need data sets on proportions ever-divorced rather than currently divorced, and such data sets are non existant for two points in time.

In the previous sections we have equated exposure to risk with person-years spent in a union. Despite the fact that celibacy is the single most important factor in reducing exposure at the beginning of the fertile age range and that union dissolution net of remarriage causes a smaller loss later on, two complicating factors need to be added in. First, pre-nuptial and non-marital fertility are not zero, so that marital status distributions do not tell the whole story. Second, some currently married women may not be exposed at all in regions with substantial male outmigration.

5.3. Non-marital fertility

The incidence of pre-marital fertility can be measured in a variety of ways. First, the illegitimate fertility rate in the age group 15-19 with few widows and divorcees can be considered as a good indicator of pre-marital fertility. Other information can be provided by fertility histories for married women, but the proportion of these women admitting a pre-marital birth or the proportion of these births relative to all births occurring before a specific marriage duration probably underestimate the prevalence of pre-marital fertility. Yet, they may still provide valuable information with respect to regional variations. Overall non-marital fertility can be measured through questions on recent (i.e. last 12 months) fertility for women in each of the various marital status categories. Fertility measured during a longer period prior to the survey or life time fertility is of much less value for ever-married women since the link is broken between marital status at time of conception (or birth) and the amount of fertility recorded. Multi-round surveys, recording marital status at the time of two successive visits and fertility in between, will also provide information of great utility if the visits are not too far apart and if enough non-married women can be located at the time of the second round. Finally, when recent fertility is recorded for all women and for married women, illegitimate fertility rates can be calculated for all types of non-married women together, or one can produce a summary measure in the form of Coale's index Ih. This index captures the fertility of single, widowed and divorced women together, by relating their births to the theoretically expected number for non-married women subject to the high natural fertility schedule of the Hutterites.

Data on pre-marital fertility for women already married 5-9 years

ago are brought together in Table X for 5 African W.F.S.-countries. They show a striking contrast between Kenya and Cameroon with high levels, versus Ghana, Lesotho and Senegal with a low incidence. In the former two countries more than 20 percent of women married for 5-9 years admitted a pre-marital birth, and pre-marital fertility constitutes nearly a fifth of the fertility that these women have had so far. Table XI presents data contrasting average parity among single women to that of ever-married women. In the age group 15-24, essentially pre-marital fertility is captured as many of these women will ultimately marry (and may even have another birth before marriage). Kenya and Cameroon score high again, but also Tanzania joins that group. The three regions of Western Zaire (Bas-Zaire, Bandundu and West Kasai) have levels that fall in the low group. The average parity figures for single women 25-34 capture the experience of a small minority of women who will either marry very late or will be constituting the 1 or 2 percent of definitive celibate. These women are likely to be very atypical (probably characterized by very high education or by physical handicap), and yet, many of them reach 2 children before marriage.

Tables X and XI about here

Non-marital fertility in general can best be appreciated by making reference to the example of Zaire, 1956-57. The data for this colonial survey, reported by van de Walle (1968) allow for a detailed assessment of the total contribution of illegitimate to overall fertility. In Table XII, all steps in the calculation can be followed. The net result is that non-married women in the age group 15-19 (nearly all single) form 55 percent of the population but produce 15 percent of all births. In the next age group, non-married women constituting 14 percent of all women

Table X : Pre-marital and Early Marital Fertility of Women who married 5-9 Years ago in 5 African WFS-surveys, 1977-79.

	Ghana	Cameroon	Kenya	Senegal	Lesotho
i) Percent of Women reporting a pre-marital birth :	5.7	21.0	23.0	2.8	4.5
ii) Mean number of Births reported before 1st Marr.:	0.07	0.34	0.34	-	-
iii) Mean number of Births reported during first 5 yrs of Marriage :	1.62	1.41	1.69	-	-
iv) (ii) as percent of (ii) + (iii)	4	19	17	-	-

Table XI : Mean number of Children ever born to Never and Ever Married Women in 5 African Surveys, 1973-79

Age :	15-24		25-34		All	
	Never Married	Ever Married	Never Married	Ever Married	Never Married	Ever Married
Kenya 77-78	.22	1.78	1.79	4.57	.33	4.84
Cameroon 78	.20	1.35	1.70	3.59	.32	3.26
Tanzania 73	.20	-	-	-	-	-
Ghana 79	.05	1.33	.81	3.34	.09	3.66
West Zaire 76						
- Bas Zaire	-	-	-	-	.13	(5.48)
- Bandundu	-	-	-	-	.07	(4.68)
- West Kasai	-	-	-	-	.04	(4.45)
- three regions combined	.07	(1.55)	1.03	(4.42)	.08	(4.78)

Note : figures in parentheses give average parity for currently married women.

20-24, contribute 8 percent of all births; and from 25 onward, non-married women (less than 10 percent) still contribute 5 percent of births. In Table XIII, illegitimate fertility rates are shown for the provinces of Zaire 1955-57. In Shaba (then Katanga), the district average of illegitimate fertility rates to single women 15-19 increased from a national level of .036 to .090, implying that these young women (36 percent of their age group) contributed about 16 percent of all births to women 15-19. In Zaire as a whole again, and accepting the stable age distribution as fitted by Romaniuk (1968), the total contribution of all types of non-married women 15-49 (22 percent of the female population) is nearly 8 percent of all births.

Tables XII and XIII about here

These percentages are rather impressive. Yet, the schedule of illegitimate fertility used here is on the low side by African standards (this was also revealed in comparing the recent schedule for Western Zaire with those of Kenya, Cameroon and Tanzania (cfr. Table XI)). An extensive comparison can be made using the Ih-index. In Zaire 1955-57, this index gives a level of illegitimate fertility of 16 percent of Hutterite fertility. In Table XIV, the contributions are presented for other countries. Burundi, Rwanda, Northern Ghana and Senegal have levels that are lower than those of Zaire 1955-57, while those in Lesotho are of a comparable magnitude. Central and Southern Ghana, Kenya and Cameroon have higher levels, and in some regions, fertility of <u>non</u> -married women approaches 40 percent of Hutterite fertility. This is as high or higher than the fertility of <u>married</u> women in many French departements around 1850. Ih-values for Europe during its natural fertility regime prior to 1850 seldom exceeded 5 to 7 percent of Hutterite fertility.

Table XII : Contribution to the Total Annual Number of Births in Each Age Group by Non-Married Women, Zaire 1955-57

Age :	15-19	20-24	25-29	30-34	35-44
i) Number of non-married women per 1000 in each age gr.	544	137	87	91	140
ii) Fertility rates for non-married women	.036	.158	.119	.073	.027
iii) Births contributed by non-married women (i)x(ii)	20	22	10	7	4
iv) Number of currently married women per 1000 in each age group	456	863	913	909	860
v) Fertility rates for currently married women	.259	.282	.242	.177	.089
vi) Births contributed by currently marr. women (iv)x(v)	118	243	221	161	77
vii) Total number of births by all women (iii)+(vi)	138	22	231	168	81
viii) Percent of all births contributed by non-married women	14.5%	8.3	4.3	4.2	4.9
ix) Number of women in each age group from stable model	662	576	498	432	675
x) Contribution of non-married women to all births by women 15-49	———		7.6%		———

Note : "currently married" includes women in consensual unions.

Table XIII : Fertility Rates for Non-Married Women Aged 15-19 (i.e. virtually all single) in the Districts of Zaire, District Averages by Province, 1955-57

Equateur	.033	Leopoldville	.027
Kasai	.024	Orientale	.037
Katanga	.090	Total Zaire	.036 (cfr. Table XII)
Kivu	.046	District Minimum	.009; Maximum : .104

Source : van de Walle (1968)

Table XIV about here

5.4. Polygyny and fertility: individual effects

The link between fertility and polygyny can be studied from two angles. In a first approach, we can compare the experience of individual women living in a given society and study differences in behaviour and effects of selection mechanisms. In a second approach, societies can be compared with the aim of establishing the institutional rationality behind the various societal arrangements.

At the individual level, polygyny usually lowers age specific marital fertility. There are three major reasons for this. First, polygyny facilitates prolonged lactation and postpartum abstinence. Second, the age gap between husband and wives can be very substantial and the monthly probability of conception (fecundity) of perfectly fecund wives can be reduced in marriages involving older husbands. In theory, these two factors operate fairly equally for all women in a polygynous union, irrespective of their rank. But, aside from these general effects, a major selection mechanism interferes. Women who prove to be subfecund or sterile after a number of years in marriage have a high chance of being rejected and end up as a second or third wife in another union. Hence, it is essentially differential fertility and sterility by rank order of wives in polygynous unions that produces the overall effect on marital fertility(11). These three mechanisms are documented by the data of the Cameroon fertility survey of 1978.

Table XIV : Estimated Values of the Coale Index of Illegitimate Fertility (I_h) for Selected African Populations, 1955-79

Reference : Zaire 1955-57 I_h = 0.16

Lower Values		Similar Values		Higher Values	
Burundi 70-71	0.01	Ghana 79		Congo (Brazzav.)74-77	
Ghana 79		-Upper Region	0.15	-Brazzaville	0.22
-Northern Region	0.08	-Volta Region	0.17	Cameroon 78	0.22
-Greater Accra	0.09	Lesotho 77	0.18	Ghana 79	0.25
Rwanda 70	0.10	-Mountain	0.16	-Brong Ahafo	0.26
Senegal 78	0.10	-Lowlands	0.17	-Ashanti	0.28
		-Foothills	0.17	-Eastern	0.30
		W.Zaire 76		-Western	0.33
		-Bas Zaire, Bandundu & W.Kasai	0.18	-Central	0.35
				Lesotho 77	
				-Orange River Valley	0.26
				Kenya 77-78	0.35
				-Nairobi	0.23
				-Western	0.32
				-Central	0.35
				-Nyanza	0.36
				-Coast	0.36
				-Eastern	0.37
				-Rift Valley	0.43

Data : WFS-data on births last 5 yrs (marital and overall fertility rates) and marital status distributions; W.Zaire : data from Tabutin et al (1978) and births last 12 months; Burundi : data from Enq. Démogr. 70-71 and births registered during first interval of multiple round survey; Rwanda : data from Enq. Démogr. 70 and births last 12 months; Brazzaville : data from Dubroz' multiple round survey of 74-77, births during 27 month interval.

The action via differential child-spacing is shown in Table XV. Here, durations of breast-feeding and postpartum abstinence were measured in the last closed pregnancy interval(12). Along with the mean durations, percentages who stopped lactation or abstinence before the 12th month are also given(13). On both accounts, women in polygynous unions have a better child-spacing pattern than the others. The differences are, however, only of the order of 1 to 2 months. In similar Ghanaian data of 1979, differences were of the order of 2 to 3 months.

Tables XV and XVI about here

The age gap factor is documented in Table XVI, by age of wife and type of union. From the start it should be pointed out that two thirds of women would not give the age of their husband, and that the non-response rate is higher still for women married to a polygynist. The bias provoked by this is likely to be substantial, but if a lack of knowledge of the husband's age is positively related to the width of the age gap itself, the differences between monogamous and polygynous unions would be larger still.

Below age 30, the distributions for women in monogamous and polygynous unions are very different indeed: the modal category for age difference for the monogamous is 5 to 9 years, whereas it is 20+ years for women in polygynous marriages. About 1 woman in 3 aged 25-29 married to a polygynist is likely to have a husband in his fifties. As age of women advances, the two distributions come closer: older polygynists die off and more divorcees and widows are selected into polygynous unions. For women in their lower fourties, the distributions are much more alike, except for the fact that still about a fifth of polygynously married women have husbands in their sixties, as compared to 5 percent among those in a

Table XV : Length of Breast-feeding and Postpartum Abstinence in Last Closed Pregnancy Interval by Age and Type of Union, Cameroon 1978

Type of Union	$\bar{X}$ Brfd.	$\bar{X}$ Pp. Abst.	% Brfd. < 12 mths	% Abst. < 12 mths
All Ages				
- Monogamous	18.4 mths	12.3 mths	11.9%	45.2%
- Polygynous	20.7	14.9	10.3	36.6
- All (incl. Wid+Div)	19.3	13.4	11.6	41.3
< 30				
- Monogamous	17.6	11.6	13.9	47.5
- Polygynous	19.4	13.2	11.6	39.4
- All (incl. Wid+Div)	18.1	12.2	13.2	44.7
⩾ 30				
- Monogamous	19.1	12.8	10.2	43.2
- Polygynous	21.6	15.6	9.5	34.9
- All (incl. Wid+Div)	20.1	14.2	10.5	38.9

Note : Data for last closed pregnancy interval are for women with at least 2 pregnancies, any current pregnancy included.

Table XVI : Percentage Distribution of Currently Married Women according to Age Difference with Husband, by Women's Age and Type of Union; Cameroon 1978.

Age Gap (Husband - Wife) :		< 5 yrs	5-9	10-14	15-19	20+	Pct. Non Response
Type of Union & Age of Wife							
15 - 19	Monogamous	23.0	38.2	25.6	7.0	6.1	58
	Polygynous	11.4	11.0	18.7	14.4	44.5	69
20-24	Monogamous	35.4	39.5	12.0	7.4	5.8	53
	Polygynous	5.8	23.6	15.9	14.2	29.7	67
25-29	Monogamous	39.1	34.6	16.5	6.4	3.3	56
	Polygynous	21.6	19.1	23.2	12.1	24.0	73
30-34	Monogamous	34.7	30.3	18.1	4.9	12.1	65
	Polygynous	17.2	26.9	23.2	12.9	19.8	78
35-39	Monogamous	43.7	30.6	10.7	10.6	4.4	66
	Polygynous	28.3	26.2	16.3	14.8	14.4	78
40-44	Monogamous	29.5	38.2	17.4	10.8	4.2	64
	Polygynous	27.8	25.6	15.0	12.7	18.8	78
15-54	Monogamous	35.5	34.6	16.7	7.4	5.7	60
	Polygynous	23.6	20.8	18.5	12.5	24.6	74
	All Unions	33.5	30.4	16.8	8.4	11.0	67

Note : Modal categories are underlined.

monogamous union. Obviously, differences of this order - and they are similar in Ghana and Northern Sudan - must lower fecundity of polygynous marriages.

The selection for sterility operating via divorce and remarriage is very well documented by the Cameroon data set. For each duration since first marriage, women with and women without children were distributed over the various marriage types and ranks of wife. If no selection took place, the distributions presented in Table XVII should look alike and remain similar when age since first union increases. Nothing of the sort occurs. Already for durations of less than 5 years, women who have had at least one live birth are more commonly found in monogamous marriages, whereas the childless are markedly overrepresented among those who refused to reveal their status (and are presumably mainly deserted or divorced women). Among those in a polygynous union, the difference by rank also emerges at this short duration of exposure: there are fewer childless women in rank one than among the monogamously married, but much more childless in rank 3. As exposure increases, the pattern develops further: ranks 2 and 3 absorb more and more of the childless women as the sterile are dropped disproportionately from the monogamous state or from rank 1 in polygynous unions(14). The Ghanaian data, not reported here, show very similar effects, except for the fact that the sorting takes slightly longer to produce this typical pattern. But judging from the W.F.S.-surveys in these two countries, primary sterility is much less of a problem in Ghana than in Cameroon (2 percent childless after 10 years of exposure against 10 percent).

Table XVII about here

Table XVII : Percentage Distribution of Ever-Married Women by Fertility Status over the Various Types of Unions, Cameroon, 1978.

Years since 1st Marriage & Fertility Status	Monogamous	Polygynous				Wid.&Div.	No Response
		Rank 1	2	3	All		
< 5,no live birth(=100%)	55.4%	3.5	16.3	8.3	28.1	2.4	14.1
with live birth(s)(=100%)	60.6	5.3	16.1	6.8	28.1	3.5	7.7
ratio (i)/(ii)	.91	.66	1.01	1.22	1.00	.69	1.83
5-9,no live birth	50.3	5.8	18.7	8.2	32.7	5.8	11.1
with live birth(s)	55.8	11.5	16.2	7.4	35.2	4.3	4.7
ratio (i)/(ii)	.90	.50	1.15	1.11	.93	1.35	2.36
10-14,no live birth	47.5	12.9	18.0	15.3	41.7	8.6	2.2
with live birth(s)	51.9	15.0	17.8	7.5	40.3	6.4	1.5
ratio (i)/(ii)	.92	.86	1.01	2.04	1.04	1.34	1.47
15+, no live birth	44.0	15.5	16.3	7.8	39.5	15.0	1.5
with live birth(s)	46.1	18.6	12.2	6.5	37.2	15.4	1.3
ratio (i)/(ii)	.95	.83	1.34	1.20	1.06	.97	1.15
all durations, no live birth	50.1	8.8	16.8	8.5	34.1	7.6	8.2
with live birth(s)	51.4	14.4	14.6	6.9	35.9	9.6	3.1
ratio (i)/(ii)	.98	.61	1.15	1.23	.95	.79	2.65

The joint effect of better spacing, lowered fecundity and selection for sterility in polygynous unions can be appreciated through a simple relationship between the marital fertility rate for a specific age group and the various determinants of natural fertility (Bongaarts, 1976). Theoretically, the fertility rate is the reciprocal of the length of the birth interval if sterility is zero and fecundity homogeneous. In practice, the following relationship produces an adequate approximation:

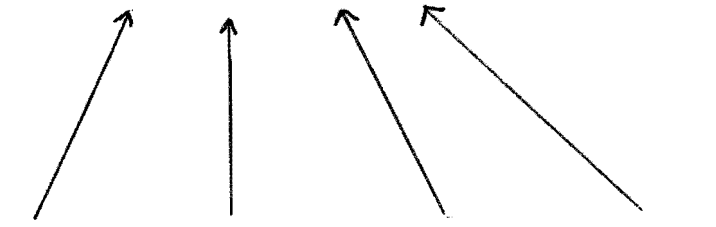
$$m = \frac{(1 - s)\ 12}{nsp + \frac{1}{(1-a)f} + \frac{a}{1-a} I_a + 9}\ 0.875$$

where m is the marital fertility rate, s the proportion sterile, nsp the length of the non-susceptible period after a live birth, Ia the length of the non-susceptible period after a miscarriage, a the proportion of conceptions ending in a foetal loss and f the monthly probability of conception or fecundity. Taking values for Cameroon, age group 25-29, for respectively women in monogamous and polygynous unions,

	monogamous	polygynous
s=	.103	.116
nsp=	14 months	16.5 months

assuming a small fecundity difference with f=.17 for monogamous unions and .15 for polygynous ones, and that all women would have the same risk of spontaneous abortion of .25 and an associated postpartum sterility period of 2 months, the two marital fertility rates would be

$$m(25\text{–}29,\ \text{monog}) = \frac{12 \times 0.897}{14 + 7.84 + 0.67 + 9} \times 0.875 = 0.299$$



$$m(25\text{–}29, \text{polyg.}) = \frac{12 \times 0.884}{16.5 + 8.89 + 0.67 + 9} \times 0.875 = 0.265$$

In this example, the polygynous fertility rate would be 89 percent of the monogamous one. The ratios between such rates for other age groups would obviously depend on how fast the sorting of sterile women takes place, given societal arrangements for divorce and remarriage, on the fertility of older husbands, on how much the child-spacing pattern for the two types of marriage converge at younger ages and diverge at older ones, and on differentials in foetal loss and in incidence of diseases that cause it. On the whole, one would expect that the ratio is closer to unity at younger ages; the sorting for sterility has not fully occurred, breast-feeding or abstinence patterns are likely to be more similar for younger women, and

polygynists are still younger than 50.

The ratio of the two marital fertility rates derived in this example for Cameroon is a very plausible one: the actual value of m(25-29) was 0.286 as compared with (0.299*0.60) + (0.265*0.40) = 0.285 with 60 percent being in monogamous unions and 40 in polygynous ones. The plausibility can also be checked against a series of ratio's from older colonial surveys in West and Central Africa (see Table XVIII). Here, one can again observe that marital fertility rates are lower by 4 to 14 percent in the age group 25-29. There is also a trend toward larger differences with increasing age, as expected, and the data for Guinea, Upper Volta and Congo (Brazzaville) illustrate how the presence of women of ranks 3 and 4 increase the gap. The total marital fertility rate (TMFR) of women in households with only 1 co-wife ("petite polygamie") is 3 to 8 percent lower than that of women without co-wives, but in the instance of "grande polygamie", the gap is as large as 26 percent in Upper Volta or 32 percent in Congo. The ratios between general marital fertility rates (GMFR 15-49), finally, exaggerate the difference as a result of age distribution differences between women in the two types of marriages, but still pick up the expected "grande polygamie"-effect in the Central African Republic.

Table XVIII about here

One last factor needs to be introduced operating at the individual level: at identical ages, women in monogamous and polygynous unions may have different lengths of overall exposure time. First, women ending up in a polygynous setting are likely to come from more traditional backgrounds and tend to have a lower age at entry into any marriage than women in monogamous households. The data for Cameroon 1978 are again used

Table XVIII : Ratio's of Marital Fertility Rates, based on Births in the Last 12 Months, of Women in Polygynous Unions to those of Women in Monogamous Unions - Results from Colonial Surveys 1955-61

Country and Husband's number of wives		20-24	25-29	30-34	35-39	40-44	TMFR	GMFR(15-49)
Guinea (Conacry) 54-55	2	.92	.96	1.04	.91	1.08	.95	.90
	3+	.95	.96	.98	.92	.85	.94	.81
Zaire 55-57	2+	.86	.81	.75	(.71)		.80	.67
Mali, Niger Delta 56-58	2+	1.01	.93	.85	.82	.81	.89	-
Gabon 60-61	2	.82	.87	1.03	.97	1.33	.97	-
Upper Volta 60-61	2	.99	.93	.95	.71	.80	.94	-
	2+	.95	.90	.87	.71	.68	.88	-
	3	.95	.86	.79	.76	.59	.84	-
	4+	.77	.78	.67	.66	.51	.74	-
Centr. African Rep.59-60	2	-	-	-	-	-	-	.86
	3	-	-	-	-	-	-	.71
	4	-	-	-	-	-	-	.70
	5+	-	-	-	-	-	-	.69
Ivory Coast 57-58	2	-	-	-	-	-	-	.90
	3+	-	-	-	-	-	-	.70
Congo (Brazzav.) 60-61	2	(.89)		(1.07)		-	.92	-
	3	(.75)		(.86)		-	.68	-

Data : Zaire : van de Walle(1968); others : J.M. Cohen (1967).

as an example in Table XIX, were the percentages are shown of women marrying before age 20 among those ever married and currently aged 25+. At a national level for Cameroon, a 6 percentage point difference in incidence of marriage prior to age 20 corresponds to half a year difference in the singulate mean age at marriage. From Table XIX it seems that this is about the order of magnitude of the difference between those currently in a polygynous and a monogamous union. The data for Ghana 1979, not reported here, are very similar. This extra period due to earlier starting for women in polygynous unions is lost later on when such unions pick up more and more widowed and divorced women. In Cameroon, the mean number of years spent in any union is about 1 year more for women currently in a polygynous union in the age group 25-29, but it is only 0.2 years more in the age group 30-34. By age 40 the difference ceases to exist. The data for Ghana are very similar again with 0.8 years extra for polygynously married women 25-29, 0.4 years extra in the age group 30-34, and virtually nothing extra beyond 40. Considering these orders of magnitude and the national mean age at marriage, only a very small portion of the difference in total marital fertility between the two types of unions is alleviated by earlier starting for the polygynous women. Furthermore, as fertility for women at identical ages but with different durations since first marriage is lower for those longest in a union, much of the earlier start effect would be lost at any rate, even if divorce or widowhood did not interfere.

Table XIX about here

To sum up, differences in lactational amenorrhoea and abstinence together with lower fecundity connected with the husband-wife age gap do count in lowering marital fertility for those in a polygynous household. But from age 25 onward, the selection on childlessness and subfecundity

Table XIX : Percentages of Ever-Married Women Aged 25+ who married before Age 20, by Type of Union and Current Age; Cameroon 1978

Current Age :	25-29	30-34	35-39	40-44	45-49	25-49
Type of Current Union						
- Monogamous	76.9	79.7	70.3	72.5	61.2	74.1
- Polygynous	86.3	83.8	75.5	59.9	62.2	78.3
- Wid. & Divorced	81.0	78.2	72.0	74.8	69.1	73.7
- All Women	80.9	80.8	72.8	73.4	63.5	75.7

counts even more, especially in lowering marital fertility rates for subsequent order women in households with "grande polygamie". If "grande polygamie" is widespread, the reduction of the TMFR may be well in excess of 10 percent when compared to the level of monogamously married women.

5.5. Polygyny and fertility: societal differences

The individual comparisons presented in the previous section are to some extent already contaminated by effects operating on societal levels. Both Cameroon and Ghana harbour regions and ethnic groups with very different cultural arrangements involving fertility and marriage, and the differences between individuals in polygynous and monogamous unions in these countries taken as a whole are already constrasts between individuals belonging to different ethnic groups and regions (Northern Ghana and the North-West crescent in Cameroon are much more heavily polygynous than the other regions' populations).

Before turning to societal comparisons of effects on fertility stemming from polygyny (and vice versa), it is essential to have an idea of the geography of polygyny. Here, we have used the percentage of women currently in such a union among all currently married 15-49 as an indicator. The data are presented in the Basic Indicator File in the Appendix and are also shown on the four maps of Figure VII. Low (20 percent) and medium-low (20-29 percent) levels of polygyny exist predominantly in Eastern and Southern Africa. Northern Sudan, Rwanda, Burundi and Lesotho have the lowest levels; these of Kenya and Tanzania are slightly higher. Medium-high (30-39) to very high (40 percent or more) polygyny levels are mainly found in Central and West Africa(15).

Figure VII about here

At the aggregate level, questions pertaining to the organizational forms of the demographic system can be posed. For instance, have highly polygynous societies maintained an earlier starting pattern of fertility or a pattern of faster remarriage? Have they maintained an overall stronger pattern of child-spacing via postpartum abstinence, so that also the spacing among monogamously married women in such societies is better than among women belonging to weakly polygynous societies(16)? Has a high incidence of polygyny aggravated the problem of sterility and subfecundity for the society as a whole?

The record of the various regions in the 6 W.F.S.-countries complemented by regional information for Tanzania (1973) and Western Zaire (1976) is used here to address these questions. In Figure VIII we have tested the proposition that high levels of polygyny (40 percent+) are associated with:

- an early marriage pattern (less than 50 percent single among women 15-19)
- a pattern of intensive and fast remarriage (80 percent or more of those with a disrupted first union are already remarried by age 50)
- the maintenance of the long postpartum taboo (average duration of abstinence of 12 months or more)
- a high incidence of sterility and subfecundity (13 percent or more of women with durations since first marriage of 10-24 years have only had 2 live births or less)

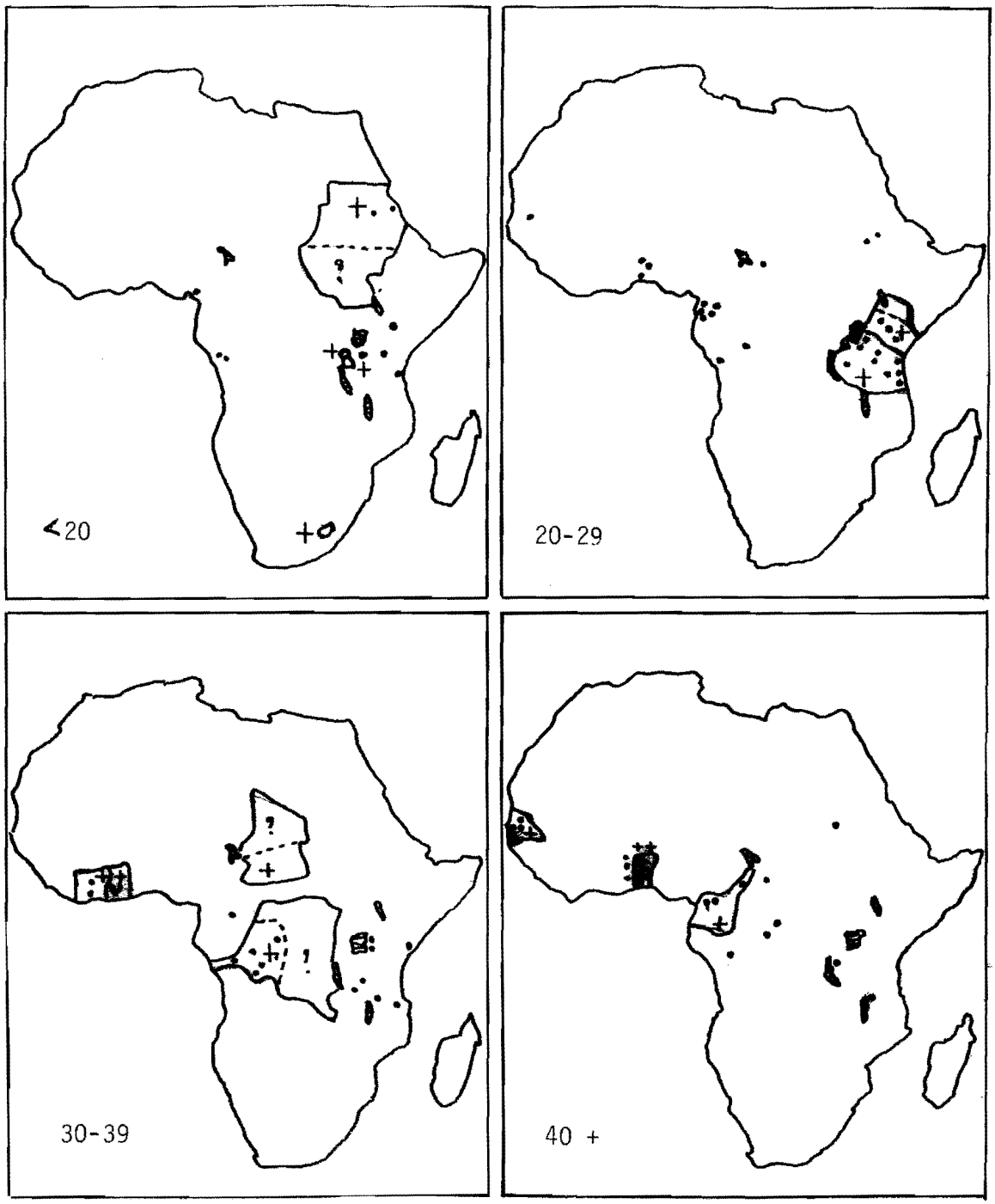


Figure VII : Regional Patterns of Percentage of Currently Married Women 15-49 Currently in a Polygynous Union.
Note : National levels are indicated by (+), regional levels by (.).

The number of regions for which the checks are made vary depending on availability of data, and even if the sample is not fully representative for all regions on the continent, a number of important observations can still be made:

Figure VIII about here

i) Starting from high polygyny , one cannot predict whether such societies belong to the categories with early marriage, fast remarriage and long abstinence: high polygyny regions can be found in either of the high or low categories with respect to these three dependant variables;

ii) Starting from low or medium polygyny , however, one has a very good chance of predicting the outcome correctly: such regions have rarely early marriage, fast remarriage and a long taboo.

With respect to sterility and subfecundity, the pattern is reversed:

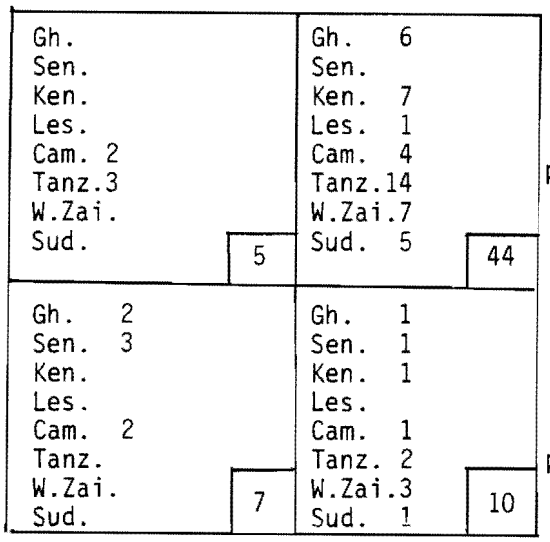
i) Starting from high polygyny , one does very well in predicting high levels of infecundity;

ii) but starting from low polygyny levels, one has much less of a systematic pattern to go by.

These specific configurations mean that the probabilities (even if LT.50) are always higher to find early marriage, fast re-marriage, long abstinence and high infecundity in the highly polygamous societies than in the others.

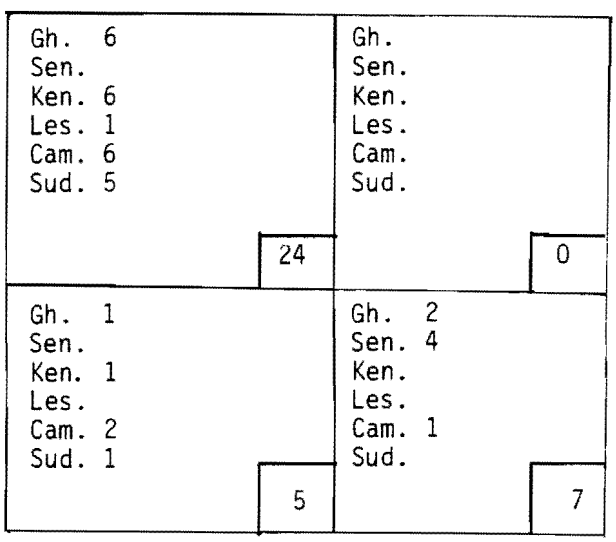
Figure VIII : Test of Presumed Association between High Incidence of Polygyny, Early Marriage, Intensive Remarriage, Long Postpartum Abstinence and High Levels of Sub-fecundity, using Regional Data from Recent African Surveys (1973-79)

Association between percent single 15-19 and polygyny (15-49)



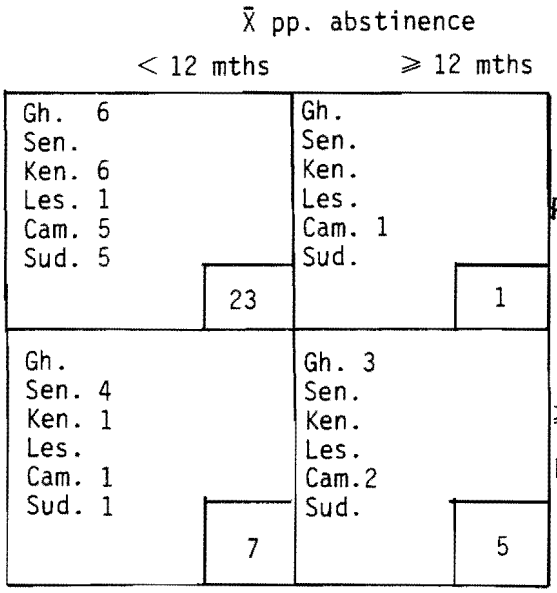
(56 regions & 10 Zaire ethnic groups)

Association between percent remarriage 15-49 and polygyny (15-49)



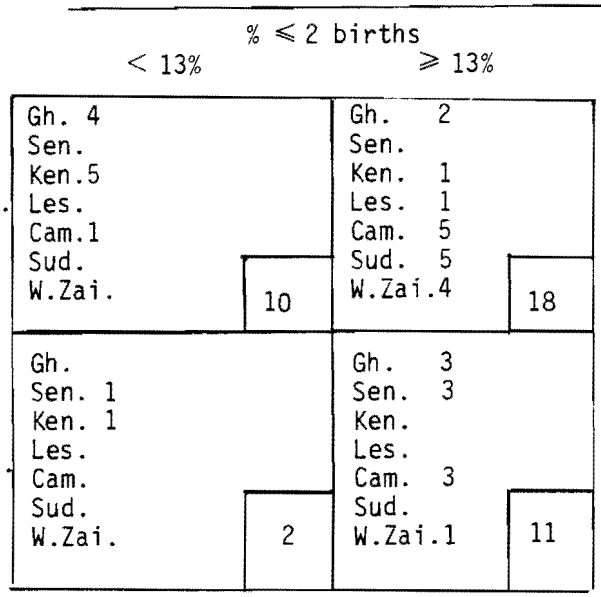
(36regions)

Association between length of postpartum abstinence and polygyny (15-49)



(36 regions)

Association between percentage women with 2 or less live births after 10+ years of exposure and polygyny (15-49)



(41 regions)

This can be verified below:

	highly polyg. societies	medium & low polyg. societies
Probability to get:		
- early marriage	.41 (7/17)	.10 (5/49)
- fast(re)marriage	.58 (7/12)	.00 (0/24)
- long pp. abstinence	.42 (5/12)	.04 (1/24)
- high steril. & subfec.	.85 (11/13)	.64 (18/28)

Obviously, none of these associatins are of sufficient strength to single out polygyny as the prime determinant of any of the others, as one is sometimes tempted to do on the basis of national data sets alone(17), but on the aggregate level, polygyny is an important contributing or facilitating factor for the maintenance of a highly traditionist demographic regime. Conversely, the maintenance of early marriage, long postpartum abstinence, fast marriage and endemicity of the subfecundity problem tend to maintain high polygyny levels. The data in Figure VIII produce the following ratio's:

	probability of obtaining a highly polygynous society		
given early marriage	.58 (7/12)	later marriage	: .19 (10/54)
" fast(re)marriage	1.00 (7/7)	slower(re)marriage	: .17 (5/29)
" long taboo	.83 (5/6)	short taboo	: .23 (7/30)
" high ster. & subfec.	.38 (11/29)	lower infecundity	: .17 (2/12)

These traditionalist regimes are beyond any doubt essentially Sahelian and West-African, and possibly also Central African. Furthermore,

they seem to have survived best in societies in this area which are more isolated geographically and have benefitted less from socio-economic development; also they tend to be Islamicized and to have low levels of female literacy (e.g. Senegal with the exception of the Central region including Dakar, the two northern regions of Ghana, the three regions in the north-western crescent of Cameroon, Darfur region in north-west Sudan). Finally, in regions which already have a tendency toward higher polygyny levels, such levels can be increased further through high male labour outmigration. In such settings, the absence of younger males does not lead to an increase in the age at marriage for females (as was for instance true in the European setting, e.g. Ireland), but to a reinforced degree of polygyny whereby the older resident males control local resources, including female labour. Some authors have extended this feature into a feedback mechanism: high levels of polygyny and firm gerontocratic control push younger males toward emigration. The examples of such mechanisms come again from West Africa: young males belonging to Voltaic groups try to constitute the necessary capital by working in the economies of regions located further south before they can acquire a first wife back in the home region. This contrasts rather strikingly with the southern African experience where labour outmigration does not fuel polygyny, but where female headed households exist (e.g. Lesotho).

5.6. Polygyny and fertility: conclusions

From the previous sections it is obvious that the pattern of social organization of a society and its regime of family formation and reproduction are closely connected and that polygyny is a major differentiating factor. It is also clear that polygyny operates in a variety of ways on marital fertility, on the overall length of exposure to

risk, and via these on overall fertility.

The links between polygyny and fertility are made explicit in the diagram presented in Figure IX. On the individual level within a given society, polygyny tends to lower marital fertility by extending the postpartum period of non-susceptibility and by reducing fecundity through large age differences between spouses. Large age gaps fuel widowhood, which feeds back to polygyny through fast remarriage (often levirate), and by routinizing such behaviour, polygynous societies minimize the exposure time lost. This corrective mechanism has, however, led to the aggravation of the infecundity problem as soon as venerial diseases appeared. From then onward, a positive feedback mechanism comes into operation whereby sterility of a first wife leads to divorce and more divorce to higher polygyny. A major symptom of such a condition is the emergence of fairly small differences in marital fertility between women in monogamous unions and those who maintained themselves as first wives of polygynists, but more marked differences between first wives and subsequent order wives. Lower marital fertility among women in a polygynous union is then also the result of an intricate selection mechanism operating on the basis of childlessness or subfecundity.

Figure IX about here

The other corrective mechanism for lower - although not pathologically lower - marital fertility is the early marriage pattern. This is essentially a societal effect typical for strong gerontocracies in which younger men are "fended off" and female labour resources "monopolized". Within a given society, differential age at marriage between women in monogamous and polygynous unions respectively is not a

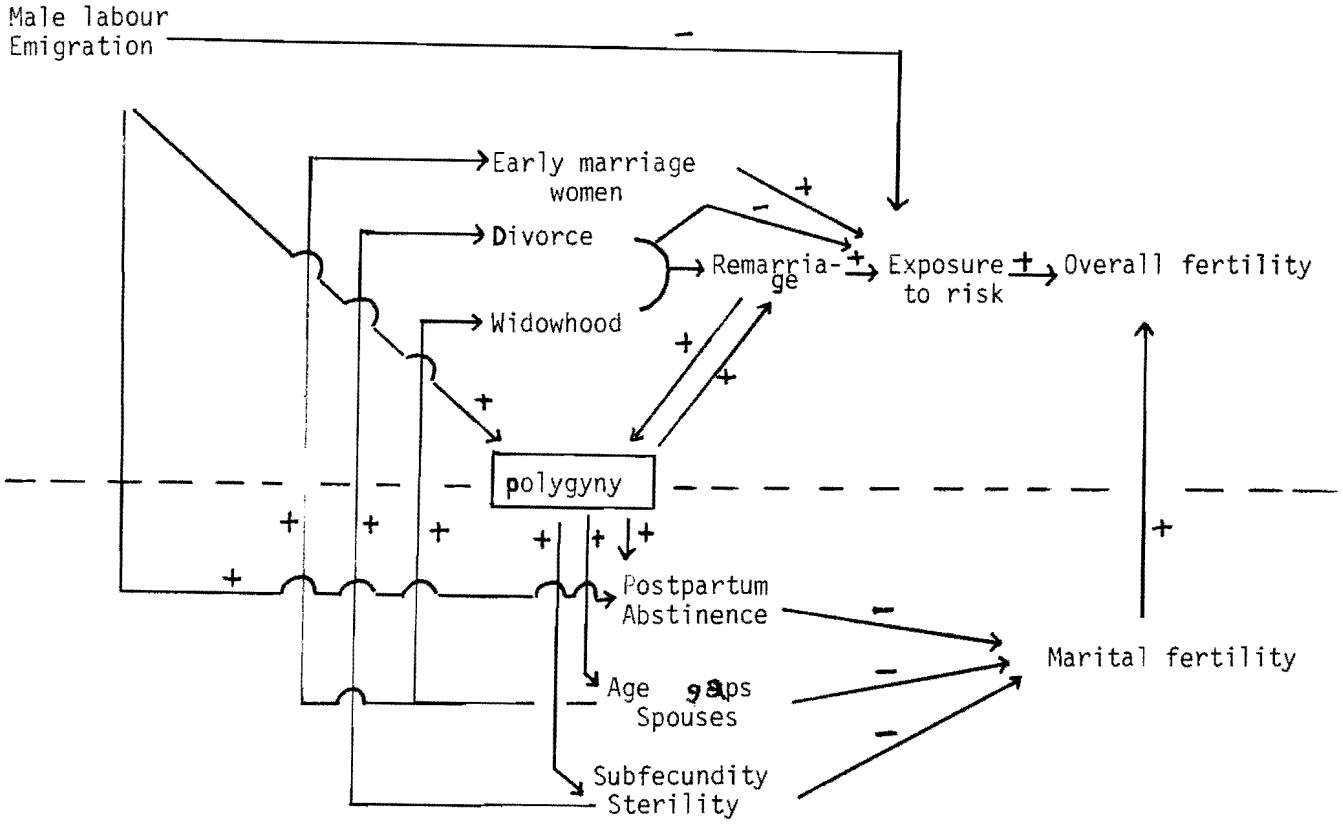


Figure IX : Mechanisms through which Polygyny affects Marital and Overall Fertility Levels.

major contributing factor in determining differentials in overall fertility, simply because the sorting of women into either type of union is not based on differential age at entry but on subsequent fertility performance. However, the comparison of aggregates indicates that polygyny as an institution tends to pull down ages at marriage for all women in conjunction with other factors of a cultural (e.g. Islam) or structural nature (e.g. low female literacy, labour migration, gerontocratic control).

To sum up, the inner arrows in Figure IX (abstinence, age gap, infecundity, divorce, remarriage) operate both on the individual as well as on the societal level; the outer arrow via the age at marriage pattern seems to be much more of a discriminating factor between societies only.

6. Total fecundity

The total fecundity rate is defined as the number of live births women would have on average if they were exposed from age 15 to 50 without resorting to voluntary fertility control (contraception) or spacing via lactational amenorrhoea in excess of 2 months or postpartum abstinence(18). In such circumstances, the total fecundity rate would primarily depend on frequency of sexual intercourse and on patterns of sterility or subfecundity. Classic values for populations that do not have problems of abnormal sterility and subfecundity are of the order of 15 to 16 live births. In natural fertility populations (i.e. not practicing parity dependant restrictions) such fecundity rates correspond approximately with a level of definitive childlessness (i.e. zero live births) of the order of 4-5 percent among women with 15+ years of exposure. There are no reliable

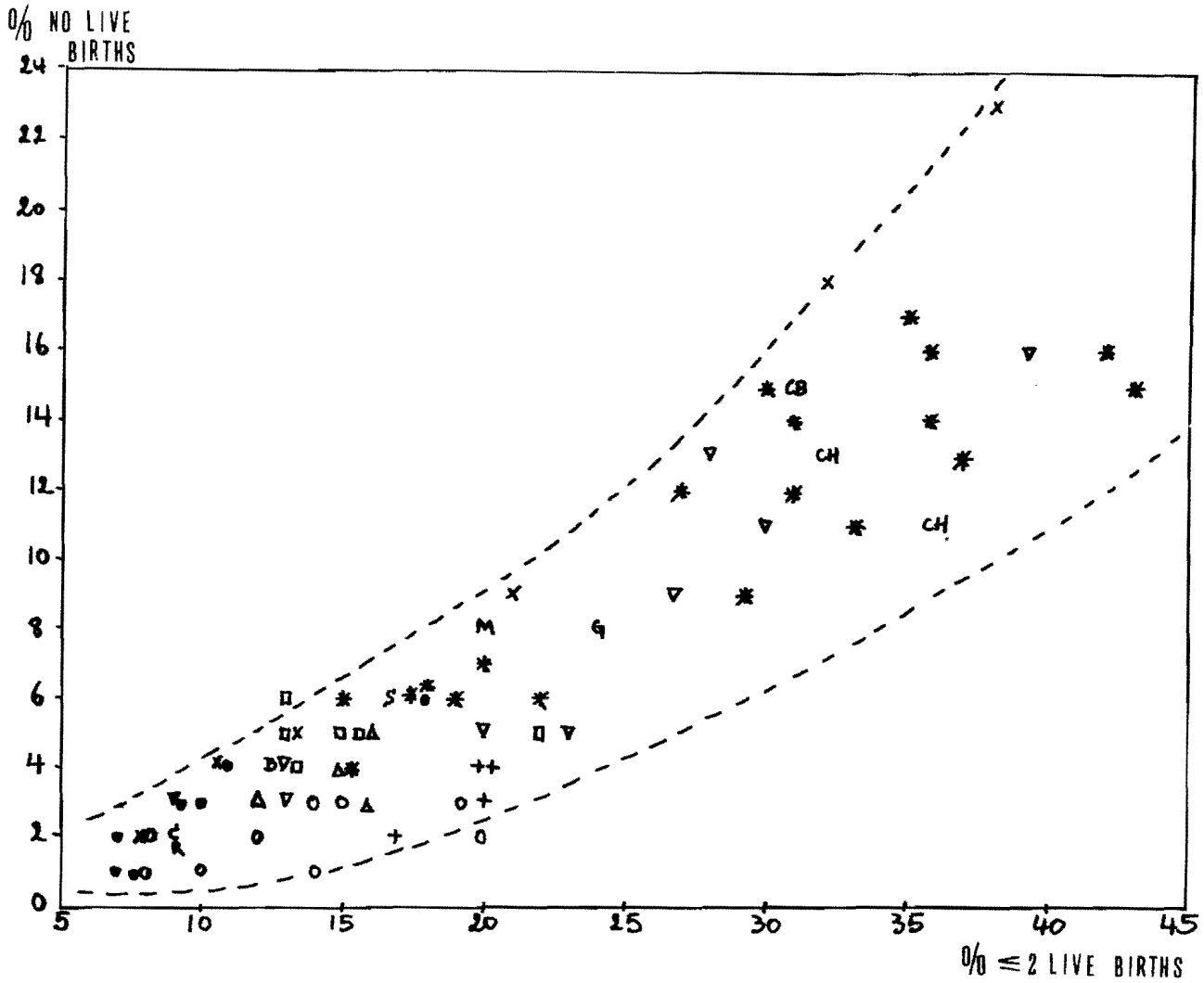
data on the first factor influencing the total fecundity rate, i.e. frequency of sexual intercourse. Two common, unverified hypotheses are that such frequencies would be lower among women in polygynous households and among more traditional women (rural, no schooling, secluded, and not exposed to Westernization through mass media). As a consequence, we shall study total fecundity entirely in function of childlessness and sub-fecundity.

The infecundity problem has two dimensions: primary sterility and early secondary sterility. The incidence of primary sterility can be operationalized through the proportion of women with enough exposure who never had a live birth. That of secondary sterility and sub-fecundity is operationalized here by the proportion of such women who do not pass the threshold of 2 live births and who obviously have encountered a problem of achieving a universally desired larger family size. Obviously, primary and earlier than normal sterility or sub-fecundity are correlated, but not as strongly as has often been assumed. In Figure X, the two measures are plotted against each other for a large number of data points from all over sub-Saharan Africa, and the range of possible combinations has been drawn in. Obviously, each of the measurements is subject to error, and this is particularly true for childlessness. This variable is likely to be underestimated: childless women vanish as soon as they know that interviewers are around asking embarassing questions, and those who are contacted very often refuse cooperation. Childless women will therefore very often be found in the "non-response" columns(15). A portion of the spread exhibited by Figure X is differential measurement error, but even if this would account for 50 percent of the spread, there still would be much less than a perfect association. For instance, 5 percent childlessness corresponds to a range of the percentage not progressing beyond 2 children

after 15+ years of exposure from 12 to 25 percent, and 15 percent primary sterility corresponds to a range from 28 to 45 percent not progressing further than 2 children. Conversely, at 20 percent not progressing beyond 2 live births, primary sterility can be comprised between 2 and 9 percent; and at 30 percent, primary sterility varies between 6 and 16 percent. Hence, much of this variation must also depend on the pathology of the problem and on how fast the various causes (ranging from various venerial diseases to malaria) are spread over the population (also cfr. supra, section on polygyny)(20).

Figure X about here

The relationship between the total fecundity rate and the measure of infertility and subfertility is shown in Figure XI, mostly using data from the African WFS-surveys of 1977-79. These surveys allow for the measurement of the total marital fertility rate (TMFR), and for the measurement of the length of the non-susceptible period (postpartum amenorrhoea and abstinence) and current use of contraception. As a result of the fertility reducing action of the latter variables, the TMFR is commonly only about 45 to 65 percent of the total fecundity rate (TF) in sub-Saharan populations (cfr. infra). At this point, measurement problems intervene again: if the TMFR is in error by 0.5 child (and most of them are!), the TF would be in error by 1 child if postpartum non-susceptibility and contraception produce a reduction of the fertility potential by 50 percent (0.5/0.5=1). Hence, a good part of the scatter shown in Figure XI is again produced by amplified measurement error(21). Yet, the Figure shows that the infertility and subfecudity variable accounts for the variation in estimated TF-values to a very significant extent. One can in fact, estimate the level of TF from the percentage of women not having



△	Senegal	✱	Tanzania	CH	Chad
▽	Cameroon	B	Burundi	M	Mauritania
o	Ghana	R	Ruanda	C	Calabar (Nigeria)
+	Lesotho	G	Gambia		
•	Kenya	CB	Congo (Brazza)	X	West Zaire
□	North. Sudan	S	Swaziland		

WFS — Other sources.

Figure X : Relationship between Percentage of Women with Sufficient Exposure who have no Live Births and Percentage who have not progressed beyond 2 Live Births.
Note : Pertains to women aged 35-49 or to women with 15-24 years since first union (WFS-data); Data are for regions or failing that, ethnic groups.

progressed beyond two live births after 15 years of exposure (LE2LB) as

$$TF = 16.5 - 0.225*LE2LB$$

This relationship gives a TF of just over 15 live births for a level of LE2LB of 5 percent(22)(23), and a level that drops to as low as 8 or 9 live births if LE2LB goes beyond 30 percent. Such a considerable stortfall has definitively been associated with the low fertility zone in Central Africa (see Figure I). More recent surveys detected an equally important problem in the Malagasy Republic (1966) and Tanzania (1973). In the former, childlessness for women 30-49 is 17 percent, which, judging from the data on Figure X, implies a minimum level of LE2LB of 30 percent and hence a TF below 10, possibly below 9. The LE2LB-value for Mainland Tanzania (women aged 30-49) was 28 percent, again implying a TF of the order of 10 live births only. Furthermore, in 12 of the 19 regions, the TF estimated via the equation on Figure XI is below 12 live births and drops as low as 8 or 9 in six regions (Coast, Dar Es Salaam, Lindi, Singida, Tabora, Shinyanga). In such settings, the effect of health problems causing sterility and sub-fecundity in reducing fertility is larger than that of lactational amenorrhoea, postpartum abstinence and contraception combined.

Figure XI about here

For some areas, the evolution of primary sterility can be reconstructed from one or more data sets on childlessness by age. There appears to be <u>at least</u> a double pattern in the trends. First, in the high infecundity zone of Central Africa, regional data for Zaire (1975-76) and Cameroon (1978) show a very marked decline from levels of 30-40 percent childlessness to new levels of only 10 percent. Second, in the East

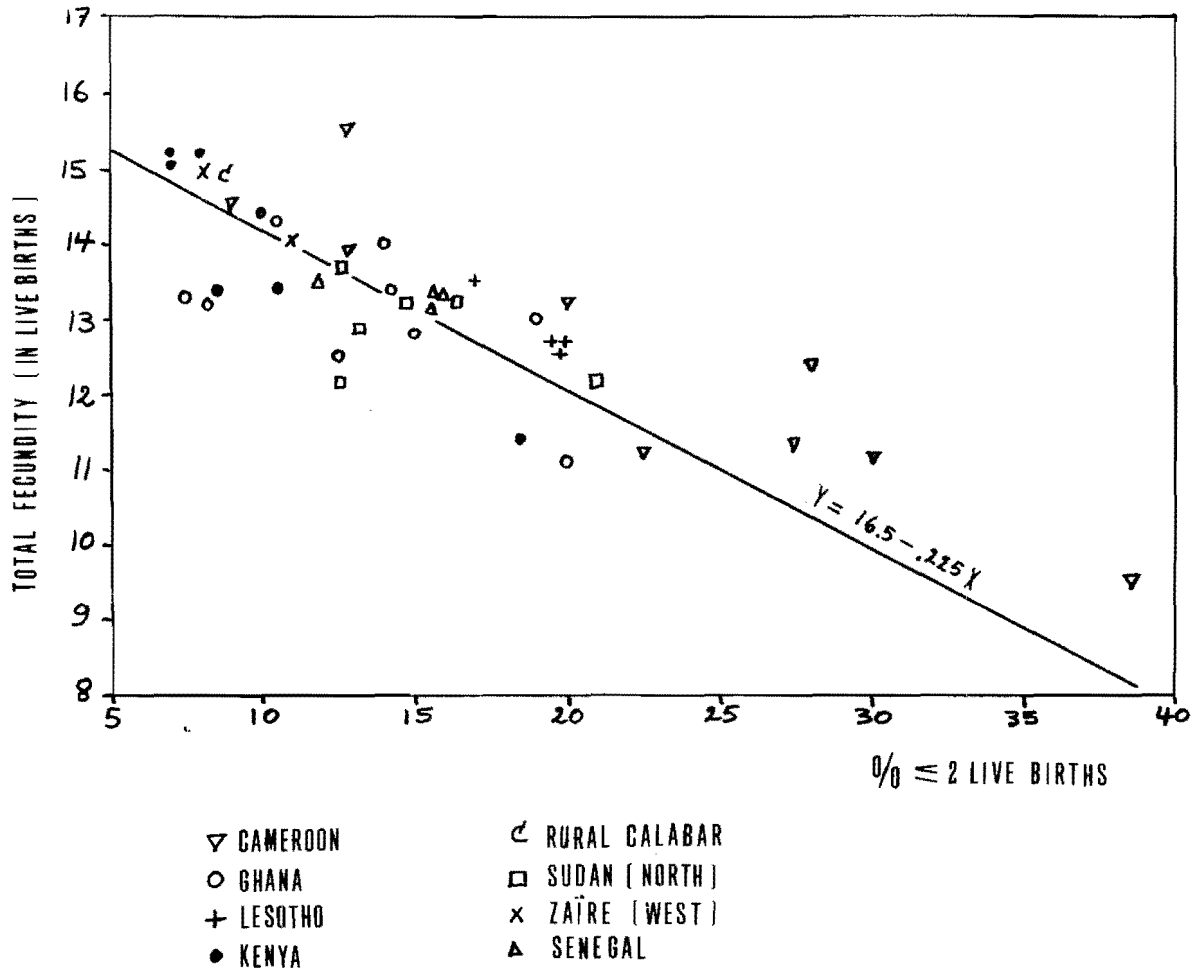


Figure XI : Relationship between Total Fecundity and Percentage of Women with Sufficient Exposure who have not progressed beyond 2 Live Births.
Note : Sufficient Exposure = aged 35-49 or 15-24 years since first marriage (WFS-data); Data are for regions.

African zone of low fertility (e.g. along the Coast) original levels of childlessness of the order of 10-20 percent for women beyond age 30 have either remained as high or have dropped by a few percentage points only. Reductions from levels above 15 percent to a new "normal" level of 5 percent or less are exceptional.

The data for 3 Zairois regions are shown in Figure XII and stem from 2 surveys spaced at a 20 year interval. Cohorts born before 1930, and hence procreating during the 1940's and 50's had a childlessness percentage of 40 in the regions of Equateur (shown in Figure XII) and Tshuapa (not shown). Cohorts born after 1930 but before 1940 reduced this level at a very rapid pace, thereby considerably increasing fertility during the 1960's and early 1970's. With minor changes in the marriage pattern, the TFR in Equateur and Tshuapa increased in the interval between these two surveys from about 4 to 6 and the birth rate from 32 to 39. Other areas in Western Zaire with high levels of childlessness followed a similar pattern with a steep drop of infecundity from the late 1950's onward (Kinshasa from 35 to 6 percent; Mai-Ndombe from 18 to 6; West Kasai from 16 to 7). Even in Bas-Zaire, with low levels to start with, a small reduction has been observed.

Figure XII about here

The other data for the central African zone come from Cameroon (W.F.S. - 1978) and are presented in Table XX by duration since first union. Assuming a mean age at marriage of about 17, women with 30 or more years of exposure were procreating before 1960. At that time they had sterility levels of 30 percent in two regions (North, Central-South) and of just over 20 percent in the nation as a whole. A 10 percentage point

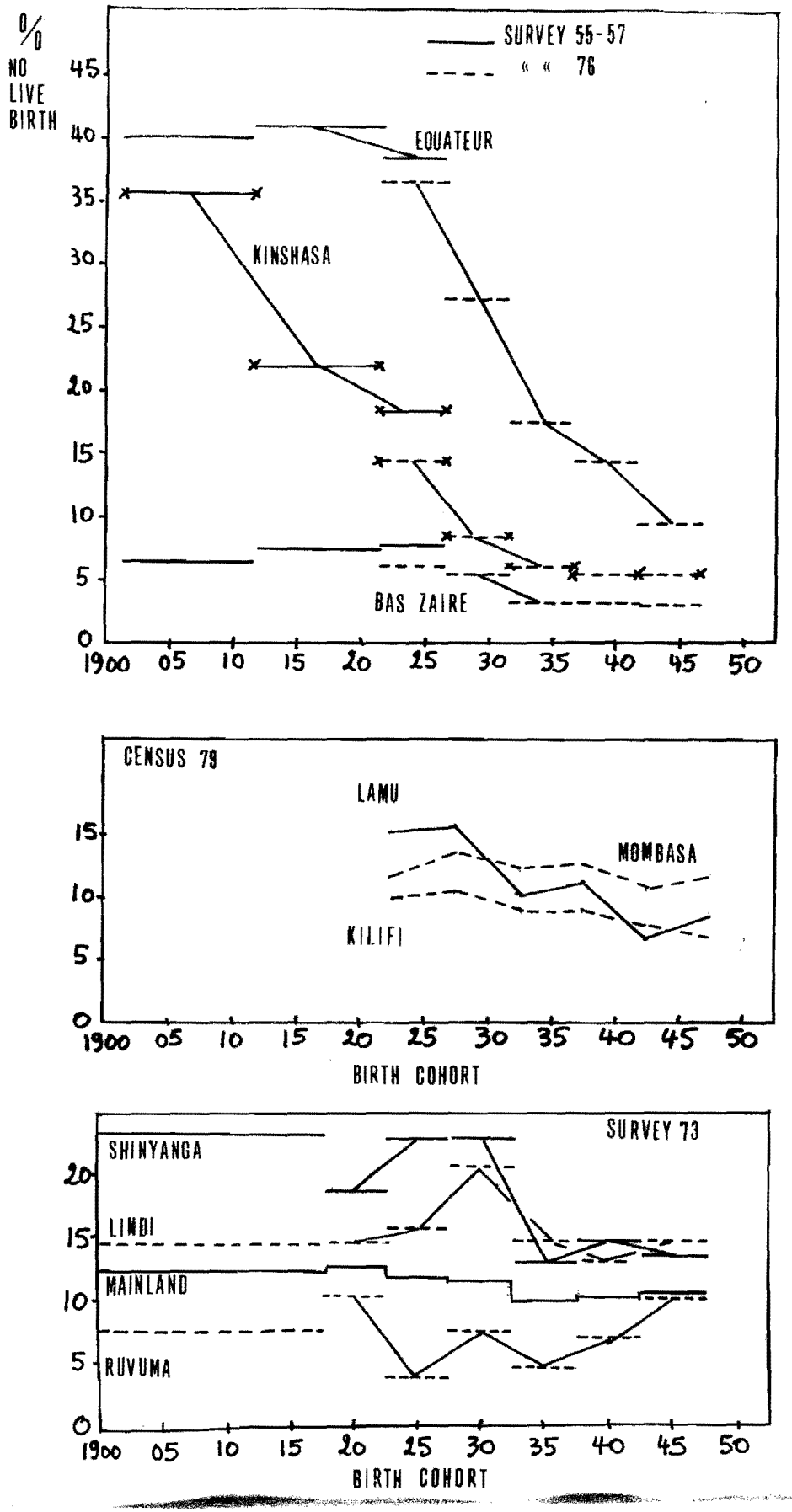


Figure XII : Changes in Percentage Women with Sufficient Exposure but without a Live Birth, by Birth Cohort; Selected Regions of Western Zaire, Kenyan Coast and Tanzania.
Note : Sufficient Exposure = aged 35-49.

reduction in childlessness occurs to women in the marriage duration category 25-29, who are now on average in their middle fourties and who were contributing their fertility from the late 1950's onward. The pattern of the decline in primary sterility and the increase in marital fertility levels is hence of a directly comparable nature to the pattern in West Zaire.

Table XX about here

The East-African material shows far less spectacular results. Of course, the starting levels were only half as high as those of Central Africa (i.e. 10 to 20 percent primary sterility), but in most regions they remained above the 10 percent level. The data for Tanzania stem from the national demographic survey of 1973 (and are old by now), but they do not show any major reduction for women procreating during the 1960's: on the national level, the proportion childless dropped by less than 2 percentage points. The only area with a substantial decrease seems to be Shinyanga in North-West Tanzania with a drop of 10 percentage points (from 23 to 13), but the other high sterility districts have had only half as much, as can be seen from Table XXI and Figure XII. The implication of this in combination with a nearly constant level for the Mainland as a whole is obviously that all medium-level areas have not had any improvement at all and are oscillating around levels of 7 to 13 percent. The story for the Kenyan Coast is similar. Judging from te census results for 1979, only the district of Lamu had a significant drop (from 14 to 6 percent among ever married women), but the situation in Mombasa hardly changed over a period of at least 25 years (see Figure XII and Table XXII). In the Sudan, finally, an improvement has occurred in the Western region of Darfur (see Table XX) with a sudden drop from 12 to 5 percent primary sterility among

Table XX : Percent of Ever-Married Women without a Live Birth by Age and Duration since First Union; Data from 6 WFS-surveys, 1977-79.

	Age and Birth Cohort					
	50-54	45-49	40-44	35-39	30-34	25-29
	1918-23	1923-28	1928-33	1933-38	1938-43	1943-48
Cameroon 78	27.4	13.7	10.8	11.4	9.6	11.0
Sudan 79	-	8.6	6.5	5.3	5.4	7.5
Lesotho 77	-	4.1	5.8	4.2	3.3	6.0
Senegal 78	-	3.5	3.5	3.4	4.4	4.1
Kenya 77-78	-	2.8	3.5	1.6	2.5	4.6
Ghana 79	-	2.1	2.6	1.0	4.2	5.8

	Duration since First Union				
	30+	25-29	20-24	15-19	10-14
Cameroon 78	22.5	13.6	11.2	8.6	11.2
- North	30.9	20.0	16.5	12.5	18.2
- Central south	30.6	21.0	19.1	10.5	9.1
Sudan 79	8.7	7.3	4.2	3.7	6.2
- Darfur	(11.3)	12.3	5.0	5.6	4.0
Lesotho 77	6.6	9.1	6.3	5.8	3.8
Senegal 78	3.2	3.1	2.4	4.0	4.1
- West	7.7	3.1	2.7	2.8	2.7
Kenya 77-78	3.1	3.2	1.8	1.9	3.7
- Coast	6.5	6.2	5.4	3.4	7.5
Ghana 79	0.6	1.7	2.1	1.4	2.9
- Upper	3.8	2.1	4.2	1.1	5.2

Note : the value between parentheses is based on less than 50 women; regional data are only given for the highest infertility zones within a country; levels of childlessness have almost certainly been underestimated in Ghana.

women marrying in the late 1950's versus those marrying before 1955. In this way, the Darfur experience is similar to that of Central Africa.

Tables XXI and XXII about here

The commonly cited cause for the reduction in infecundity is the spread of the useage of antibiotics. These may have cured a number of venerial disease patients, but they have essentially prevented the spread of such diseases and broken the feed-back mechanism between polygyny and infertility. In East Africa other factors may have alleviated this effect, otherwise levels of primary sterility should have fallen to 5 percent or lower. Finally, it should be stressed again that data for many other regions in Africa are lacking and that the available material measures the trend almost as an exercise in historical demography (women must have had long enouth exposure to measure definitive childlessness). Some medical authorities fear that infertility and sub-fecundity are increasing in major urban areas, and also in remote regions which are no longer reached by medical supplies. Breakdowns in the supply channels and the present economic crisis are certainly not improving the current situation(24). In short, the trends seem to have gone in the right direction - and in some areas in a much more spectacular way than in others - but the battle is not yet won.

7. Demand-side variables

So far we have only considered factors affecting exposure and natural fertility under the assumption that no alteration in behaviour took place aimed at restricting the number of children in function of the number

Table XXI : Percent of All Women without a Live Birth by Age; Selected Areas of Tanzania,1973

	Age						
	25-29	30-34	35-39	40-44	45-49	50-54	55+
i) Areas with high levels							
- Lindi	14.4	13.1	14.6	20.6	15.6	14.7	14.6
- Coast	11.4	12.2	15.3	13.2	14.9	16.9	16.6
- Dar Es Salaam	15.8	15.6	12.6	14.6	18.3	16.0	19.1
- Shinyanga	13.6	14.8	12.6	20.6	20.4	18.7	23.4
- Tabora	13.7	15.8	18.6	15.9	15.0	14.8	16.7
ii) Mainland Tanzania	10.8	10.2	9.8	11.1	11.7	12.7	12.6
iii) Areas with low levels							
- Iringa	6.6	5.6	3.1	4.3	6.6	5.7	12.0
- Kilimanjaro	12.8	6.0	5.7	6.1	5.4	8.3	6.2
- Ruvuma	10.8	7.0	4.6	7.5	3.4	10.4	7.4

Table XXII : Percent of All Women and of All Ever Married Women by Age without a Live Birth; Data for 3 High Infertility Areas in Kenya, 1979 Census

	Age					
	30-34	35-39	40-44	45-49	50-54	55-59
i) All women						
- Lamu	8.6	6.6	11.1	10.1	15.3	15.0
- Kilifi	6.6	7.5	8.9	8.9	10.2	9.9
- Mombasa	11.7	10.6	12.4	12.1	13.5	11.7
ii) Ever Married Women						
- Lamu	6.6	5.6	10.3	9.3	14.7	14.2
- Kilifi	6.1	7.1	8.6	8.7	9.8	9.6
- Mombasa	8.1	7.6	9.9	10.0	11.6	10.1

already born or alive. Such factors constitute the supply side. At the other side of the balance we find variables that measure fertility preferences for the various cohorts. If these happen to lead to a desired family size which is equal to or smaller than the number already available, one would expect that also a set of contraception related variables would gain importance. Aside from contraceptive use for stopping, women have also preferences with regard to the timing of their fertility, which may again lead to contraception if the traditional patterns of child-spacing appear to be impractical. Hence, preferences are not only of relevance with respect to intensity of fertility but also with respect to the length of birth intervals. Preferences are shaped by the economic value of children, costs associated with child-rearing (including costs of time), emotional factors entering both on the benefit as well as the cost-side, relative income etc. (see Easterlin, 1980, for a complete list). Preferences can be influenced from outside, and on a societal level changes in the normative cultural code (religion, traditionalism) are of major importance. The pace of these changes is not only determined by alterations in preferences at the micro-level, but also by national policies and ideological factors underpinning it. Until recently most African leaders were convinced that large amilies were ideal and that family planning was an alien concept. More recently, however, they seem to have become consderably more aware of the demographic growth problem, and have realized that contraception is a necessity in replacing the older props of child-spacing.

In short, preferences measured at the individual level not only capture a micro-economic setting but also a major ideational component operating at a societal level.

7.1. Family size preferences

Surveys in sub-Saharan Africa have paid a great deal of attention to the supply side - for understandable and fully justified reasons -, but have spent little effort in measuring fertility preference in an adequate way. Small scale surveys probing into the motivations behind preferences also exist (e.g. Caldwell & Caldwell, 1981) but are more typical for urban than for rural settings.

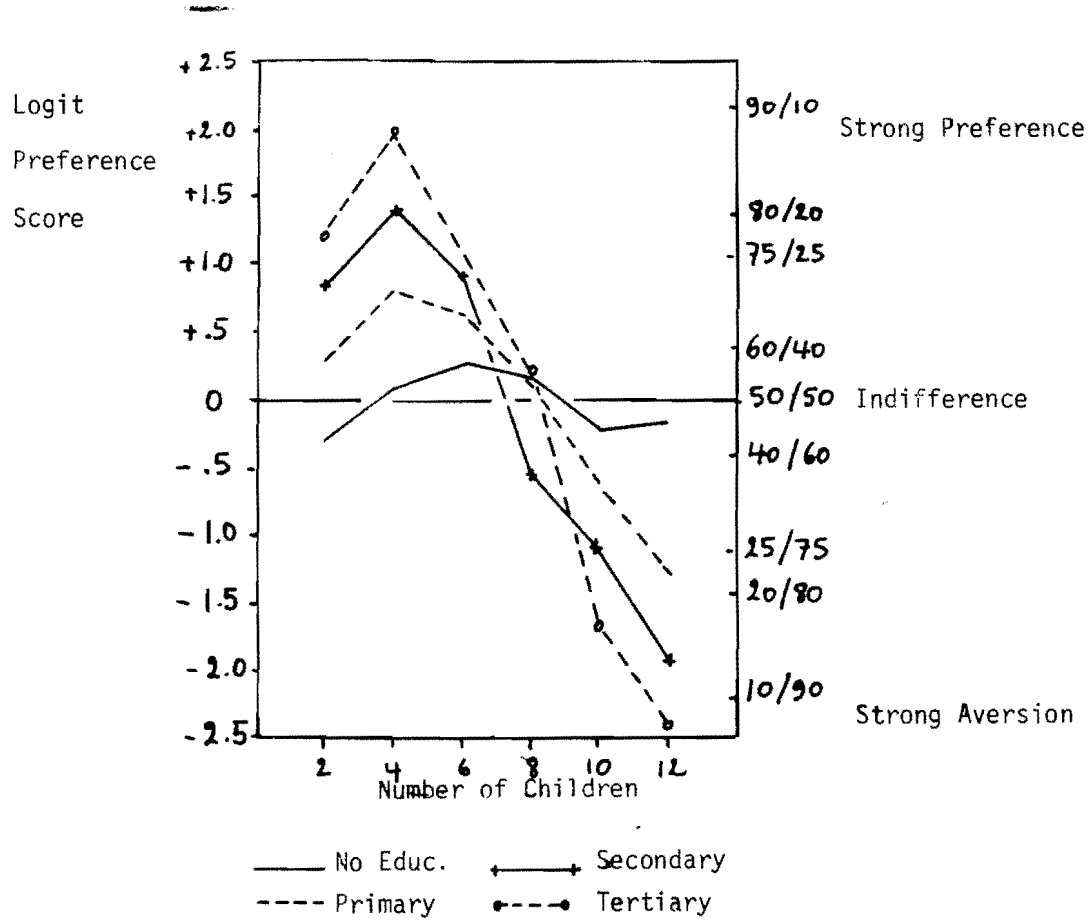
The measurement of family size preferences through a single question expecting just one numerical answer is inadequate for a variety of reasons. First, it picks up a tiny piece of information only. If preferences would range from 2 to 12 children, producing 10 possibilities, the total non-redundant information available is 45 bits: if all possibilities are evaluated against each other in pairs, a total of (10*9)/2=45 pairs can be obtained and for each pair 1 unit of information (=1 bit) is obtained. The picking of just 1 out of 10 possibilities yields 3.3 bits and leaves the remainder of 41.7 bits unused. Ranking produces considerably more information and with full ranking of 10 possibilities 22 bits are obtained. Coombs' unfolding technique is better still (it includes sex preference) and full pairwise comparison yields the total amount of non-redundant information. Second, non-numerical answers of the "Up to God" or "As many as possible" type are not often followed by a probe (if God would let you choose, how many would you then wish to have?) and are dropped from the calculation of means. Experience with a probe indicates that the vast majority starting with a "Up to God" answer readily produces a numerical one subsequently or moves to the "As many as possible"-category (in Lagos only 2 percent out of the original 20 percent

"Up to God"-answers stayed with their original reply, see Lesthaeghe, Page & Adegbola, 1981). Third the failure to explore the available information when adopting the "pick 1 number"-type of question leads to an unjustified reliance on mean values. Preferences are by no means always articulated and a broad range may exist within which there is essentially indifference. Results from Lagos (1975) for example indicate that illiterate women had an aversion for 2, 10 and 12 children when presented a pairwise comparion test, but that very little preference differentiation occurred in the range 4-8. Also, they preferred overshooting the modal choice of 6 children rather than remaining below that level. With increasing education levels, choices became much more articulated: preferences and aversions were more focussed ad inconsistencies in the scoring pattern dropped(25). For women with incomplete primary education up to those wih full secondary, the 4-child ideal moved to the first rank of preference, followed by 6 and 2. The gap between illiterate and some education was one of the striking findings at that time. Finally, for women with university or other post-secondary education, the 2 child-family moves up to the second rank, but 4 enjoys an overwhelmng popularity. The Lagos preference scores are plotted in Figure XIII as they constitute one of the rare instances of quantitative measurement of the entire pattern in an African population. The scores are stated in logit form on the Y-axis.

Figure XIII about here

A score of zero indicates that a family size of $\underline{i}$ children is picked in 50 percent of all instances where size $\underline{i}$ is present in a pair. With an equal chance of being picked or rejected, there would be no preference or aversion. A score of +1.10 gives a 75-25 ratio of being picked and a score of -1.10 a 25-75 rejection ratio; a score of 2.20 corresponds to an

Figure XIII : Logit Preference Scores for Alternative Desired Family Sizes, by Education; Lagos 1975.



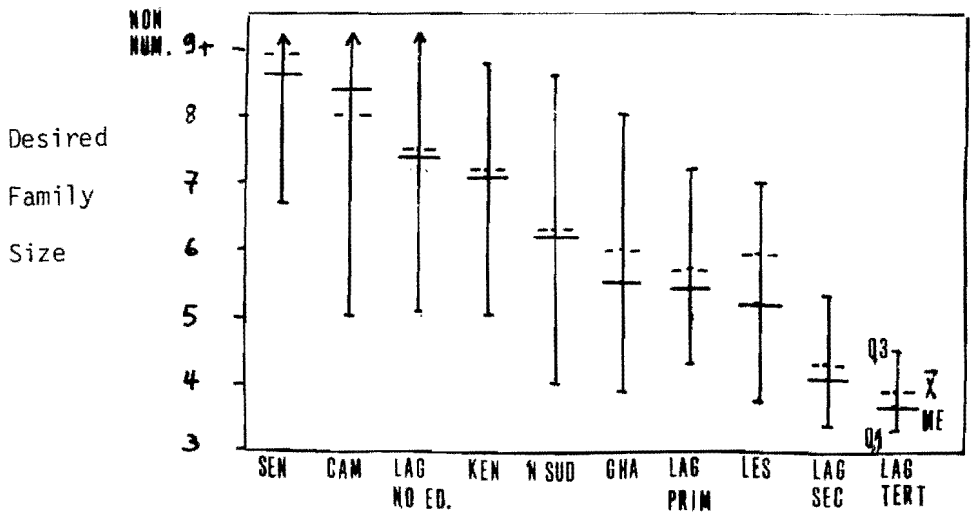


Figure XIV : Distribution Characteristics for Verbally Stated Desired Family Size, WFS-Countries 1977-79 and Lagos Education Groups, 1975.
Note : Data are for ever-married women.

outspoken preference of the 90-10 order. The logit scale implies that a move away from the 50-50 indifference split is relatively easy to achieve at first, but that ratios more extreme than the 75-25 are indicative of an acceleration in preferences or aversions. The Lagos results show such large variation with rising education that they can be used as a point of comparison. The W.F.S.-data allow for the calculation of quartiles and medians of the verbally stated preference distributions, and these can be compared with similar data for Lagos in Table XXIII and in Figure XIV.

Table XXIII and Figure XIV about here

Despite the fact that the measurement of preference patterns is not adequately achieved through picking just one value, the distributions of such values show a very large range for the 6 W.F.S-countries. At the traditionalist end of the scale, mean and median values reach 9 children, the first quartile is above 6 and the third quartile ends in the 9+ or non-numerical zone. As one progresses on the modernization scale, the first quartile and the median are lowered, but the third quartile still hangs in the zone of undefined large family sizes. With further lowering of the median to about 5-6 children, also the third quartile comes down, and near the end of the scale, a medium of about 4 children is reached with a considerably reduced spread. Characteristic is, however, that preferences below 4 children are only found among a portion of urban females with atypically high education (full secondary and beyond). Among the W.F.S.-countries, Senegal has by far the most traditionalist pattern for the country as a whole, followed by Cameroon. Ghana and Lesotho are mid-way with medians below 6, but third quartiles still around 7-8. Also note that Kenya has a more traditional pattern than the Islamic Northern half of the Sudan.

Table XXIII : Distribution Characteristics of Verbally Expressed Desired Family Size : Comparison of the WFS-Results for Ever Married Women with the 4 Lagos Patterns, 1975-79

	1st Quartile Q1	Median Me	3rd Quartile Q3	$\bar{X}$ numerical $\bar{X}$
Lagos 1975				
- No education	5.1	7.4	As many as poss.	7.5
- Partial & Full Primary	4.3	5.4	7.2	5.7
- Partial & Full Secondary	3.4	4.1	5.3	4.3
- Tertiary	3.3	3.7	4.5	3.9
Lesotho 77	3.7	5.2	7.0	5.9
Ghana 79	3.9	5.5	8.0	6.0
Sudan 79	4.0	6.2	8.6	6.3
Kenya 77-78	5.0	7.1	8.8	7.2
Cameroon 78 (a)	5.0	8.4	non numerical (b)	8.0
Senegal 78	6.7	8.6	non numerical (b)	9.0

Note : (a) as a result of an error in the filter questions only 2/3 of ever married women were asked the question on desired family size;

(b) non-numerical answers are most commonly "Up to God" or "As many as possible".

Part of the spread shown in Figure XIV is also due to cultural heterogeneity within a given country. Obviously, the regional patterns in Lesotho hardly move away from the national average, but those in Cameroon are very heterogeneous. Some data for subregions within each country are given in Table XXIV for currently married women. The average desired number of children, based on numerical answers only, reaches no less than 10 children in two major regions of Cameroon (West and North-West) and in one region of Senegal (South). Averages above 8 were found in the Northern region of Ghana, the Coast province of Kenya, the North-Eastern region of Senegal, and in 3 more regions of Cameroon (Littoral, South-West and Douala). Averages below 6 on the other hand were typical for the Southern part of Ghana (Accra, Western, Volta), Lesotho (Lowlands and the Orange River Valley), for Nairobi, Lagos and Khartoum. Yaounde had not joined this group of capital cities ($\bar{X}$=7.2).

Table XXIV about here

The age pattern of average desired family size and of percentages non-numerical answers provide some - albeit limited - additional information. Obviously, desired family sizes are adjusted upward as child-bearing continues and the differences between averages for age groups are not differences between cohorts at identical ages. Conversely, however, any lack of difference in desired family size between older and younger women is an indication of prolonged traditionalism. The results for Senegal fit the bill again: there is hardly a drop in average desired family size for very young women and 20 percent or more give non-numerical answers. The same holds for Cameroon above age 20 (see Tables XXV and XXVI). Not only the living standards, the value of children or Islam have

Table XXIV : Average Desired Number of Children for Currently Married Women, National Levels and Extreme Values for Regions; Data from 6 WFS-Surveys; 1977-79.

National		Lower		Highest	
Cameroon (a)	8.0	East	6.3	North-West	10.1
		North	6.5	West	10.9
Senegal	8.9	West	7.9	North-East	9.1
		Central	8.7	South	10.4
Kenya	7.3	Nairobi	5.8	Rift Valley	7.9
		Central	7.1	Coast	8.3
N.Sudan	6.4	Khartoum	5.6	Kordofan	6.8
		Northern&Nile	6.0	Darfur	7.0
Ghana	6.1	Greater Accra	4.9	Upper	7.2
		Volta	5.8	Northern	8.7
Lesotho	6.0	Lowlands	5.8	Mountain	6.2
		Orange Riv.V.	5.9	Foothills	6.4

Note : (a) Due to an error in the filter questions, only half the number of currently married women were asked the question on desired family size.

produced this traditionalist pattern: Northern Sudan is equally Islamic and enjoys no better living conditions, but it has a highly different pattern (even more "modern" than that of Kenya). Rather, governmental hostility toward family planning in the past has contributed to the maintenance of this traditionalist preference structure(26)(27).

Tables XXV and XXVI about here

7.2 Current use of contraception as related to family size preference

There is obviously a relationship between preferences and action in the form of contraception, but there is also a very large gap. In order to bring out patterns we shall primarily use three variables: desired family size or proportions of women who wish to stop child-bearing at a given parity, knowledge of contraception and current use.

At the level of regions, several observations can be made:

i) It would be a crucial mistake to assume that methods of contraception (other than abstinence and local folk methods) are widely known. As documented in Table XXVII, there are still many regions left in Africa in which the vast majority of the population has never heard of any of the various methods of contraception (withdrawal, rythm, condom, douche, foam, diaphragm, pill, injection, IUD, sterilization). The percentages of a total lack of knowledge are particularly high in the Muslim regions (except for large cities such as Khartoum). They are particularly low in the whole of Kenya and the southern part of Ghana.

Table XXV : Average Desired Number of Children for Currently Married Women, by Age; Data from 6 WFS-Surveys, 1977-79.

	Age							
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	All
Lesotho 1977	5.6	5.4	5.6	6.0	6.5	7.0	7.1	6.0
Ghana 1979	5.2	5.2	5.5	6.3	6.9	7.2	7.3	6.1
N.Sudan 1979	5.4	5.4	6.0	7.0	7.1	7.4	6.8	6.4
Kenya 1977-78	6.6	6.4	6.8	7.3	8.1	8.2	8.7	7.3
Cameroon 1978 (a)	6.5	7.8	8.1	8.2	7.8	8.3	8.6	8.0
Senegal 1978	8.8	8.4	8.7	9.2	9.1	9.4	9.2	8.9

Note : (a) Due to an error in the filter questions, only half the number of currently married women were asked the question on desired family size.

Table XXVI : Percent Non-Numerical Answers given by Currently Married Women to the Desired Family Size Question, by Age; Data from 6 WFS-Surveys, 1977-79.

	Age							
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	All
Lesotho 1977	2	1	2	2	2	3	3	2
Ghana 1979	12	11	10	12	13	11	13	11
N.Sudan 1979	16	12	14	19	24	20	28	18
Kenya 1977-78	11	12	18	21	23	25	26	19
Senegal 1978	22	20	30	31	34	38	36	29
Cameroon 1978 (a)	17	37	31	31	36	38	31	33

Note : (a) Due to an error in the filter questions, only half the number of currently married women were asked the question on desired family size.

Table XXVII about here

ii) Knowledge of contraception is a necessary condition, but not a sufficient one to increase current use. This is eloquently shown by the data in Figure XV on the percentage of currently married women using any method of contraception (including abstinence and in Senegal even the "gris-gris"(28)) plotted against the percentage of ever married women who had no knowledge of any family planning method. The Kenyan data points are particularly striking in this figure: they show that a nearly universal knowledge of at least one method can be combined with levels of current use that are as low as the levels for areas where 70 percent or more of women have no knowledge whatsoever. The Kenyan problem is not ignorance but low use-knowledge ratio's . At comparable levels of knowledge, Ghanaian populations for instance have much higher user levels.

iii) The link between desired family size and current use of contraception is shown in Figure XVI. Here, the data points for the regions of the 6 W.F.S.-countries do not just fall below a single line (a use-knowledge threshold as in Figure XV) but they are sandwiched between two lines. The upper one (line"A") indicates that high desired family sizes (extending from 8 to as far as 11 children on average) are clearly associated with low levels of current contraceptive use. The bottom line ("B") shows that only a reduction of desired family size below a mean of 6 children is accompanied with a rise in current contraceptive use. Part of the problem in sub-Saharan Africa is that preferences do not commonly fall below the average of 6 and another part is that the associated rise in current

Table XXVII : Percent of Ever Married Women who have never heard of any Type of Contraception; National Levels and Extreme Values for Regions; Data from 6 WFS-Surveys 1977-79

National		Lowest		Highest	
Cameroon	66	Central South	29	North	88
		Yaounde	23	West	77
N.Sudan	49	Khartoum	18	Darfur	78
		Northern & Nile	29	Kassala & R.Sea	62
Senegal	40	West	33	Central	40
		South	35	North-East	55
Lesotho	35	Lowlands	29	Foothills	41
		Mountains	34	Orange River Valley	41
Ghana	31	Greater Accra	7	North	78
		Volta	4	Upper	78
Kenya	12	Central	4	Coast	15
		Nairobi	6	Rift Valley	11

contraceptive use is rather moderate in the areas where the 6-child preference threshold is crossed(29).

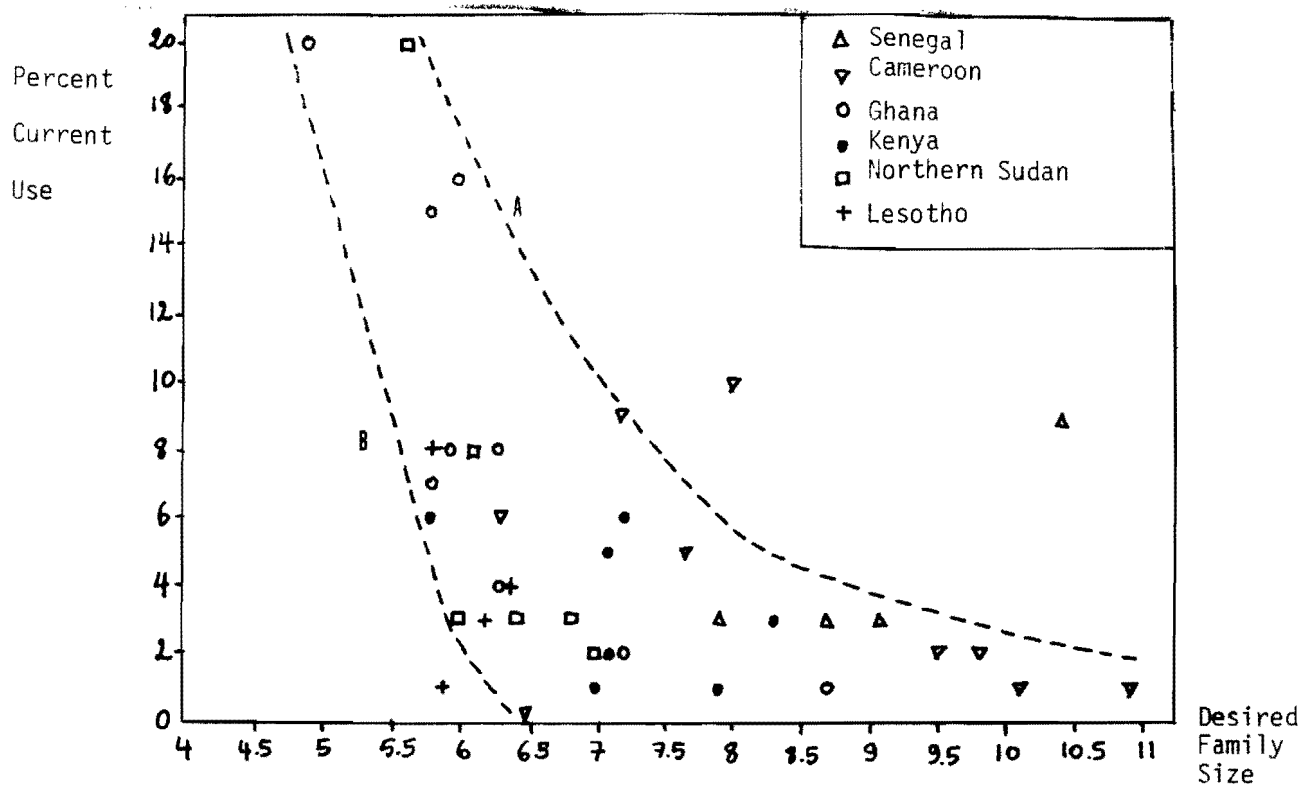
Figure XVI about here

iv) Average desired family size and levels of ignorance of any method of contraception are also linked, but as shown in Figure XVII, there exists more than one pattern. Along line "A", we find the Kenyan regions with their typically high levels of knowledge, but also relatively high levels of desired family size. Line "B" is typical for Cameroon and Senegal. Here, ignorance about contraceptive methods and rising average desired family size are very clearly associated. Line "C" finally captures essentially the regions of Ghana, Sudan and Lesotho with relatively low levels of desired family size, but spanning the full ignorance range. This typology with three dominant types of slope may of course vanish when other data points for more countries are added, but they show at least that a clustering occurs within broad geographical and cultural zones. They also show that on the level of the entire continent the positive association between desired family size and contraceptive ignorance is covered by a very wide spectrum of slopes. In this spectrum, some populations have essentially an " ignorance problem "(line "C"), some others have a" high fertility preference-problem" (line "A") and the third group has both (line "B").

Figure XVII about here

Two major dimensions have been neglected so far: the number of living children and the proportion of women who wish to stop childbearing

Figure XVI : Plot of Percentage Currently Married Women Currently Using Contraception against Average Desired Family Size; Data for Regions in WFS-Countries, 1977-79.



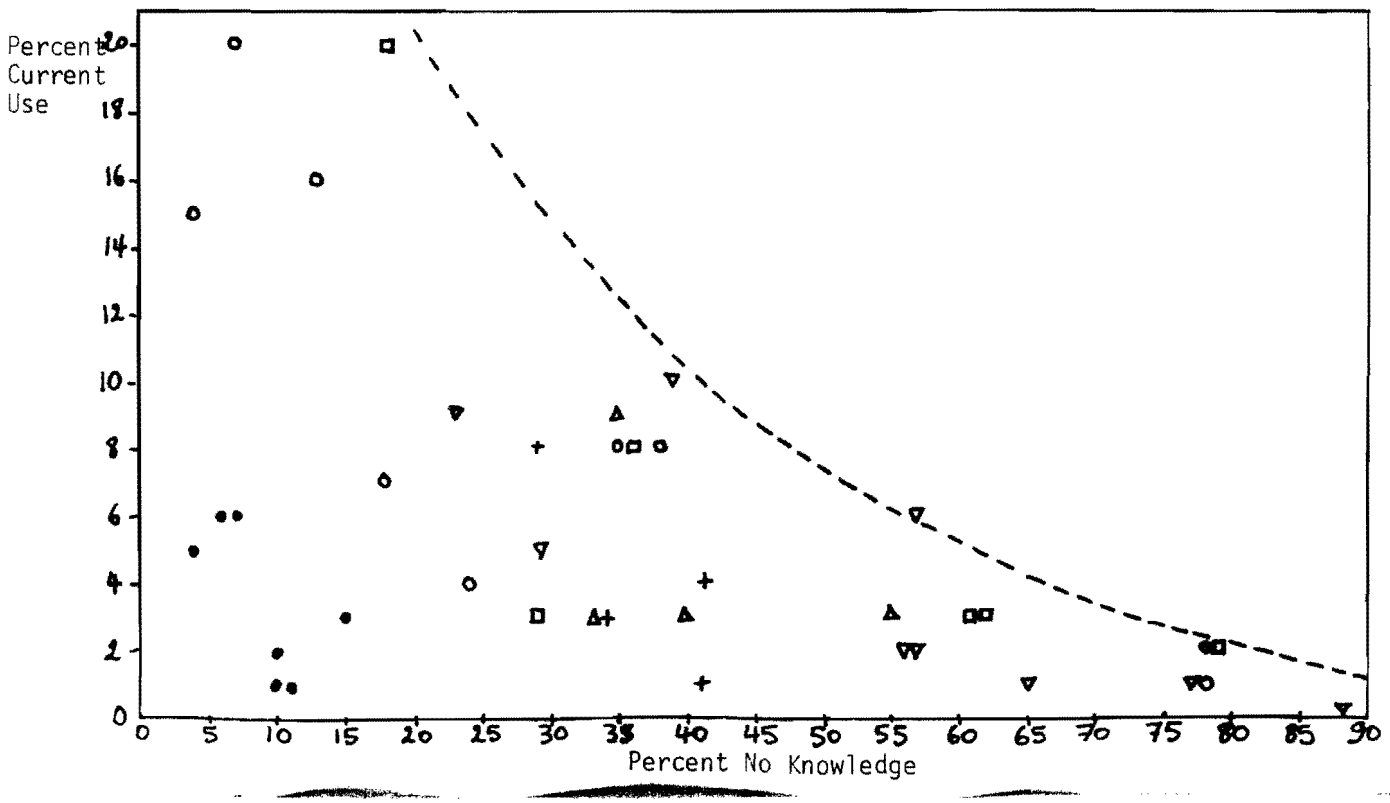


Figure XV : Plot of Percentage of Currently Married Women Currently Using Contraception against Percentage of Ever Married Women with No Knowledge of Any Method of Contraception; Data for Regions in WFS-Countries, 1977-79.

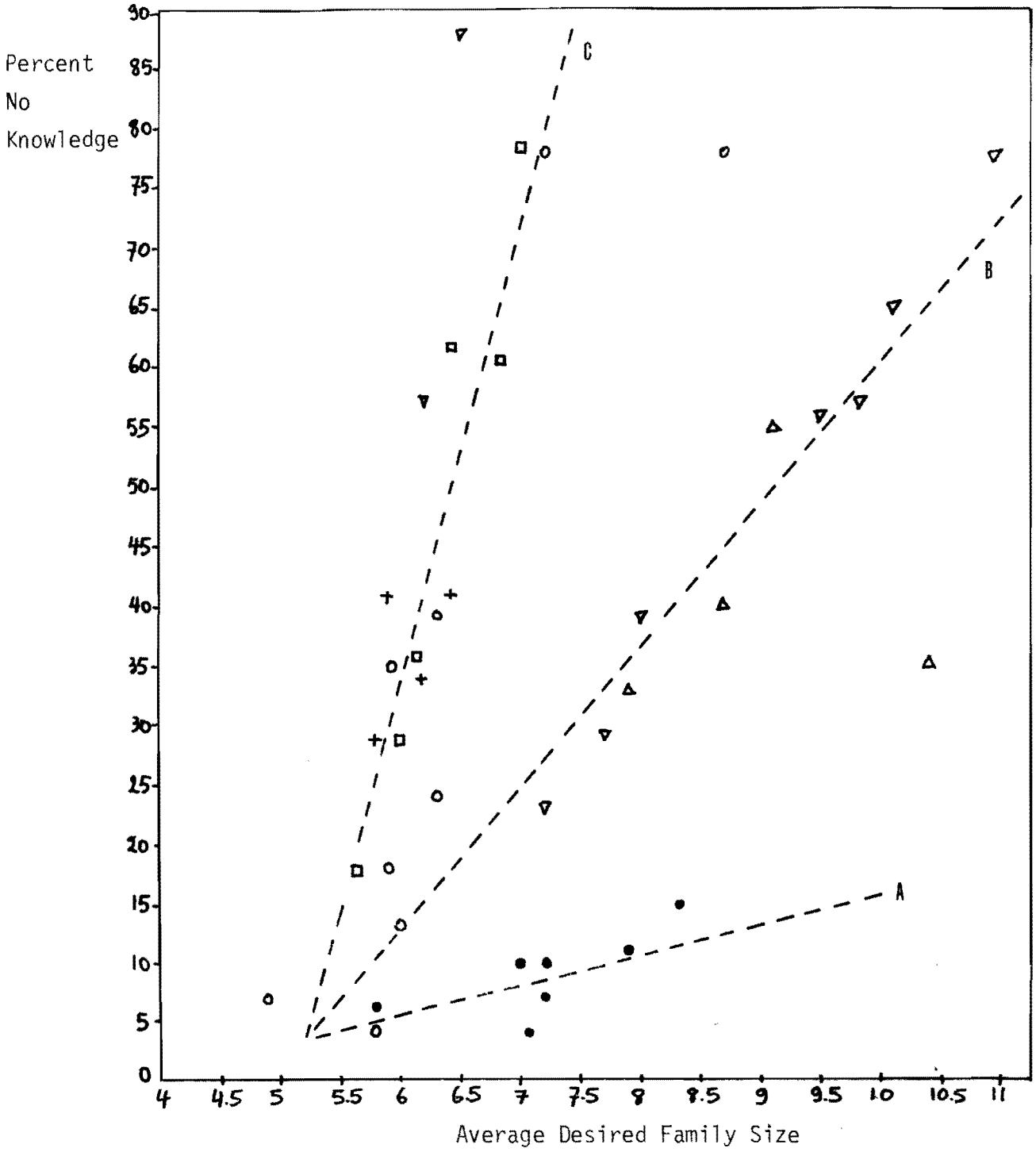


Figure XVII : Plot of Percentage of Ever Married Women who have No Knowledge of Any Contraceptive Method against Average Desired Family Size; Data for Regions of WFS-Countries, 1977-79.

at each of these parities. Data on current use of contraception by these two dimensions are given for national populations in Table XXVIII. They pertain to "exposed" women, i.e. who are currently married, presumably fecund and not currently pregnant. Note, however, that no data are available for Senegal and Cameroon: the French questionnaire contained erroneous filter questions thereby eliminating large numbers of women who should have been asked te questions. This mishap obviously reduces the variation since Senegal and Cameroon are likely to exhibit a pattern that would be markedly different from that of the remaining four countries. The following observations can be made on the basis of the data in Table XXVII:

Table XXVIII about here

i) The parity specific (living children) proportions of women who wish to stop childbearing are very similar in Ghana, Kenya and Northern Sudan; they are noticeably higher in Lesotho. In the former three countries, about two thirds of women with 5 or more living children have not yet decided to stop, in Lesotho more than half of these women want at least an additional child or are undecided.

ii) Among those who stated that they wish to continue (undecided excluded) one may presume that contraception is primarily used for spacing purposes. In this category, Ghanaian exposed women have percentages of current use (12%) which are nearly twice as high or slightly more than twice as high than in the other countries.

iii) Among those who stated that they did not want any additional children, contraception is presumably intended for stopping purposes. Given that percentages wishing to stop become of importance only

Table XXVIII : Patterns of Current Use of Contraception among Exposed Women, by Number of Living Children and Desire for Future Births; Results from 6 African WFS-Surveys 1977-79

	Nr Living Children	% Undecided + Want More	% Want No More Children	Curr. Use Contraception among : Want More	No More	All(undecided incl.)
Lesotho 77	< 3	96	4	3	15	4
	3	84	16	8	18	10
	4	73	27	5	35	13
	5+	55	45	6	19	12
Kenya 77-78	< 3	98	2	4	26	5
	3	93	7	8	28	10
	4	85	15	8	18	10
	5+	67	33	9	21	13
Ghana 79	< 3	98	2	11	31	11
	3	94	6	15	19	14
	4	85	15	10	31	14
	5+	66	34	11	20	13
N.Sudan 79	< 3	95	5	4	16	5
	3	91	9	7	20	8
	4	86	14	4	23	6
	5+	69	31	4	15	7
Senegal 78	< 3	n.a.	n.a.	n.a.	n.a.	5
	3					5
	4					4
	5+					5
Cameroon 78	< 3	n.a.	n.a.	n.a.	n.a.	3
	3					4
	4					3
	5+					3

after 4 living children, we shall mainly concentrate on current contraceptive use in these higher parity categories. Contraception for stopping is considerably higher than contraception for spacing. In Ghana and Lesotho about 25 percent of exposed women who desire no additional children are current users, in Kenya and Northern Sudan this percentage is about 20. The overall striking factor here is, however, not so much the differentiation between the countries, but the fact that the gap between the intention of stopping and the actual use of contraception is of the order of 75 percent. This particular feature singles out sub-Saharan African populations fom any of the Asian and Latin American ones in which the W.F.S.-survey has been conducted. The only factor that slightly alleviates this picture of very low contraceptive use among women intending to stop is that the proportion of use of efficient methods (injection, pill, IUD) is noticeably higher than among those who use contraception for spacing purposes.

The combination of all of these factors is to a large extent reflected in the age pattern of current use. These patterns are shown in Figure XVIII for currently married and presumably fecund women in each of the 6 W.F.S.-countries. The expected differentiation occurs immediately: Ghana, Kenya and Lesotho have not only higher percentages useage than Cameroon, Senegal and Northern Sudan, but also tend to have percentages that rise to at least age 40. In the former three countries, the effect of the number of living children outweighs the effect of slight differences in knowledge among women below 25 and those between 25 and 35. This is a promising omen as one can reasonably expect that younger cohorts will achieve higher levels of knowledge by the time they reach 30 than their predecessors and will presumably also improve the use-knowledge ratio. In

the latter three countries, which typically have much lower levels of female education, the present age pattern provides no basis for speculation about the future beaviour of women currently below age 30. Judging from the record of the late 1970's, useage levels of the order of 20-25 percent can be envisaged for Ghana, Lesotho or Kenya within a period of 10 years for women who will then be 30-39 years old, but in Senegal and Cameroon such an achievement would constitute a major surprise (which can, however, not be excluded). In the countries which have low levels of female education - even by African standards - much will hinge on improvements in schooling for the coming generations of girls.

Figure XVIII about here

8. African Regimes of Reproduction: Comparisons based on the Bongaarts Indices

Up till now we have considered the major demand- and supply-side variables individually. The most important of these can, however, be connected and compared through the Bongaarts summary indices. A full decomposition of fertility also allows for comparisons of the reproductive strategies found in the various countries, regions or socio-economic subgroups.

8.1. The Bongaarts Summary Indices: A short Presentation

The philosophy behind the decomposition is that of a succession of various fertility lowering effects taken in a particular sequence. The total fecundity rate (TF) serves as the starting point. It measures

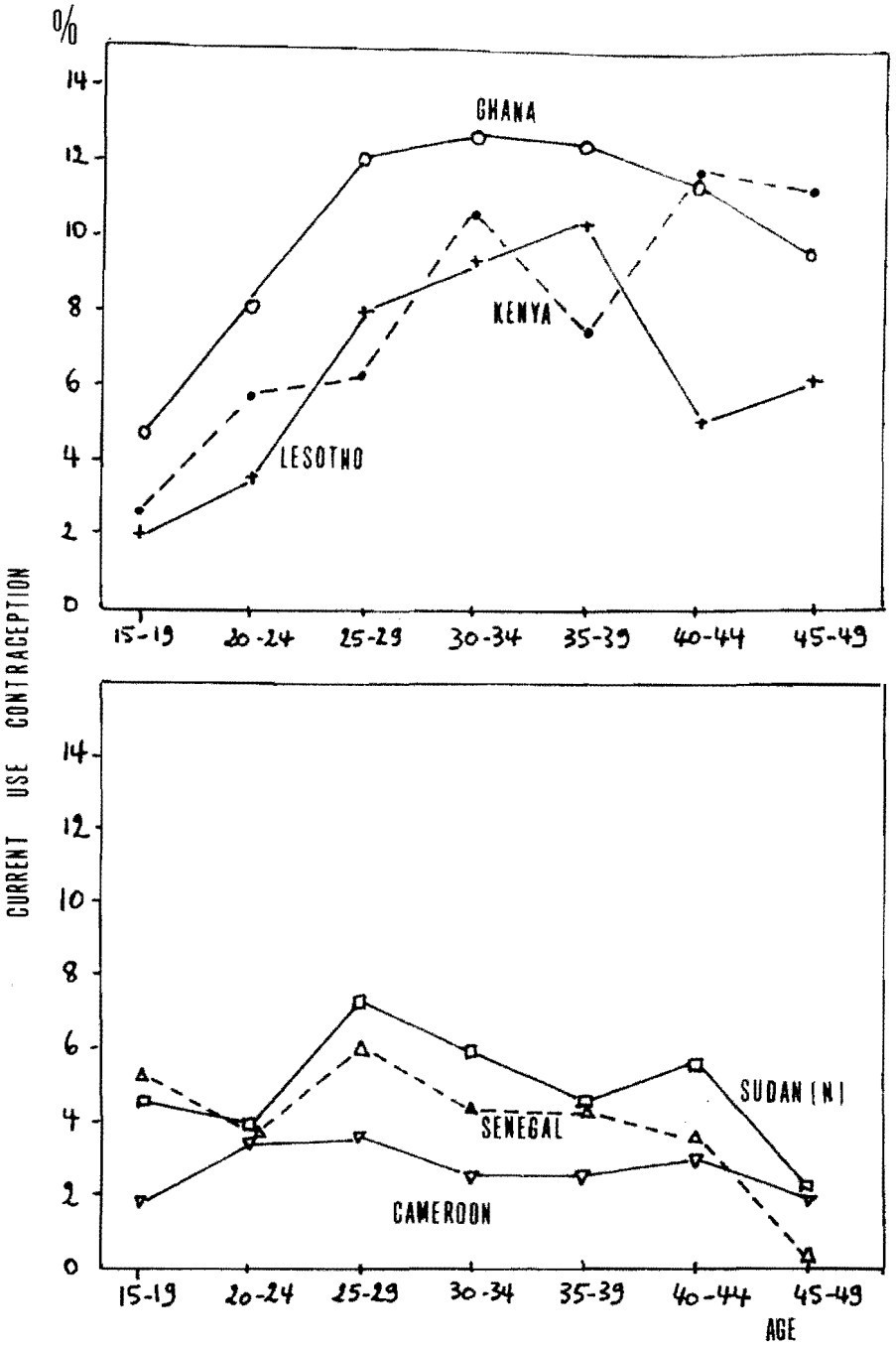


Figure XVIII : Age Patterns of Percentages of Currently Married Women Currently Using Contraception; 6 WFS-Surveys, 1977-79.

essentially the total number of children that would be reached by age 50 if all women had been exposed without interruption from age 15 onward in the absence of any fertility lowering effect of contraception, induced abortion, lactational amenorrhoea (beyond a minimum of 1.5 months) or postpartum abstinence. In the present decomposition, no measurement of induced abortion is available, and hence the level of TF will not only reflect the impact of coital frequency, sterility or subfecundity, foetal loss, but also that of unmeasured abortion.

The total fecundity rate is lowered to the level of the total natural marital fertility rate (TNFR) via the child-spacing variables, lactational amenorrhoea and postpartum abstinence, (combined into the postpartum non-susceptible period NSP). The index capturing this fertility lowering effect is obtained as the ratio between the average birth interval produced in the absence of lactational amenorrhoea (i.e. 1.5 months only) and abstinence to the average birth interval including the spacing effects of non-susceptibility:

$$Cnsp = 20/(18.5 + \bar{X}nsp)$$

In the equation above, the birth interval without spacing is set at 20 months, whereas the interval with spacing can be obtained as $(20-1.5)+\bar{X}nsp$, where $\bar{X}nsp$ is the average duration of the postpartum non-susceptible period(30). Values of Cnsp for African populations fall in the range of 0.45 to 0.75, meaning that the TNFR is only 45 to 75 percent of the TF:

$$TNFR = TF*Cnsp$$

The TNFR is further reduced to the level of the total marital fertility

rate (TMFR) when also the fertility lowering effect of contraception is taken into account. The index Cc is unity if no contraception is used and a fraction ranging from 0.85 to 0.99 in sub-Saharan populations. It is obtained as:

$$Cc = 1 - (1.08*u*e)$$

Here, u is the proportion of currently married women using contraception and e is the average use-effectiveness of contraception (i.e. the proportionate reduction in the monthly probability of conception produced by contraception). Efficient methods have been assigned a value of e=0.95 and less efficient methods (withdrawal, rythm, condom, diaphragm, foam) a value of 0.75. Errors in the evaluation of e are obviously of no consequence if u is of the order of 1 to 3 percent only. The factor 1.08 takes account of the fact that some users may no longer be fertile. Adding Cc to the chain, one obtains:

$$TMFR = TF*Cnsp*Cc$$

The TMFR in its turn is reduced to the total fertility rate (TFR) by the proportion of women who are not exposed by not being in a sexual union. Bongaarts originally proposed to measure the index of non-exposure, i.e. Cm, as the sum of the proportions currently married by age weighted by the age specific marital fertility rates over the TMFR. This procedure, however, assumes that there is a perfect correspondence between being married and being exposed, or that the presence in a sexual union can be adequately recorded by adding in consensual unions. In section 5.3, we have shown that fertility of women with only occasional exposure is far from negligible. Most surveys in sub-Saharan Africa have attempted to

capture presence in a sexual union by using broadened definitions of "currently married", but even then a substantial portion of illegitimate fertility is unaccounted for. In these circumstances, we have measured the value of Cm simply as the ratio between the TFR and the TMFR, which are measured independantly. Values of Cm obtained by this procedure are smaller than those obtained by the method originally proposed by Bongaarts: non-marriage is less of a fertility reducing agent in settings where single women, widows and divorcees contribute their share than in settings where illegitimate fertility is negligible. The chain can now be completed:

$$TFR = TF*Cnsp*Cc*Cm$$

One should bear in mind that the three indices of fertility lowering effects are defined in such a way that their order of introduction is fixed : Cm for example does not measure the amount of the total fecundity avoided through non-marriage, it measures the amount of the total marital fertility rate not realized through non-exposure. The sequential nature of the multiplicative chain distorts the visual impression that one would obtain from representing the TF, TNFR, TMFR and TFR on a bar diagramme using a regular scale expressing the total number of live births corresponding with each of them. The impact of the postpartum non-susceptible period would visually appear to be much larger than the impact of Cc or Cm, simply because the TF is much larger than the TNFR or the TMFR. The use of a logarithmic scale for total number of live births corrects for such a distortion by turning a multiplicative chain into an additive one.

We also need to point out that the level of the TF has been estimated via two procedures. The direct procedure consists of estimating

$\tilde{X}$nsp and Cnsp, and applying the latter to the TMFR so that TF=TMFR/Cnsp. The indirect procedure is valid for natural fertility populations or populations with hardly any recurrance to contraception, and uses the empirical relationship found in section 6 between the TF and the percentage of women with long enough exposure who have not progressed beyond 2 live births. This indirect method supposes that the TF is predominantly conditioned by sterility and subfecundity, and not by fecundity reflecting lowered coital frequency or induced abortion. This additional estimate of TF is primarily used to have an approximate idea of the extent to which the TF-values calculated via the direct procedure reflect the subfecundity and sterility dimension. On the whole, populations with direcly estimated TF-values of less than 12 are also the ones with high childlessness and high proportions not progressing beyond two live births, but discrepancies between the two TF-estimates do occur, in part because of substantial measurement error in the components (see section 6 for the amplification of measurement error in the TMFR for instance).

Finally, major problems with respect to the TMFR and TFR had to be solved in survey data sets. As these two measures of total fertility are based on age specific fertility rates that are given an equal weight, distortions in the total occur as a result of small sample sizes after age 35. As a general rule, the TMFR's and TFR's for subpopulations are based on the level of the age specific rates between age 20 and 35 only and on the age pattern at all ages found at the national level. For the TFR this is for instance:

$$TFRsub = \left(\sum_{20}^{34} f(a)sub. / \sum_{20}^{34} f(a)natl.\right) \times TFRnatl.$$

In the calculation of the national TMFR, the marital fertility rate for the

age group 15-19 has been reduced to 70 percent of that in the age group 20-24. This is done to eliminate rather volatile distortions introduced by pre-marital conceptions and precipitated marriages.

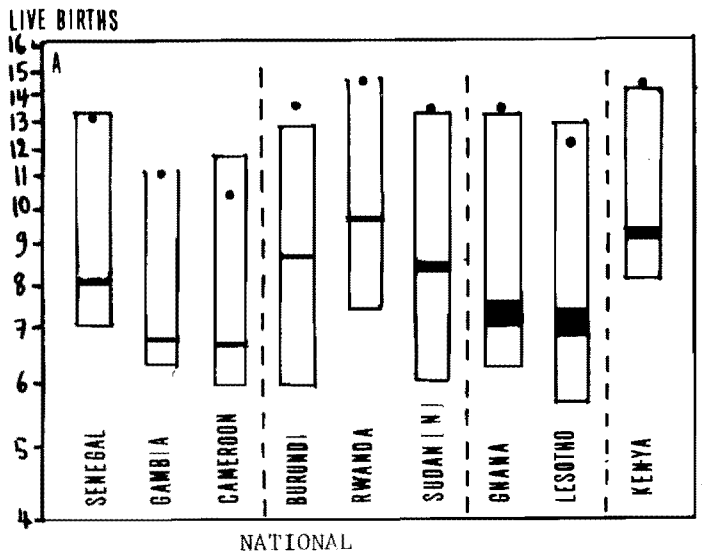
With these specifications in mind, we can now turn to the examination of differential patterns.

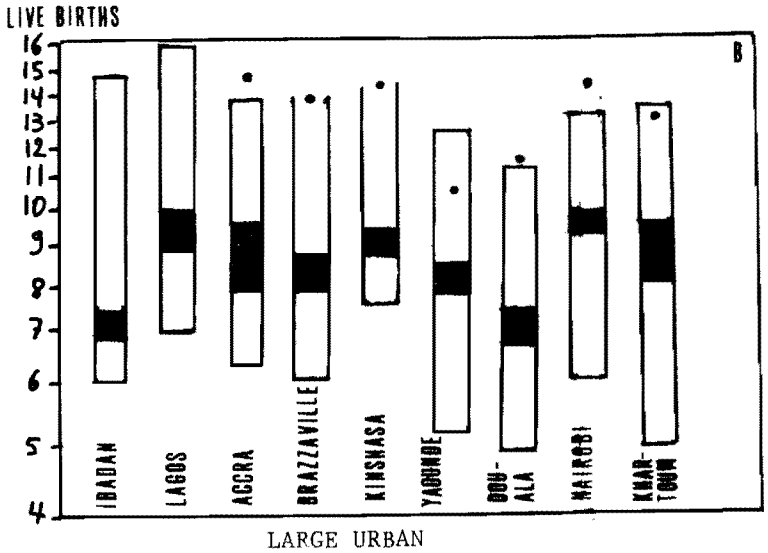
8.2. African Fertility Strategies: Regional Patterns

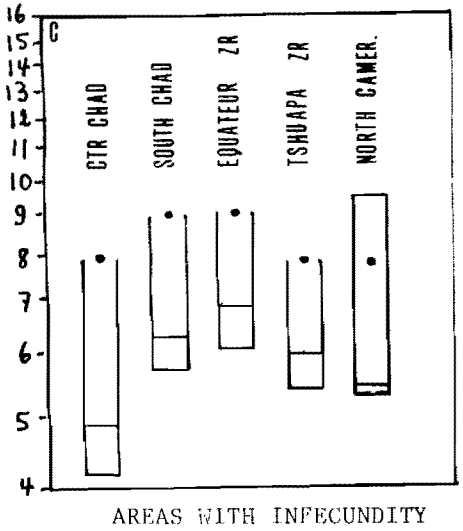
The wide variety of regional patterns already noticed at the level of each of the ingredients separately can now be appreciated again by studying the entire configuration. The diagrammes presented in Figure XIX compare the national patterns, the patterns for large urban areas and those found in selected high sterility zones of Central Africa. Roughly four families can be identified as far as the national configurations are concerned. The first group contains essentially populations with minor fertility reducing effects of non-marriage and contraception, and overwhelming reliance on birth spacing, either with or without an abstinence bonus. Total fertility rates are moderate to low, depending on the presence of an infecundity problem. Strategies of this type are followed in the Senegambia and in Cameroon, but they are likely to be representative for much of Western Africa and especially for areas with lower female educational levels.

Figure XIX about here

The second group of populations relies on a marked effect of non-marriage, or better, on the effect of retarded entry into sexual unions. In Burundi, this effect is of a similar order of magnitude as that







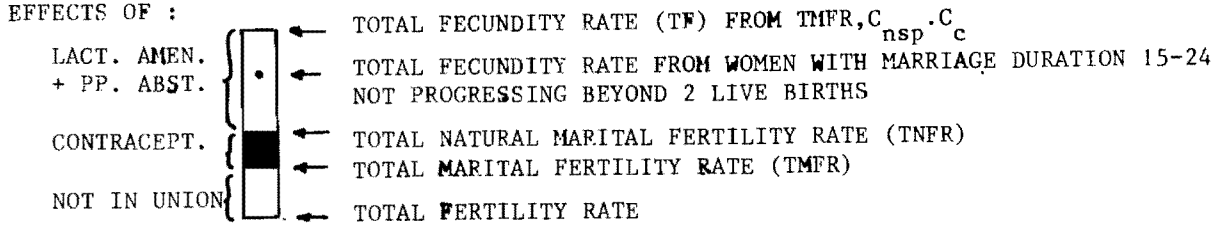


FIGURE XIX :FERTILITY RATES AND FERTILITY LOWERING EFFECTS OF PROXIMATE DETERMINANTS ; DECOMPOSITION FOR NATIONAL POPULATIONS, LARGE CITIES AND POPULATIONS WITH INFECUNDITY,1970-1979.

of birth spacing through prolonged lactation. This is an exceptional feature in sub-Saharan Africa. In Rwanda and the Northern Sudan, the effect of marriage postponement is also substantial, but slightly below that of lactational amenorrhoea. Characteristic for these three examples is that the effect of postpartum abstinence is zero or very small. Rwanda and Burundi are in fact the classic examples of populations which have had no postpartum taboo for at least two decades. They also developed the late marriage pattern (SMAM GT 21) before the mid-1950's despite low literacy levels. With their very high rural population densities, prolonged celibacy and non-susceptible periods of the order of 12-15 months, these populations follow strategies which have moved in the direction of those of certain rural Western European historical populations which retained longer breast-feeding (e.g. Friesland in the Netherlands, the Belgian Ardennes, certain areas of North-Western Germany). The main difference with the historical Western European settings is that marriage is universal in the two African examples considered here. The presence of Northern Sudan in this group with a nuptiality strategy is equally remarkable, considering that marriage postponement cannot be the result of prolonged education for females in this Islamic country either. The observation that the marriage postponement element is of a much more recent date in the Northern Sudan than in Rwanda and Burundi does not subtract anything from the fact that the demogaphic response to altered living conditins can take directions which are not commonly found in traditional African settings.

The third group of populations has a strategy that contains a noticeable contraception component combined with child-spacing via prolonged breast-feeding and/or postpartum abstinence. The two examples of this category are Ghana and Lesotho. Particularly striking here is that similar demographic regimes can spring from very different social and

economic settings. In Lesotho, the child-spacing element is essentially maintained via absence of males and is hence a byproduct of the total economic dependance on the RSA; in Ghana, it stems essentially from prolonged lactation and an extra abstinence bonus for non-Akan groups. Yet, despite these contrasts, both populations have high schooling levels for females (Northern Ghana excepted). This factor is not a sufficient condition to increase use of contraception, but it certainly contributes to it.

The Kenyan population contributes so far a category on its own. It has all fertility maximizing features: a high total fecundity, only moderate durations of breast-feeding, no post-partum abstinence effect, relatively little contraception and rather early marriage. From the information of the Tanzanian national demographic survey of 1973, we have the impression that a number of Kenyan features are also present further south. However, the main difference with Kenya is that Tanzanian total fecundity rates are undoubtedly much lower as a result of much higher levels of childlessness and low parity (LE 2 live births). This obviously depresses the TMFR and TFR to much lower levels than in Kenya.

The decomposition of fertility is made for the major urban centres in panel B of Figure XIX. Not surprisingly, Accra has the highest fertility reduction due to contraceptive use. It is immediately followed by Khartoum. The measurements for Lagos and Ibadan were made 4 years earlier, so that the achievement of higher levels by 1979 cannot be ruled out. Characteristic, however, is that the contraception effect in Nairobi in 1977-78 is the lowest of all, even if more traditional cities are added in such as Ibadan, Brazzaville, Yaounde and Douala. Of the cities presented here, Ibadan has the highest fertility reduction through

lactational amenorrhoea and especially postpartum abstinence (which is typical for the Yoruba which constitute the overwhelming majority of its population). Kinshasa has apparently the highest total fertility rate, whereas Douala and Khartoum have the lowest (but achieved in very different ways).

Panel C, representing the situation in high sterility zones, is added in for contrast: the TF never reaches 10 live births, contraception is non existant, but also the pattern of child-spacing is not markedly developed. In the past, most of these populations had a TFR of less than 4 to 5 live births (see Figure I), but with a recent reduction in sterility, combined with the maintenance of rather early marriage and relatively short durations of breast-feeding and postpartum abstinence, the TFR's have been able to climb to about 6 live births by the mid-1970's. The potential for further increases in the TFR remains present and is obviously linked to a further reduction in childlessness and subfecundity. With a "normal" TF of 14, the TFR can easily rise above 8 live births, given the values of Cnsp, Cc and Cm in these areas.

8.3 Regional differentials and aggregate levels of female education

Our prime concern in this section is to establish to what extent regional differences within and across countries can be explained by levels of female illiteracy. The dependant variables are again the various fertility reducing components taken either separately or in combinations.

Figure XX about here

The plots presented in Figure XX give an idea about the present

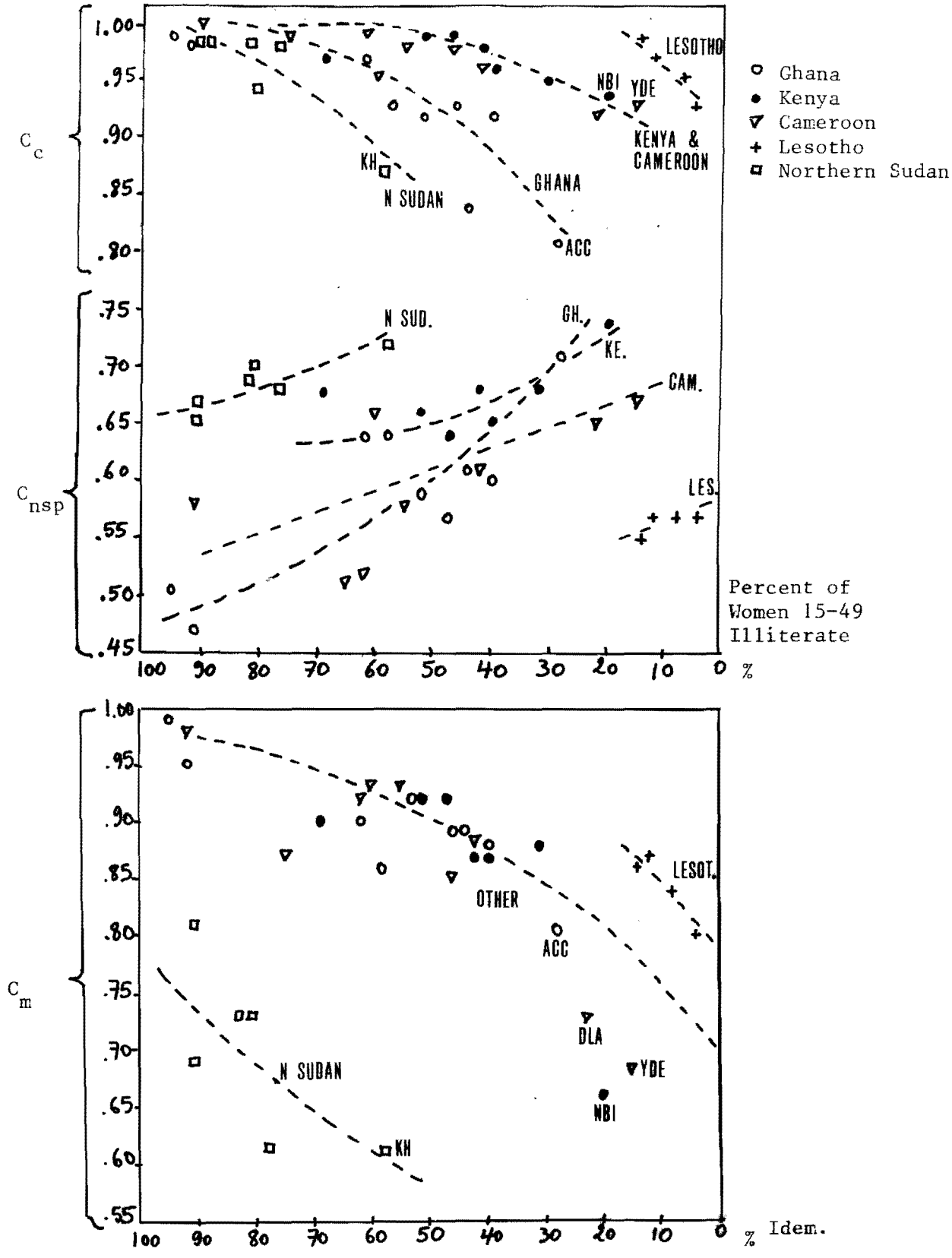


FIGURE XX : BONGAARTS INDICES OF CONTRACEPTION, POSTPARTUM NON-SUSCEPTIBILITY AND NON-MARRIAGE BY PERCENTAGE OF WOMEN 15-49 STILL ILLITERATE; DATA FOR REGIONS OF THE AFRICAN WFS-COUNTRIES, 1977-79.

effect of the eradication of female illiteracy on the fertility lowering effects of contraception (Cc), of lactational amenorrhoea and postpartum abstinence (Cnsp) and of marriage postponement or instability, net of illegitimate fertility (Cm). Obviously, as one moves to lower levels of illiteracy, contraception increases, the non-susceptible period shortens and marriages are contracted at later ages. The main feature exhibited by Figure XX is, however, the existence of very different intercepts (for Cnsp and Cm) and slopes (especially Cc). With respect to the fertility lowering effect of contraception, Lesotho as a whole, has for instance a relatively high level of useage (cfr. Figure XIX), but it has very low levels relative to the fact that female illiteracy is nearly entirely eradicated. Northern Sudan provides the contrast: some areas have useage levels of contraception similar to those in Lesotho, but in situations with 50 to 75 percent illiteracy. The Ghanaian pattern of high useage by African standards is also relatively independant of illiteracy levels when compared to levels in Kenya or Cameroon. In the latter countries, Cc reaches 0.92 only in the capitals, i.e. at illiteracy levels of about 20 percent; in Ghana levels of Cc of the order of 0.92 are found in predominantly rural areas and in provincial towns with illiteracy levels that are twice as high.

The plot of Cnsp versus illiteracy reveals other characteristics. First, scatter within countries (especially Ghana and Cameroon) is larger. Second, the slopes are fairly similar, but the intercepts vary greatly. These two features are obviously resulting from the fact that regional variations with respect to the degree of child-spacing have deeper historical roots. When comparing the pattern of Cnsp with that of Cc, another striking feature emerges: less reliance on traditional mechanisms of child-spacing corresponds with faster adoption of contraception, even if female illiteracy is high (e.g. Sudan) and vice versa (e.g. Lesotho,

Cameroon). Kenya and Ghana deviate to some extent from this balancing effect, but they do so in opposite directions: at a given level of illiteracy, Ghanaian regions benefit from higher contraceptive use and more marked spacing via lactational amenorrhoea or abstinence, whereas Kenyan regions have comparatively too low levels of contraception for their shortened child-spacing pattern.

The link between the postponement of first marriage and lowering of illiteracy is essentially similar for Cameroon, Kenya and Ghana, but, as indicated earlier, Northern Sudan falls in an entirely different league. In the "mainstream" group, a lowering of illiteracy levels by 5 percentage points corresponds with a reduction of Cm by 1 percentage point. However, this slope accelerates below 40 percent illiteracy as a result of adding in the major urban areas. Lesotho, finally, has again a substantial reduction in fertility through later marriage if taken in an absolute sense. Relative to the high literacy levels, however, the values of Cm are high and marriage early.

Figure XXI about here

A typical pattern of Cc, Cm and Cnsp by regional levels of illiteracy is represented in Figure XXI and the conversion in the total natural fertility rate, the total marital fertility rate and the total fertility rate is made just below it, assuming a uniform total fecundity of 15.3 births. The pattern itself can be taken as roughly representative for Cameroon, Ghana and Kenya. The results of the conversion in various fertility rates is rather revealing:

i)The total marital fertility rate exhibits a steady increase across the

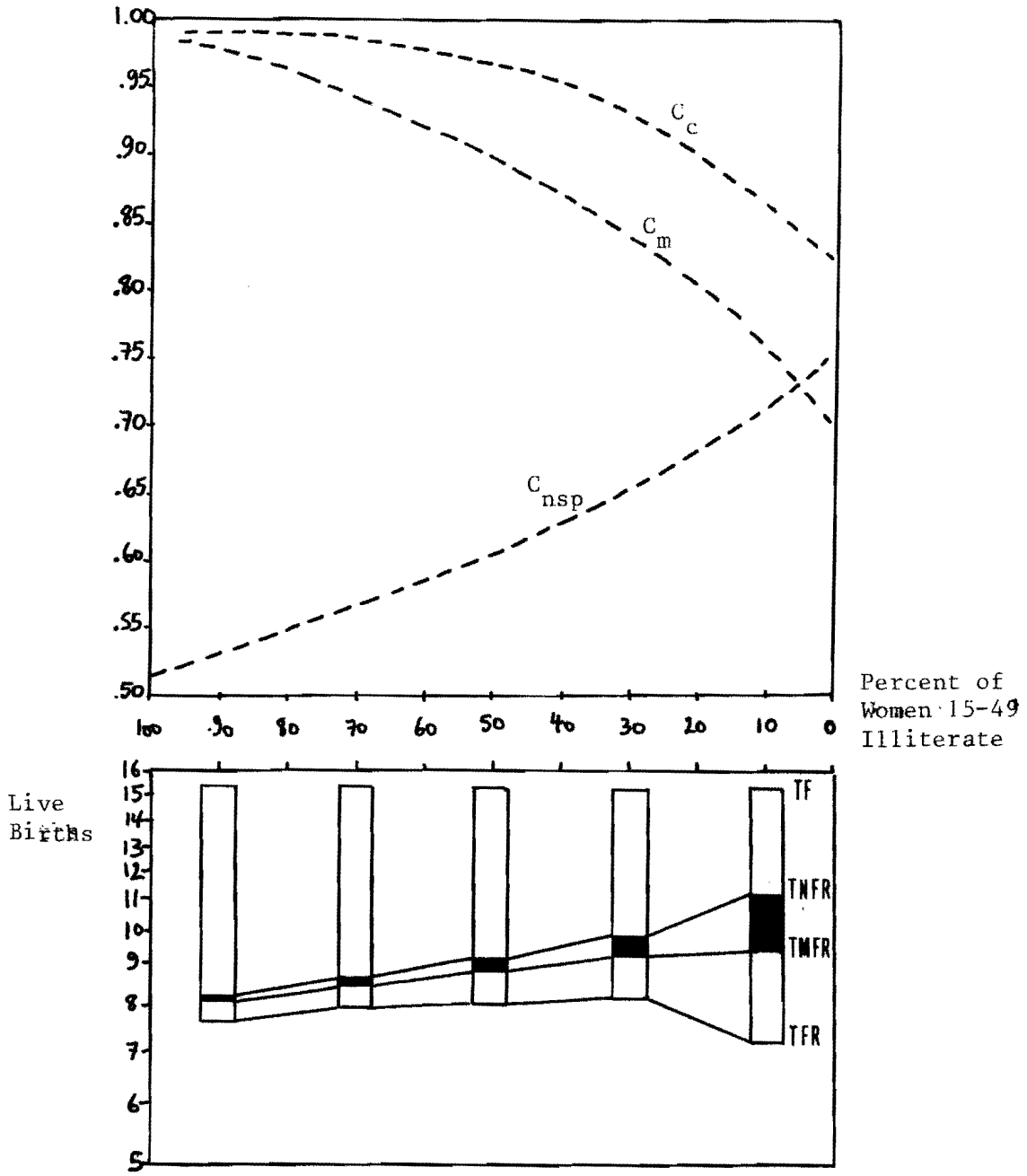


FIGURE XXI : MODEL PATTERN OF FERTILITY REDUCING EFFECTS BY PERCENTAGE ILLITERATE FOR REGIONS OF GHANA, KENYA AND CAMEROON.

entire range of illiteracy levels from about 8 to 9.5 live births. The reduction of the non-susceptible period clearly outweighs the effect of increased use-effectiveness of contraception considering the present elasticities across regions.

ii) The total fertility rate follows this increase in the TMFR until the low urban illiteracy levels are reached corresponding with an accelerated drop in Cm. From that point onward, it is later marriage that redresses the situation.

The findings of Figure XXI can largely be transposed to the actual regional patterns in the various countries.

Figure XXII about here

The conversion of observed indices of fertility reduction into the set of fertility rates has been performed in Figure XXII for the regions of Kenya, Ghana, Cameroon and Sudan(31). Differences in total fecundity add complexity, but on the whole, they amplify the pattern shown in figure XXI: at first, TF values tend to rise and sterility is reduced when female literacy levels improve.

The conclusions from this cross-sectional analysis are clear: if the current cross-regional elasticities of Cc, Cnsp and Cm with respect to literacy would be maintained in the future, total marital fertility rates would fail to decline at any level of literacy and the nuptiality effect would only start to pull down the TFR once illiteracy is reduced below the 30 percent mark in Kenya and Cameroon, below 60 percent in Ghana and below 80 percent in Northern Sudan. Obviously, cross-sections cannot be used for

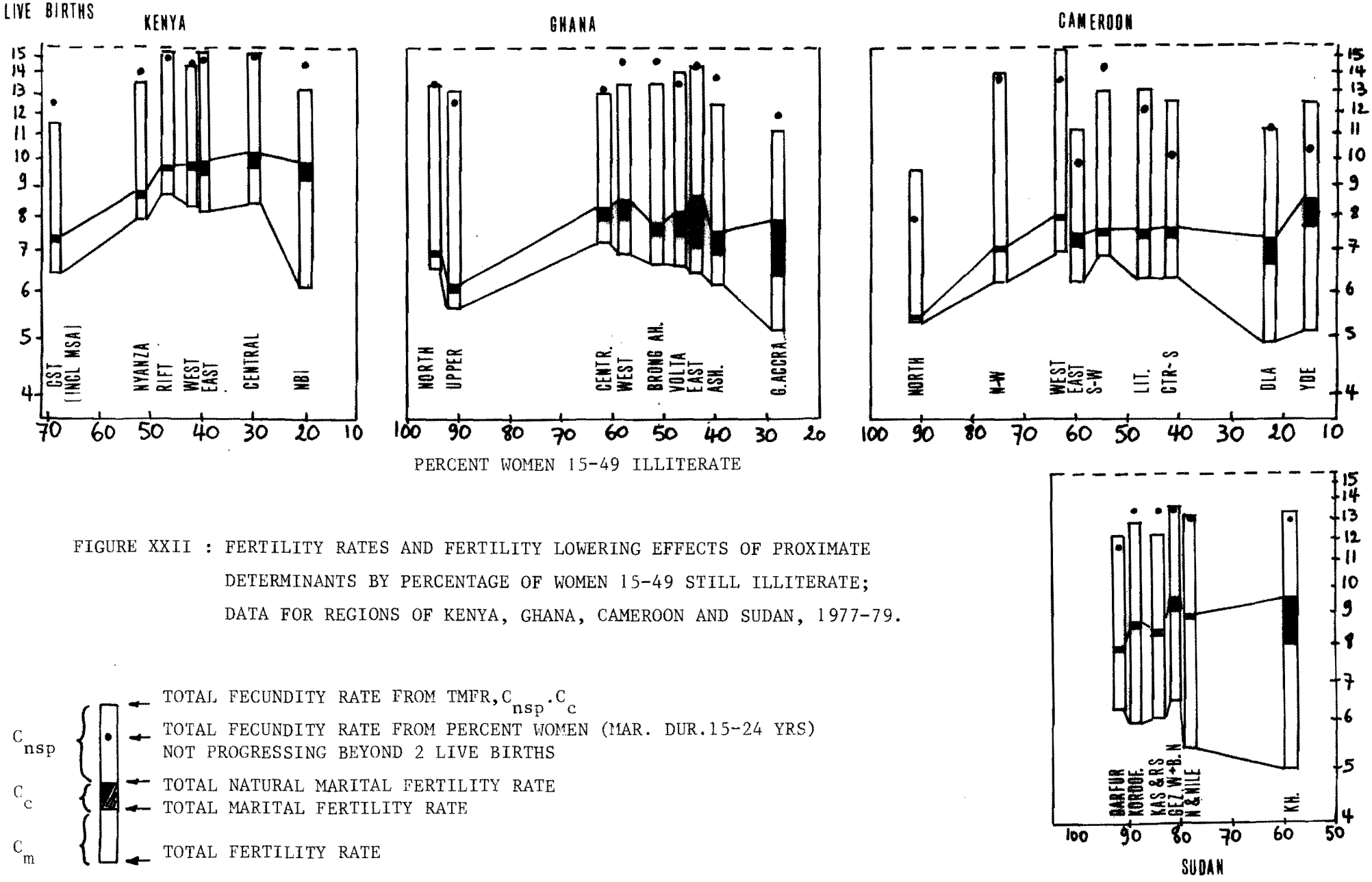


FIGURE XXII : FERTILITY RATES AND FERTILITY LOWERING EFFECTS OF PROXIMATE DETERMINANTS BY PERCENTAGE OF WOMEN 15-49 STILL ILLITERATE; DATA FOR REGIONS OF KENYA, GHANA, CAMEROON AND SUDAN, 1977-79.

extrapolation in time, but the exercise proves that a very major change in slope has to occur with respect to Cc and to a lesser extent also with respect to Cm, before the present positive association between marital fertility, or in part also overall fertility, and literacy can vanish.

8.4 Overall effects of female education

The previous analysis only considered the literacy dichotomy. The picture requires further refinement by the introduction of the various schooling levels. The presentation of the set of fertility rates by level of schooling is again done graphically in Figure XXII. The findings of the previous section remain largely valid. For instance, the TMFR remains virtually constant from the "no-schooling" category to the secondary education one in Ghana, Lesotho and Kenya. The TMFR increases in Cameroon, partly as a consequence of the fact that the Northern region with a marked sterility problem contributes a disproportionately large number of illiterate women. The only instance of a clear drop in the TMFR occurs in Northern Sudan with the transition from incomplete to complete primary schooling or more. A part of this transition is, however, also the effect of women with completed primary education being concentrated in Khartoum (44 percent).

Figure XXIII about here

The effect of later entry into sexual unions outweighs that of increasing contraception: the total fertility rate (TFR) does not remain constant as was true for the TMFR, but declines roughly towards completion of primary education. The reduction of the TFR is accelerated once secondary education is reached.

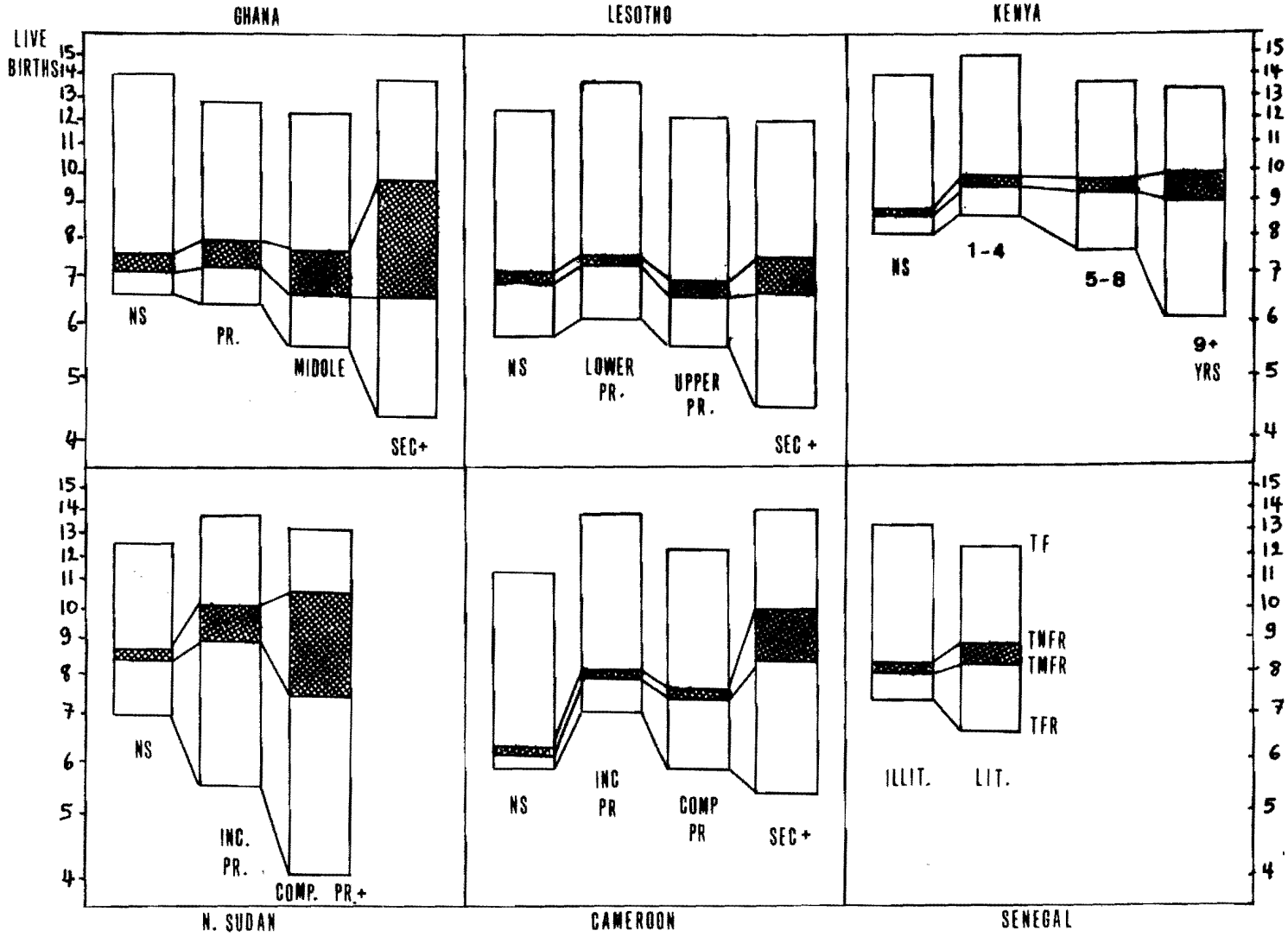


FIGURE XXIII : FERTILITY RATES AND FERTILITY LOWERING EFFECTS OF PROXIMATE DETERMINANTS BY FEMALE EDUCATION LEVEL; DATA FOR 6 AFRICAN WFS-COUNTRIES, 1977-79.

The cross-national comparisons relative to schooling level are also of interest. For instance, the fertility reducing effect of contraception among women with secondary education in Kenya is identical to that among women with only primary education in Ghana. At equal levels of total fecundity, the TFR for women with secondary education in Kenya is higher than that among women with "middle school" education in Ghana, lower primary education in Lesotho, or incomplete primary schooling in Northern Sudan. Hence, the low use levels of contraception in Kenya can be found in all education categories and are not produced by the distribution of women according to schooling levels.

The image conveyed by Figure XXIII has to be weighted by the percentage of women 15-50 in each of the educational categories. These percentages are given in Table XXIX. From these, it appears that the rather modern pattern for women with at least completed primary education in Northern Sudan pertains only to 18 percent of all women. The similar pattern for Ghanaian women with secondary education (11+ years of schooling) is representative for 4 percent only. In short, considering the weights of Table XXIX, one could assume that TFR's are more likely to increase in most countries (except Lesotho and N.Sudan) when more women are brought into primary education, given that present patterns among fertility reducing agents would persist. Once more, the pattern of Cnsp, Cc and Cm needs to be altered if more primary education is expected to operate as a major fertility reducing factor. The continued measurement of intermediate fertility variables with instruments comparable to those used in the W.F.S-round is therefore essential at intervals of about 5 years(32).

Tables XXIX and XXX about here

Additional information on contraceptive knowledge or current use and on desired family size is also available for educational groups and by age. This information is presented in Table XXX for ever or currently married women in the age groups below 25 and 25-34. Such a comparison across age groups is instructive because it reveals whether or not the younger women are surpassing their predecessors on any of these three dimensions. It turns out that the knowledge of contraception among the younger women is slightly less than that of women aged 25-34 in all countries, except Lesotho, where it is substantially less. Desired family size on the other hand has shrunk in all educational categories, and most in Sudan (least in Lesotho where the reduction is much more confined to women with less education). However, this indicator is not exactly the most thrustworthy one, given that women below age 25 have about 20 to 25 years of exposure ahead of them. The pattern of current use among younger women follows essentially the typical educational differential displayed by those currently aged between 25 and 34 (except, again in Lesotho), but young women are by no means up to the useage levels of the cohorts that preceded them. Levels of contraceptive useage among the younger women will obviously increase, but the picture in Table XXX is not conveying the imminence of a contraceptive revolution as yet. Unless the next survey proves the contrary, we would be inclined to accept the static picture of the impact of Cc by education or literacy (as shown in Figures XXI through XXIII) as a conservative working hypothesis. This underscores once more the need for monitoring the situation at regular time intervals.

Table XXIX : Distribution of Women aged 15-50 by Educational Level; 6 WFS-Surveys 1977-79

N.Sudan 79		Senegal 78		Cameroon 78	
- No schooling	70 %	- Illiterate	85	- No schooling	64
- Incompl. Prim.	12	- Prim. incompl.	5	- Primary	28
- Compl. Prim.+	18	- Compl. Prim.	5	- Secondary +	8
		- Incompl. Sec.	5		
		- Compl. Sec.+	1		

Kenya 77-78		Ghana 79		Lesotho 77	
- No schooling	44	- No schooling	52	- No schooling	15
- 1-4 yrs	18	- Primary	11	- Lower Prim.	49
- 5-8 yrs	27	- Middle	33	- Upper Prim.	29
- 9+ yrs	10	- Secondary+	4	- Secondary+	6

Note : Coranic schooling is equated with no schooling.

Table XXX : Indicators of Desired Family Size, Contraceptive Knowledge and Current Use, by Level of Education and Age; Data from 5 WFS-Surveys, 1977-79

	< 25			25-34		
	%Never heard Contracept. E.M.	$\bar{X}$ Desired Nr Children C.M.	%Curr.Use Contracept. E.M.	%Never heard contracept. E.M.	$\bar{X}$ Desired Nr Children C.M.	%Curr. Use Contracept. E.M.
Kenya						
No schooling	17	7.0	2	12	7.5	4
1-4 yrs	10	6.6	3	5	6.7	7
5-8 yrs	7	6.2	6	2	6.7	11
Secondary+	1	5.4	11	1	5.8	19
All	10	6.5	4	7	7.0	7
Ghana						
No schooling	79	6.1	3	73	6.5	6
1-6 (Prim.)	50	5.1	6	49	5.6	13
7-10 (Middle)	23	4.6	9	25	5.2	18
11+ (Sec.+)	16	4.3	26	6	4.3	34
All	53	5.2	7	53	5.9	11
Lesotho						
No schooling	56	5.6	2	44	6.5	0
Lower Primary	41	5.8	4	31	6.1	6
Upper Primary	41	5.3	2	23	5.6	8
Secondary+	22	4.9	5	14	4.8	14
All	41	5.4	3	28	5.8	7
Sudan						
No schooling	59	5.6	1	58	6.7	2
Incompl. Prim.	18	5.1	8	18	6.0	12
Compl. Prim.+	12	4.7	15	2	4.7	40
All	46	5.4	4	48	6.4	6
Cameroon						
No schooling	83	n.a.	1	81	n.a.	1
Incompl. Prim.	54	n.a.	4	45	n.a.	3
Compl. Prim.	39	n.a.	2	28	n.a.	4
Secondary+	19	n.a.	10	11	n.a.	24
All	61	n.a.	2	65	n.a.	3

Note : EM = ever married women; CM = currently married women; the difference between EM and CM is small for the age group below 25.

8.5. Individual and Contextual Effects of Female Education

The general effect of female schooling on fertility and its proximate determinants can be split into three components: the individual effect, the contextual effect and the interaction between these two. The individual effect refers to the difference in the dependant variable produced by a difference in schooling levels between individuals who live in an identical social environment. The contextual effect refers to the impact of a difference in aggregate levels of schooling of the contexts, holding constant the individual's level of schooling. The question of how, for instance, fertility levels vary between illiterate women living in an area with low overall literacy (i.e. where illiterate women constitute a majority) and illiterate women living in an area with higher average education (i.e. where they are a minority) pertains to this cotextual effect. The interaction effect, finally, indicates te extent to which the individual effect of more education is shaped by the contextual level. If an increment in individual education has the same effect on fertility or on one of its proximate determinants irrespective of the educational level of the individuals' environment, there is no such interaction effect. If, however, fertility responds to individual differences in schooling in different ways, depending on the context, such an interacton effect exists.

The contextual and interaction effects are of importance for several reasons. First, the aggregate schooling level is produced as an accumulation of the experience of more than one chort. Areas where female education was introduced early or which have drawn in more educated women through education-selective migration, have by now achieved higher contextual schooling averages. Young women in such areas have consequently the examples in front of them set by older and relatively well educated

women, and they may be at a comparative "advantage" with respect to newer forms of behaviour (i.e. less traditional spacing, more contraception) relative to younger women living in contexts with less education. In other terms, the contextual effect captures to a large extent the pay-off of earlier and heavier investment in female schooling in a particular area. Second, one would expect an effect of "reference-group"-behaviour: the minority group with respect to education would tend to adjust its behaviour in the direction of that of the majority, resulting into a "regression toward the mean"-effect. Third, the interaction between the individual and contextual schooling levels may shape the pattern of the fertility transition, especially if two processes are at work (i.e. the decline of traditional spacing patterns and the rise of new contraceptive behaviour). As education is one of the major driving forces behind each of these processes, one could envisage that an individual increment in schooling would at first lead to a net fertility increase (contraception fails to neutralize the effects of shortened breastfeeding and abstinence) in areas which are at the onset of the transition and have low contextual levels of schooling. Conversely, an identical increment in individual schooling would lead to a fertility decline only in areas that have accumulated a much larger stock of educated women (thereby creating for instance a more positive attitude toward contraception). Hence, the direction of the effect of a number of years of schooling for individuals on fertility may very well depend on the schooling level of the context.

The study of these three effects of female education on the relevant fertility variables could be performed for the Ghanaian and Kenyan W.F.S-samples which are sufficiently large for studying such differentiations. In both instances, the contexts were originally taken as the sampling units (104 in Kenya, 224 in Ghana), but they were grouped in a

dozen contextual zones, depending on the average length of schooling of their female population aged 15-49 and on their location (i.e. province). Most provinces then contain 2 or 3 such "contextual schooling zones"(33). For each of these k contextual zones and for each dependant variable a separate regression equation was specified(34):

-for the age at first birth (AFB) and age at first marriage:

$$AFBk = Ak + B1k\ EDUC + B2k\ AGE \qquad (k=1,12)$$

where EDUC is the individual's number of years of schooling;

-for the current use of efficient forms of contraception and use in the last closed interval CUSE or USELCI):

$$CUSEk = Ak + B1k\ EDUC + B2k\ LIVCH + B3k\ AGE$$

where LIVCH is the number of living children;

-for the duration of breast-feeding (BRF) and postpartum abstinence (ABST):

$$BRFk = Ak + B1k\ EDUC + B2k\ AGE$$

-for the index of life time marital fertility (DRAT):

$$DRATk = Ak + B1k\ EDUC + B2k\ AGE + B3k\ MARDUR$$

where DRAT is the Boulier and Rosenzweig (1978) measure of relative average pace of procreation(35) and MARDUR the duration since first union(36). The

variables other than education serve as controls and the sample sizes in each of the k contextual zones vary from 102 in "Nairobi-high education" to just over 600 in several other zones. The average difference in contextual schooling between successive zones in the Kenyan provinces is 2 years and the Ghanaian regions 2.7 years.

Several summary tables have been produced on the basis of these regression equations. In Table XXXI we have shown the effect of an increment in individual schooling of 5 years on the various proximate determinants and on the level of relative life time marital fertility with a control for context (individual effect only)(37). Table XXXII shows that the contextual effect, holding individual education constant. More specifically, the Y-variables were calculated from the k-regressions with individual education set at 0 years and 5 years of schooling, and the figures in the table indicate how the results evolved on average as one moved from the lower education zone to the higher one(s) in each province. Table XXXIII, finally, gives the interaction effect. Here we measure by how much the change produced by 5 years of individual schooling increases or decreases on average when moving up 1 contextual zone within the provinces.

Tables XXXI, XXXII and XXXIII about here

A number of findings emerge from these three tables and their exploratory analyses:

i) The variables typifying the starting pattern of procreation show a systematic effect of individual education in the two countries and, on average, 5 years of education produce roughly a postponement of

Table XXXI : Change in the Y-Variables produced by an Increase in Individual Schooling of 5 Years after Controls for the Z-Variables, Kenya 1977-78 and Ghana 1979.

Y-variable	Z-variables	Average effect (across 12 zones) of 5 years increase in EDUC	
		Ghana	Kenya
Age first union	Age, Prov., Cont.ed.	+0.5 yrs[x]	+1.0 yr[x]
Age first birth	Age, Prov., Cont.ed.	+0.4 yrs[x]	+0.5 yrs[x]
Current use eff. contr.	Age, Liv.ch., Prov., Cont.ed.	+3.5 %[x]	+4.5 %[x]
Use eff. contr. LCI	Age, Liv.ch., Prov., cont.ed.	+4.2 %[x]	+4.0 %[x]
Duration Brfd. LCI	Age, Prov., Cont.ed.	-0.8 mths[x]	-1.0 mths[x]
Duration Abst. LCI	Age, Prov., Cont.ed.	-0.5 mths[x]	-0.1 mths
Lifetime mar. fert. (DRAT)	Age, Mar.dur., Prov., Cont.ed.	-0.01	+0.05[x]

x The number of signs of the B-coefficient of EDUC in the expected direction is significant at the .003 level (at least 11 identical signs out of 12 for Kenya or 10 out of 11 for Ghana).

Note : DRAT-values only calculated for women married at least 5 yrs, see footnote (35); Upper and Northern regions in Ghana do not contribute information (only 1 contextual level of education).

Table XXXIII : Change in the Effect of 5 Years of Individual Schooling on the Y-variables associated with an Increase of Contextual Education by 1 Level, controlling for Z-Variables; Kenya 1977-78 and Ghana 1979.

Y-variable	Z-variables	Average change in the effect of 5 yrs of indiv. educ. associated with increment of context. educ. by 1 level	
		Ghana	Kenya
Age first union	Age, Prov.	0.0 yrs	-0.2 yrs
Age first birth	Age, Prov.	+0.2 yrs	0.0 yrs
Current use eff.contr.	Age, Liv.ch., Prov.	+2.2 %	+3.0 %
Use eff. contr.LCI	Age, Liv.ch., Prov.	+1.1 %	-1.2 %
Duration Brfd. LCI	Age, Prov.	-0.1 mths	+0.1 mths
Duration Abst. LCI	Age, Prov.	+0.2 mths	+0.1 mths
Lifetime mar.fert.(DRAT)	Age, Mar.dur., Prov.	-0.01[x]	-0.04[x]

x The number of sequences in the right direction is significant at the 0.10 level (at least 5 out of 6 for Ghana and 6 out of 7 for Kenya)

Table XXXII : Change in the Y-variables produced by an Increase in the contextual Level of Schooling after Controls for the Z-Variables; Kenya 1977-78 and Ghana 1979.

Y-variable	Z-variables	Average effect of 1 level change in contextual education	
		Ghana (+2.7 yrs)	Kenya (+2.0 yrs)
Age at first union	Educ., Age, Prov.	-0.1 yrs[x]	+0.3 yrs
Age at first birth	Educ., Age, Prov.	-0.3 yrs[x]	+0.1 yrs
Current use eff.contr.	Educ., Liv.ch., Age, Prov.	+2.0 %[x]	+1.5 %[x]
Use eff.contr. LCI	Educ., Liv.ch., Age, Prov.	+6.1 %[x]	+2.4 %[x]
Duration Brfd LCI	Educ., Age, Prov.	-0.7 mths[x]	-1.0 mth[x]
Duration Abst. LCI	Educ., Age, Prov.	+0.1 mths	-0.1 mths
Lifetime mar.fert.(DRAT)	Educ., Mar.dur., Age, Prov.	+0.02	+0.03

x The number of sequences in the right direction (i.e. systematically declining or increasing as one moves from the lower to the higher educational context) is significant at the 5 percent level (at least 16 sequences out of 24 are required for Ghana, 19 out of 28 in Kenya).

Note : A change of 1 contextual level corresponds on average with 2.7 years of schooling in Ghana and 2.0 years in Kenya; Upper and Northern regions in Ghana do not contribute information (only 1 contextual level of education).

first marriage and first birth by half a year. The other effects exhibit no consistent pattern in Kenya, but, more surprisingly in Ghana, women with identical education but living in better educated zones tend to start procreation slightly earlier than those in less educated areas. Note, however, that this finding excludes the Northern and Upper Regions (with very low education and much earlier marriage), simply because there is only one contextual zone (no variation in contextual education of the sampling units). Taking this into account, one can simply conclude by acknowledging the effect of individual education only.

ii) Among the variables associated with the traditional spacing pattern, the duration of breast-feeding responds to both individual and contextual effects of education: better educated women in a given educational setting breastfeed for shorter periods and, at a given level of individual education, also women living in a better educated environment reduce lactation further. The pattern with respect to postpartum abstinence is less clear, except for Ghana where individual education lowers its duration in a consistent way in each of the contextual zones.

iii) The variables typical for new forms of spacing and stopping, i.e. contraceptive use, also respond positively to increments in both individual and contextual education. Especially in Ghana is the impact of the educational environment of importance in facilitating use of efficient methods.

iv) The reaction of life time fertility to the various education effects sets the two countries clearly apart. In Ghana, all effects are

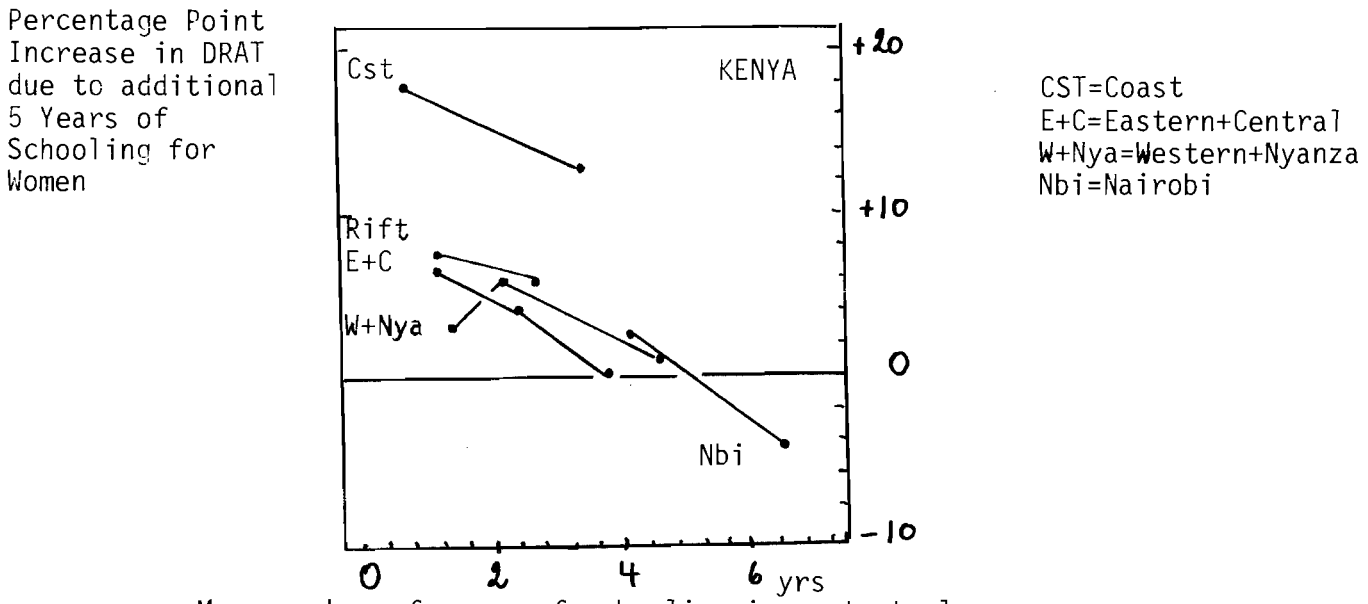
fairly small, indicating that the components of marital fertility, despite the fact that they respond to educational change, keep each other in check. This confirms the pattern found in Figure XXIII with respect to the horizontal level of the TMFR across educational categories. In Kenya, to the contrary, individual and contextual effects are positive, and the interaction effect is negative. We have a complicated picture: 5 years difference in individual schooling in each setting lead to rising fertility; at a given level of personal education, living in a setting with a schooling average of 2 years more tends to generate a higher level of fertility as well, but the fertility increasing effect of individual schooling is reduced for women in higher educational contexts. These phenomena are typical for a population which goes through a clear two phase marital fertility transition: at the onset, individual and contextual increases in education produce a rapid erosion of the traditional props of child-spacing, and this has an overwhelming effect emerging in the form of rising marital fertility. The prelude to the second phase, however, has started as the positive effect of education on marital fertility is gradually being neutralized as one moves to more highly educated environments.

The interaction effect of individual and contextual education on the pace of procreation in the two countries is worthy of further inspection. In Figure XXIV, the change in DRAT (x100) due to a rise in individual schooling by 5 years has been plotted against the average level of schooling in each of the 12 contextual zones. In Ghana, 5 years additional schooling for women produce virtually no difference in marital fertility in most of the country, irrespective of the contextual level of education. The neutralization of the fertility increasing forces by the

fertility decreasing ones is virtually complete. The only exceptions are Greater Accra and the adjacent Eastern region in which individual education has the negative effect on marital fertility typical for the second phase of the transition, and in which the negative effect gains momentum as one moves up on the scale for contextual education. These two areas are easily the most developed regions of the country, they are immigration areas and have an ethnically mixed population. Given that migration is a highly selective process, favouring the presence of less traditional women in these areas, and that ethnic melting pot situations are equally conducive to more innovative behaviour, it may well be that the true motor of the interaction effect is not so much contextual education as such, but the growth of an ethnically mixed population through immigration and urbanization. This is supported by the fact that the higher education zones with similar contextual averages but located in he West and Central regions, in Volta and in Brong-Ahafo do not exhibit a reduction in the individual effect of 5 years of schooling on marital fertility (horizontal lines in Figure XXIV).

Figure XXIV about here

In Kenya, the effect of 5 years of schooling for individuals on DRAT is positive for all except 1 contextual zone (i.e. the high education zone of Nairobi), and in several the increase in DRAT is very substantial (e.g. Coast and lower education zones of the Rift Valley, of the Eastern and Central provinces, and of the Lake Basin). But, as already indicated in Table XXXIII, an increase in the contextual level of education reduces this positive effect on marital fertility of individual education in virtually all instances. The individual effect of education becomes zero



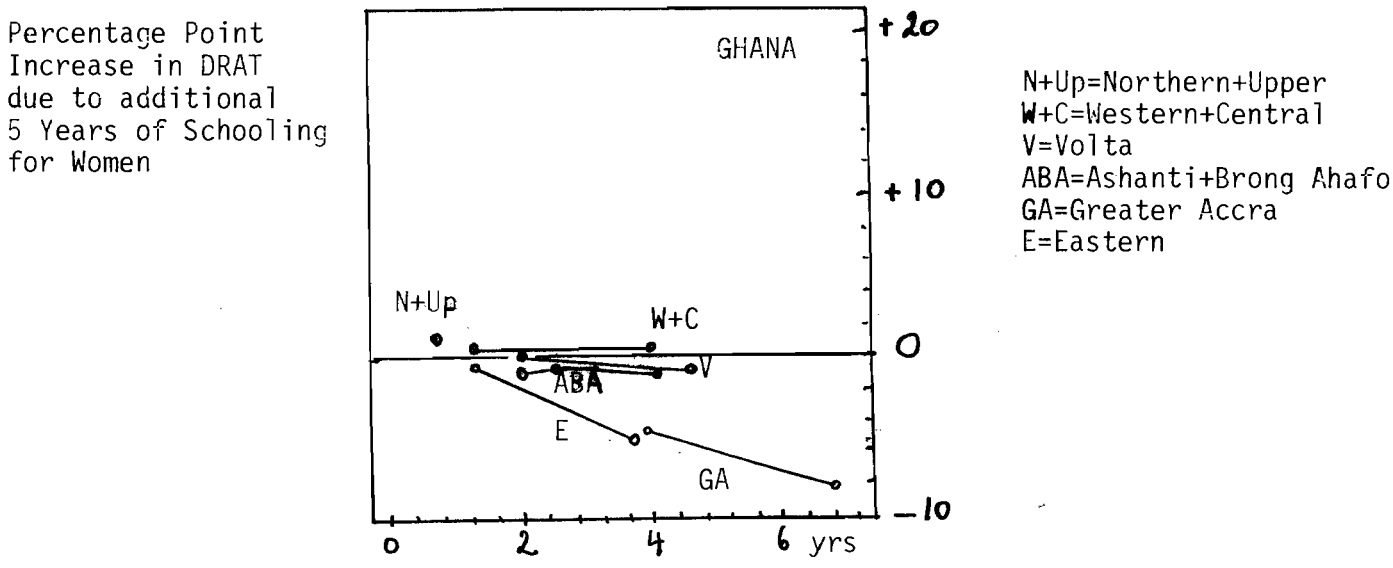


FIGURE XXIV : PERCENTAGE POINT INCREASE IN DRAT (LIFE TIME FERTILITY STANDARDIZED FOR AGE AT MARRIAGE AND LENGTH OF EXPOSURE) ASSOCIATED WITH A DIFFERENCE OF FIVE YEARS OF SCHOOLING BETWEEN INDIVIDUAL WOMEN, BY CONTEXTUAL SCHOOLING AVERAGE; REGIONS IN KENYA (77-78) AND GHANA (79).

at contextual levels of about 4.5 years of schooling and negative thereafter (i.e. when coupled with urbanization and the Nairobi ethnic "melting pot"-situation).

The impression one gets from these patterns of effects on DRAT are, however, reflecting a historical picture since DRAT is essentially a measure of life time marital fertility. It is therefore advisable to take the two main components involved in the process, i.e. lactational amenorrhoea and current contraceptive use, and repeat the study of the interaction of individual and contextual education. This has been done in Table XXXIV for Kenya. First, the indices of contraception Cc and of lactational amenorrhoea Ci are calculated in each contextual zone for illiterate women and women with at least 5 years of education. These measures pertain to current or very recent experience and hence capture the situation in the second half of the 1970's. In columns (5) and (6) of Table XXXIV, the joint effects of contraception and lactational amenorrhoea are calculated and in column (7) the difference (Delta) is established. This difference measures the individual impact of the 5+ years of education in terms of the two proximate determinants in the direction of a net fertility increase or decrease. If Delta is positive, the decline in lactational amenorrhoea associated with more individual education is not offset by an increase in contraception and a positive effect on marital fertility results. The values of Delta are also plotted in Figure XXV against the contextual education level in each of the 12 zones.

Table XXXIV and Figure XXV about here

The main feature exhibited in Figure XXV is again the presence of a very clear interaction effect: at low levels of contextual education, the

Table XXXIV: Effects of rising female educations on the fertility reduction capacity of contraception and lactational amenorrhoea, by contextual zone, KFS 1977-78

Province & mean level of education in zone	Index of use of contraception (x) C_c		Index of lactational amenorrhoea (xx) C_i		Joint effect of contraception & lact. amen. $C_c.C_i$		Individual education effect $\Delta = (C_cC_i)_{5+} - (C_cC_i)_o$
	illiterate women	5+ yrs of schooling	illiterate women	5+ yrs of schooling	illiterate women	5+ yrs of schooling	
	(1)	(2)	(3)	(4)	(5)	(6)	(7) = (6) - (5)
Eastern & Central							
<3 yrs	.97	.88	.61	.68	.59	.60	+.01
3-4.9	.92	.84	.68	.73	.63	.61	-.02
5+	.94	.85	.66	.70	.62	.53	-.09
Western & Nyanza							
<3	.97	.96	.61	.66	.59	.63	+.04
3-4.9	.97	.94	.64	.71	.62	.67	+.05
5+	.96	.83	.59	.68	.57	.56	-.01
Rift Valley							
<3	.97	.92	.63	.68	.61	.63	+.02
≥3	.94	.90	.75	.75	.71	.68	-.03
Coast							
<3	.97	.89	.59	.66	.57	.59	+.03
≥3	.98	.78	.70	.77	.69	.60	-.09
Nairobi							
<7	.94	.82	.73	.73	.69	.60	-.09
≥7	1.00	.71	.75	.79	.75	.56	-.19

(x) from observed proportions current users among currently married women, efficiency of modern methods set at 0.95 and of more traditional methods at 0.70

(xx) from breast-feeding durations of surviving children born in the last 4 years and Bongaarts' equation linking average duration of lactational amenorrhoea to the average duration of breast-feeding; see Bongaarts & Potter (1983), op. cit., p. 25, figure 2.2

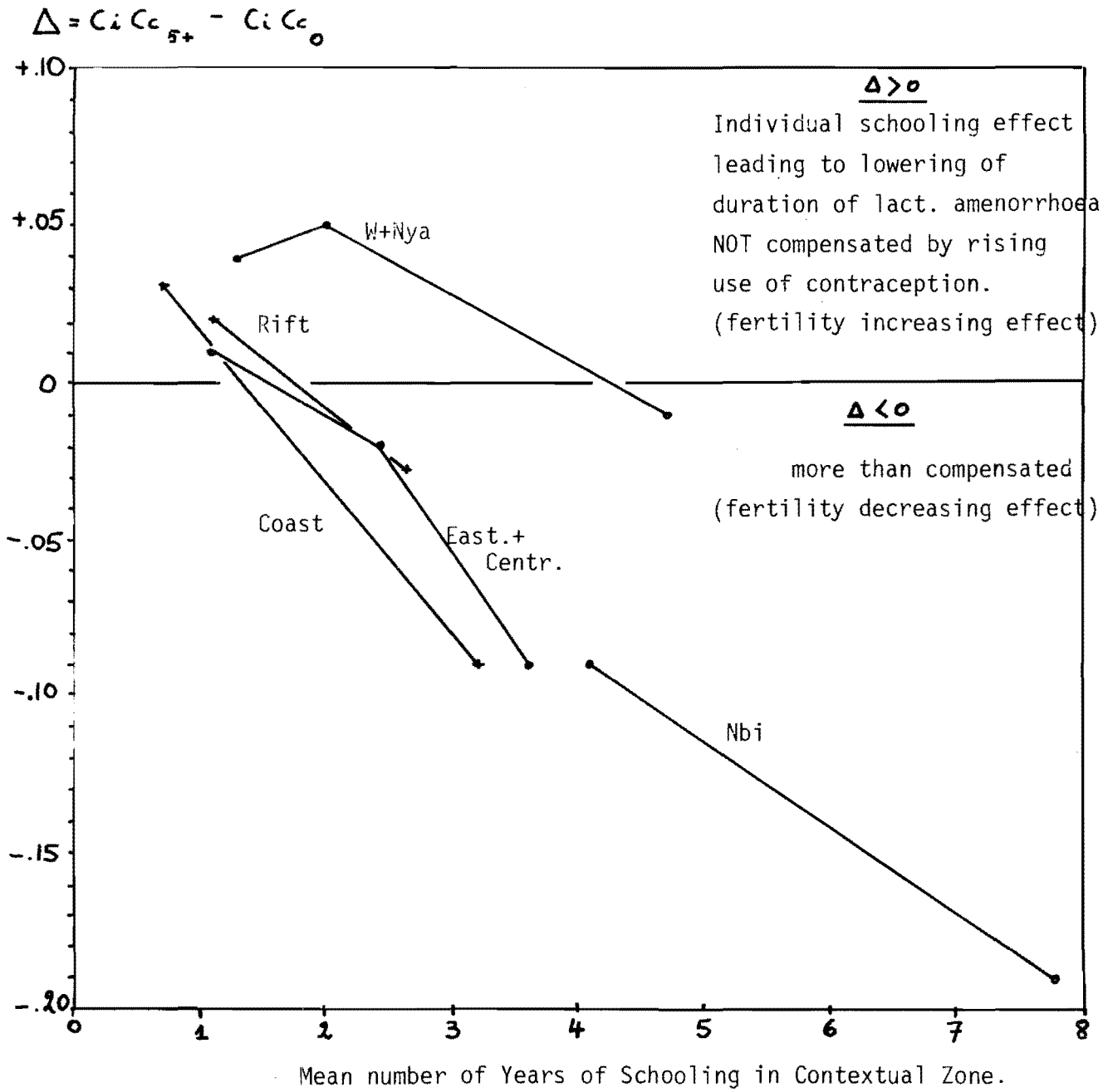


FIGURE XXV: EFFECT OF 5+ YEARS OF INDIVIDUAL SCHOOLING ON MARITAL FERTILITY VIA THE BALANCE BETWEEN LACTATIONAL AMENORRHOEA AND CONTRACEPTION (Δ), BY PROVINCE AND EDUCATION LEVEL IN CONTEXTUAL ZONES, KENYA 1977-78.

net effect of more individual education acts in the direction of an increase in marital fertility via a shortening of lactational amenorrhoea not compensated by enough contraceptive use, and at higher levels of contextual education (i.e. beyond an average of two years) the action is reversed. In fact, the data points for all Kenyan provinces with the exception of those of the Lake Basin (i.e. Western and Nyanza) tend to fall on a single downward sloping line typical for the interaction between individual and contextual levels of education. The contextual level identifying the zero-effect of individual schooling is also of interest: for life time marital fertility itself (i.e. DRAT), a contextual level of schooling of about 4.5 years was required, whereas for the recent measurement of CiCc a contextual level of only 2 years is sufficient. This can be taken as an indicator of the fact that the marital fertility transition is advancing toward the second phase and that the Western and Nyanza provinces may be lagging behind the evolution in the other provinces. Confirmation of this would, however, be required from data pertaining to the 1980's.

The conclusion for this section is obviously that the elasticities between the main proximate determinants of marital fertility or marital fertility itself and improvement of individual schooling levels are highly differentiated, depending on the characteristics of the individuals' environment. At present, we only made use of the combination of provinces and contextual schooling levels of the sample units to characterize these environments, but there are indications that individual education effects in the direction of lowering marital fertility of the educated relatively to the illiterate are also enhanced by living in immigration zones, large urban areas or areas which are on their way to become ethnic melting pots. the second phase of the transition has

therefore been restricted to zones with more rapid economic development, but there are also some indications from the recent balance between lactational amenorrhoea and use of contraception in Kenya that more areas are moving toward it.

9. Conclusions

As was already well known, the regime of reproduction in sub-Saharan Africa has many variants. Systematic data collection during the 1970's on the proximate determinants has revealed the sources of this variation and any further study of African fertility during the decades to come will simply not be able to ignore the intricate patterns exhibited by these variables. Not only the continued measurement of these variables is required to study their mutual neutralization or reinforcement, but more importantly, also the elasticities of each of them relative to factors of social change have to become a major area of study. In doing this, it will not be sufficient to link each proximate determinant of fertility to a string of individual characteristics through regression procedures, but also the study of how the coefficients in these equation vary according to contextual characteristics will gain further importance. The main reasons for this are that cultural characteristics and the props of the traditional form of fertility regulation produce specific effects which are "echoes" of the past, and that modernization processes operate in a cumulative fashion over time. The impact of the contextual level of education studied in Ghana and Kenya document the latter point.

The two-phase theory of the marital fertility transition seems to have been most appropriate in accounting for the horizontal or upward trend. Behind these trends are the compensating effects of declining

durations of the postpartum non-susceptible period and the slow increase of modern forms of contraception. Other effects, more specific to particular areas, have to be added in. In many of the low fertility zones of the 1950's, a dramatic decrease of sterility has occurred, and as these populations practiced relatively little child-spacing by African standards and had relatively low ages at first marriage, substantial increases in the TFR have already been witnessed. Further increases in fertility in these areas are not excluded. In other areas, retardation of first unions plays a prominent role. In Rwanda and Burundi, this check on nuptiality is already a well established feature, but in other populations the evolution in this direction is of a more recent date. The most striking example of it is provided by the Northern Sudan, not only because of the magnitude of the rise in the mean ages at first marriage, but also because it occurred in a population with so few educated women. Populations of the Western Sahel have many specific features as well: very low female education, emigration to the Benin Gulf areas and a high incidence of polygyny corresponding to high levels of marital instability have maintained low ages at marriage, exclusive reliance on breast-feeding for spacing and a lack of knowledge of modern contraception. Male outmigration in Southern Africa on the other hand has not led to polygyny but to long spells of abstinence and to low levels of contraceptive use considering the relatively high levels of female education. Finally, populations along the Benin Gulf have benefitted from an additional postpartum abstinence bonus in maintaining a better spacing pattern than the Sahelian or Eastern African populations, but the various agents of socioeconomic modernization are currenly acting in the direction of an acclerated breakdown of this pattern. The W.F.S.-results for the Ivory Coast, Benin and especially Nigeria ought to give a more detailed picture of what is happening in these densely populated parts of Africa, but we would expect rather marked

education related differentials in nearly all proximate determinants for the non-Islamicized parts of the population (cfr. the studies conducted in the early 70's among the Yoruba for instance).

On the whole, the most recent record with respect to starting and spacing patterns of fertility indicates that we are currently moving toward a crucial turning point in the marital fertility transition in a restricted number of areas, but it is definitely too early to predict the beginning of an overall fertility reduction for the 1980's. At the other extreme, marital and probably also overall fertility are likely to rise in areas which have maintained high levels of female illiteracy: here, too many forceful factors are operating in the direction of such an increase (reduction in breast-feeding and abstinence, reduction in sterility, maintenance of early marriage as a correlate of high polygyny), while useage and knowledge of contraception are very low, even by African standards.

The main policy implication of this picture is that very different strategies with respect to family planning have to be followed depending on the regional situation. In the least advanced ones, information campaigns have to pull up at least the knowledge levels, but it is not sure that improvements in availability will rapidly result in rises in use-effectiveness levels. Also, a major element in such a policy will have to be oriented toward improving spacing. In the most advanced areas, also contraception for stopping purposes can be promoted. Last but not least, family planning resources are far too heavily concentrated in urban areas in sub-Saharan Africa, and there is an immense shortage of both information and availability in the rural areas which are increasingly touched by the weakening of the traditional spacing pattern.

One should not be too optimistic for the 1980's with respect to the possibilities of promotion of sources of modern contraception as, among the series of obstacles, there are at least three with a great deal of weight:

i) desired family size for the vast majority of the population goes beyond 6 children;

ii) the infrastructure for basic health provisions are in most areas still very rudimentary and MCH-FP clinics have been and will continue to be swamped by other, more urgent demands;

iii) African women are highly suspicious of contraception and its possible side-effects: contraception is viewed as tampering with nature and in societies where health and religion are nearly indistinguishable, the new cultural feature of control over one own's physiology is far from being fully legitimized(38).

Yet, in our view, these obstacles - which will frustrate many field operations in the years to come - cannot be taken as an alibi for withholding family planning information and supplies. The generation of women currently below age 30 will be facing a larger family size by their mid-thirties than that of their mothers if current trends continue and a portion of them will decide to stop. As of now, the proportion of women who will take such a decision during the 1980's is, unfortunately, unknown. It would, however, be a very major mistake to push family planning in sub-Saharan Africa with measures which would show even the faintest trait of coercion or pressure. This would discredit the use of contraception for

at least a full generation. Rather, we would consider it a major success if the demand for contraception, for which we would project an increase in the more developed parts of Africa, could be met. With the present economic slump, which affects these populations far more than is recognized in the West, chances are that such a rising demand remains unmet and that African population growth rates will exceed the 3 percent level more and more if the faltering traditional props of spacing are not replaced by greater reliance on modern contraception for spacing as well as for stopping purposes(39).

Footnotes

(1) A more extensive comparison is currently being prepared.

(2) See the references under Brass et.al., van de Walle, Page and Coale, Caldwell, Page and Lesthaeghe, Molnos, Saucier, Schoenmaeckers et.al., Murdock, Coulibaly et.al. for additional literature.

(3) R.Schoenmaeckers (1984) analyzed the various data sets for Kenya from 1962 to 1979 with the same set of indirect estimation techniques, and came to essentially the same conclusion. However, Kenya is a relatively easy case given the magnitude of the increase in both the TFR and the TMFR. Another feature indicated by this author is that most of the increase can be traced back to the 1960's. See also K.Hill et.al. s.d.

(4) Fertility increase associated with the first stages of economic development are by no means confined to Africa. There is evidence for it in several regions of Western Europe during the period 1860-1900 involving marital fertility (i.e. independent from the lowering of age at marriage), in Japan where higher control of marital fertility in the older ages was entirely offset by a major increase in the ages before 30, and in all the Asian Republics of the Soviet Union.

(5) The BIF does not give numerical values for postpartum abstinence in West Zaire and Tanzania. The EDOZA-survey of 1976 in West-Zaire did however include questions addressed to village elders. These were

taken into consideration by Sala-Diakanda (1980) and indicate that the abstinence period exceeds one year among the Bakongo and among the Kwango-region ethnic groups (Bayaka, Basuku), while it does not reach this level among populations further east (Baluba) or north (Mongo). In the colonial days, district officers were asked to fill out a questionnaire on that matter and Romaniuk makes reference to these materials in sketching a picture that is similar to that of Sala-Diakanda (see Romaniuk, 1980). The Tanzanian national demographic survey of 1973 proceeded in essentially the same way, but from the brief statements reproduced in Volume III one can only infer that not much of a taboo is left in most areas. Finally, Coulibaly et.al. established large contrasts among Voltaic ethnic groups (1977).

(6) Marked differentials can exist between urban areas as well: in the large but more traditional city of Ibadan postpartum abstinence was about 7 months longer than in Lagos for every age group and every education group (comparison of Caldwell's results for Ibadan with the Lagos-survey by Adegbola, Page and Lesthaeghe).

(7) The means for all three variables involved are Prevalence/Incidence-means for births that took place in the last 24 months (only half the number of births 24 months ago are added in, given the strong rounding). Current status for non-susceptibility is simply 1=either abstaining or amenorrhoeic or both, 0=neither of the two. The alternative procedure used for Sudan and Cameroon is based on the regression equation

$$\bar{X}Nsp = -0.132 + 0.781\ \bar{X}Amen + 0.386\ \bar{X}Abst + 0.008(\bar{X}Amen*\bar{X}Abst)$$

with R2 = .98 for regional, ethnic, education and rural/urban data points for Ghana and Kenya. The scatter on Figure III reveals that the error associated with the measurement of either $\bar{X}$Abst or $\bar{X}$Amen is of more importance than the error associated with the conversion procedure itself. The regression equation has the disadvantage of containing an interaction term which magnifies the error if $\bar{X}$Abst and $\bar{X}$Amen are biased in the same direction.

(8) The distributions of age at marriage constructed from retrospective questions can only readily be produced for women above age 25, i.e. when hardly any more marriages are to occur. The mean for all women 15-49 would be very seriously biased downward as the single women who will eventually marry are excluded. This problem can however be solved by making use of the Coale standard nuptiality schedule and life table techniques (see e.g. Trussell and Rodriguez, 1980, and Vanderhoeft, 1983). These procedures are also applicable to age at first birth and allow introduction of covariates.

(9) Hajnal's singulate mean age at marriage or SMAM and Coale's natural fertility weighted index Im are typically for cross-sections. They can be produced for cohorts but only if measurements are available for several points in time of proportions single (SMAM) or currently married (Im). Across regions, ethnic groups etc., there exists of course an empirical relationship between these measures. The one between the percentage single 15-19 and SMAM is shown below in Figure A1 for 101 sub-Saharan data points. A conversion table can be deduced from this relationship, but one should bear in mind that such a conversion is only an approximation. The approximation is more

than adequate if ultimate proportions single remain below two percent; when these tend to rise, SMAM may start to deviate from the conversion pattern as it is very sensitive to final celibacy differentials. This sensitivity of SMAM to final celibacy is another reason for preferring the proportion single 15-19 whenever survey material is used: proportions single in the age group 45-54 have large sampling errors (low proportions and small sub-samples) and can be rather volatile. The Coale index Im is not a good indicator of age at entry when large differences exist among populations with respect to final celibacy, and proportions currently divorced or widowed. It is, however, much better suited as an indicator of overall exposure to risk of conception among currently married women, and was designed as such.

Figure A1 about here

Percent single 15-19	SMAM	Percent Single	SMAM
10%	15.4 yrs	55	18.3
15	15.7	60	18.7
20	16.0	65	19.2
25	16.3	70	19.7
30	16.7	75	20.2
35	17.0	80	21.0
40	17.3	85	22.2
45	17.6	90	23.8

(10) The age group 45-49 was dropped: in surveys that single out women in the fertile age range, i.e. below 50, the proportion widowed is often not measured accurately for the age group 45-49 because transfers

across age 50 take place in either direction depending on widowhood.

(11) Differential fertility between women currently in monogamous and polygynous unions cannot be studied adequately through life time fertility measures: most women in polygynous households have spent substantial amounts of exposure living in monogamous settings. The same obviously also holds for studying fertility by rank-order of women in a polygynous union.

(12) The last closed pregnancy interval pertains to the interval between the last pregnancy (may be a current pregnancy) and the previous one. Estimates of mean durations of breast-feeding, lactational amenorrhoea or abstinence tend to be biased downward as women are selected with at least two pregnancies. Young women, subfecund women and very traditional child-spacers are selected out disproportionately since they may not yet have had 2 pregnancies to report. The bias, however, varies strongly from country to country, and in Cameroon it was one of the smallest recorded in W.F.S-surveys (internal compensation of biases).

(13) The reason for this is that drawn-out tails of distributions affect the mean. The 12th month was also excluded in setting up the percentages because of the heaping effect around this number.

(14) Note with respect to Table XVIII that the distributions for all durations since first marriage together are highly misleading since younger women for whom the selection had not yet taken place form a majority.

(15) There exists a very strong empirical relationship between the overall polygyny ratio (total number of married women of all ages per 100 married men) and the indicator used here (percent polygynous among currently married women 15-49). The following conversion table can be used for African data:

Polyg.Ratio	Polyg.15-49	Polyg.Ratio	Polyg.15-49
100	0	130	39.0
105	8.5	135	42.5
110	16.5	140	45.0
115	24.0	145	47.5
120	30.0	150	50.0
125	35.0	155	51.5

(16) If that happens to hold, it would not be the individual differences between monogamous and polygynous unions in a given society with respect to abstinence that matter, but the societal differences pulling up or suppressing postpartum abstinence for all women irrespective of type of union.

(17) If the Zaire data are taken on their own a very striking positive relationship exists among regions or ethnic groups between the degree of polygyny and infecundity. This holds for the period 1955-57 (Romaniuk, 1968) and was confirmed for Western Zaire for 1976 as well (Tabutin et.al., 1981 and Sala Diakanda, 1980).

(18) Women who never breast-fed have an amenorrhoea period of 1.5 to 2 months only; that is a postpartum sterile period virtually identical to the one following a foetal death.

(19) Alternatively, interviewers shun prostitute compounds which are another concentration of childless and subfecund women.

(20) Note that the proportion not progressing beyond 2 live births after minimum 15 years of exposure also contains the proportions childless. Obviously if these are subtracted, the measures of primary sterility and of sub-fecundity would be more loosely connected than Figure X shows.

(21) The example given here assumes that the mean length of the postpartum non-susceptible period and the proportions among currently married women currently using contraception are measured adequately. But also for these 2 items, major problems exist with respect to data quality and method used to calculate means. See Lesthaeghe, Page and Shah (1982), Ferry and Smith (1981) and Vaessen (1981) for a discussion of the relevant W.F.S.-based findings.

(22) Bongaarts proposes a TF-level of 15.3 children as a general value for any population without a sterility pathology and coital frequencies leading to monthly probabilities of conception of the order of 0.25 in the age group 20-29. The data presented in Figure XI are in good agreement with this proposition: the intercept with 5 percent sterility or sub-fecundity is 15.2. We would, however, feel more comfortable about the slope of the relationship if more data were available for the high sterility end of the scale. Unfortunately, the Zaire-survey (EDOZA) of 1975-76 did not measure lactational amenorrhoea, postpartum abstinence and contraceptive use for the populations of Equateur and Tshuapa regions.

(23) Whenever possible, the estimation of TF via the TMFR and the Bongaarts indices of postpartum non-susceptibility and contraceptive protection is still highly recommended, because of the possibility of a considerable underestimation of childlessness.

(24) The present outburst of rinder pest, causing very important economic losses in cattle raising areas, is almost exclusively due to breakdown in the local production and distribution of the Plowright-vaccine.

(25) Another advantage of the pairwise comparison technique is that it allows internal consistency checks on choices. If 8 is preferred over 6, one would not expect a respondent to pick 4 over 6 when that pair comes up.

(26) The governmental policy in Senegal has been changing recently, when one realized that the pattern of child-spacing was endangered and that a continued population growth rate of about 2.7 percent was not compatible with the country's economic prospects. The participation of Senegal in the W.F.S.-project underscores the growing awareness of the various demographic problems.

(27) There is also a tendency for higher average desired family sizes in areas with an infecundity problem, but it certainly does not account for all regional variation.

(28) The "gris-gris" in Senegal refer to magic amulets with coranic verses which may be used on their own or together with other folk methods of

contraception. The dominant effect of the "gris-gris to keep the men away" may well be that they are a magico-religious and hence psychological support for women who wish to abstain for a period of time.

(29) We have no explanation for the two regions that fall above line "A" in Figure XVI; for the Lesotho region falling below line "B", one should keep in mind that very large numbers of husbands are absent.

(30) Averages of durations in lactational amenorrhoea, abstinence and non-susceptibility are obtained via the "Prevalence-Incidence Ratio". Setting the observation period to the last 2 years, this P/I-mean is simply the ratio of the total number of women in a given state (still amenorrhoeic, still abstaining...) to the average monthly number of births.

(31) The data for subregions in Senegal and Lesotho are not shown here because of the highly homogeneous levels of illiteracy (very high in Senegal and very low in Lesotho).

(32) The questionnaires of the "Contraceptive Prevalence Surveys" designed by Westinghouse Health Systems for Kenya and Zaire are <u>not</u> of comparable quality to those used by W.F.S. Admittedly, the W.F.S questionnaire could be simplified at a number of points and too complicated filter questions led to accidents in the French version, but the Westinghouse questionnaire has greater gaps than that. A typical example of this is the absence of questions on postpartum abstinence (retrospective and current status) immediately following the questions on lactation. Abstinence only figures among the

contraceptive techniques. A quick inspection of the W.F.S.-results should have convinced the designers of the Westinghouse questionnaire that the response is going to be very low for abstinence at this location: "normal" postpartum abstinence and sporadic "contraceptive" abstinence are highly differentiated items in the African mind. The problem of missing postpartum abstinence is not too serious in most Kenyan populations, but it is a much more serious shortcoming in Zaire.

(33) The Upper and Northern regions of Ghana only contain sampling units with very low average levels of female schooling. As a result, they are grouped into a single contextual zone only.

(34) In contextual analysis, a distinction is made between separate and single equation models (see Boyd and Iversen, 1979). The single equation approach has a number of advantages if the structure exhibited by the separate equation models can be accommodated. S.K.Gaisie made a number of applications with the Ghana W.F.S.-data based on this single equation approach (1983). However, separate models are easier to handle as no transformations are required and if context-samples are large enough.

(35) The DRAT-index of life time marital fertility proposed by Boulier and Rosenzweig (1978) is an indirectly standardized measure of individual marital fertility, obtained by relating the observed number of births to the expected number that would occur if each woman were subject to the high natural fertility regime (i.e. the Coale, Hill, Trussell-schedule (1975)) that serves as a standard. If f(a) represents the age specific marital fertility of the standard, $\underline{m}$ the

age at first union and a current age, the index is:

$$\text{DRAT} = \text{observed births} \Big/ \int_{m}^{a} f(a)da$$

The standard schedule f(a) has a TMFR of very nearly 12 live births (from age 15 onwards). An individual's value of DRAT of 0.80 then indicates that she has been proceding with procreation at an average pace so far which is 80 percent of the pace in the standard. Note, however, that the calculation of DRAT is only performed on women with at least 5 years of marriage: it is too risky to say anything meaningful about the "average pace of procreation" for women who are just starting.

(36) One should not normally introduce age and age at marriage in an equation predicting DRAT: the age span of exposure is already taken into account (cfr. m and a in the formula). However, the average values of DRAT by age often follow a downward sloping pattern which is produced by several factors: underreporting of births among older women, recent increase in fertility among younger cohorts, and probably also too high marital fertility in the standard at ages beyond 30 when applied to African populations. The correction for duration of marriage is also necessary as the standard schedule does not allow for the fact that women of identical age but with different ages at first marriage have different fertility at their current age: those married younger have now lower fertility (see H.J.Page, 1977).

(37) The effect of individual education (i.e. B1k) is calculated for each contextual zone and simply averaged over all zones. Control values

for age were set at 25 and 35, for living children at 2 and 6, for marriage duration at 5 and 15. The results of Table XXXI through XXXIII stem from an averaging process across these controls as well. In Table XXXII, the controls for individual education were set at 0 years of schooling and 5 years.

(38) Following P.Ariès, the breakthrough in Western medicine during the Renaissance and the demographic implications of a wide social application of these discoveries during the 19th and the 20th centuries stem precisely from such a cultural revolution in Western Europe during the 16th and 17th centuries (see Aries, 1984).

(39) The legitimacy of contraceptive use in Africa has often been defended in terms of a replacement for traditional spacing (see for instance Mabogunje, 1981) and our own work has contributed support of this view (Lesthaeghe and Page, 1981). However, we have come to realize that educated (primary + secondary education) women who are currently in their late twenties will soon face a <u>stopping</u> rather than a spacing problem as they reach their desired family size. Even if this size is of the order of 6 or 7 children, the younger generations will reach it earlier or much earlier (depending on location) than their mothers, and with increased costs of child-rearing and costs of education, the stopping element will gain considerable importance. Moreover, more educated husbands will at first object to their wives observing periods of abstinence, but they are less likely to contribute so willingly to the costs of educating fifth or higher order children given the current economic depression.

BIBLIOGRAPHY & REFERENCES

O.Adegbola (1977): "New Estimates of Fertility and Child Mortality in Africa South of the Sahara", Population Studies, Vol.31, nr.3, pp.467-468.

R.Anker and J.C. Knowles (1982): Fertility Determinants in Developing Countries - A Case Study of Kenya. Ordina Editions, Liege.

P.Ariès (1984): "L'homme et son corps - Une révolution culturelle", in Proceedings of Agora Demography, King Baudouin Foundation, Brussels (forthcoming).

D.Benoit (1976): "Une enquête démographique à partir des régistres paroissiaux en pays Gourounsi, Haute Volta", Cahiers de l'ORSTOM, Série Sciences Humaines, Vol.8, nr.3, pp.297.

D.Benoit, P.Levi, J.Papail, F.Sodter (1981): Enquête démographique en pays Lobi-Dagara, Haute Volta 1976; Office de la Recherche Scientifique et Technique Outre Mer, Section Démographie, document de travail no.13, Paris.

D.Benoit, B.Lacombe, P.Levi, P.Livenais, F.Sodter (1982): "Kongoussi-Tikare, Enquête de sources complémentaires en milieu rural Mossi, Haute Volta 1978", ORSTOM, section démographie, document de travail no.10, Paris.

D.Benoit, P.Levi, P.Livenais, F.Sodter (1982): "Mariatang, enquête de sources complémentaires en pays Dagara, Haute Volta", ORSTOM,

section démographie, document de travail no.16, Paris.

J.T.Bertrand, W.E.Bertrand and M.Malonga (1983): "The Use of Traditional and Modern Methods of Fertility Control in Kinshasa, Zaire", Population Studies, Vol.37, nr.1, pp.129-136.

W.Z.Billewicz, I.A.Gregor (1981): "The Demography of 2 West African (Gambian) Villages, 1951-1975", Journal of Biosocial Sciences, Vol.13, no.2, pp.219-240.

J. Bongaarts (1976): "Intermediate Fertility Variables and Marital Fertility Rates", Population Studies, Vol.30, nr.2, pp.227-241.

J.Bongaarts (1981): "The Impact on Fertility of Traditional and Changing Child-spacing Practices", in H.J.Page and R.Lesthaeghe, op.cit., pp.111-129.

J.Bongaarts (1982): The Proximate Determinants of Natural Marital Fertility, Center for Policy Studies working paper nr.89, The Population Council, New York.

J.Bongaarts and R.Potter (1983): Fertility, Biology and Behaviour, Academic Press, London.

B.Boulier and M.Rosenzweig (1978): "Age, Biological Factors and Socio-economic Determinants of Fertility: A new Measure of Cumulative Fertility for Use in the Empirical Analysis of Family Size", Demography, Vol.15, nr.4, pp.487-497.

L.H.Boyd and G.R.Iversen (1979): Contextual Analysis: Concepts and Statistical Techniques, Wadsworth Publishing Cy, Belmont, California.

W.Brass et.al. (1968): The demography of Tropical Africa, Princeton University Press, Princeton NJ.

J.C.Caldwell, N.O.Addo, S.K.Gaisie, A.Igun and P.O.Olusanya (1975): Population Growth and Socioeconomic Change in West Africa, Columbia University Press, New York.

J.C.Caldwell and P.Caldwell (1977): The Role of Marital Sexual Abstinence in determining Fertility: A Study of the Yoruba in Nigeria", Population Studies, Vol.31, nr.2, pp.193-217.

J.C.Caldwell (1980): "Mass Education as a Determinant of the Timing of Fertility", Population and Development Review, Vol.6, nr.2.

J.C.Caldwell and P.Caldwell (1981): "Cause and Sequence in the Reduction of Postnatal Abstinence in Ibadan City, Nigeria" in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.181-199.

P.Caldwell and J.C.Caldwell (1981): "The functions of Child-spacing in Traditional Societies and the Direction of Change", in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.73-91.

J.C.Caldwell and H.Ware (1977): "The Evolution of Family Planning in an African City: Ibadan, Nigeria", Population Studies, vol.31, nr.3, pp.487-508.

J.Capron and J.M.Kohler (1975): Migrations de Travail et Pratique Matrimoniale - Migrations à partir du pays Mossi (Haute Volta), ORSTOM Ouagadougou, mimeo.

M.Carael (1981): "Child-spacing, Ecology and Nutrition in the Kivu Province of Zaire", in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.275-286.

A.J.Coale, A.Hill and T.J.Trussell (1975): "A New Method of Estimating Standard Fertility Measures from Incomplete Data", Population Index, Vol.44, nr.2, pp.182-210.

S.H.Cochrane (1979): Fertility and Education: What do we really know, Johns Hopkins University Press, Baltimore MD.

J.M.Cohen (1967): Afrique Noire, Madagascar, Comores - Démographie Comparée - Facteurs de la Fécondité, INSEE and INED, section 5, Paris.

P.Dubroz (1979): Etude démographique de la ville de Brazzaville 1974-77, Centre ORSTOM, Bangui.

R.A.Easterlin, R.A.Pollak and M.L.Wachter (1980): "Toward a more General Economic Model of Fertility Determination: Endogeneous Preferences and Natural Fertility", in R.A.Easterlin (ed): Population and Economic Change in Developing Countries, University of Chicago Press, Chicago, Ill., pp.81-150.

B.Ferry (1981): "The Senegalese Surveys" in H.J.Page and R.Lesthaeghe (eds)

op.cit., pp.265-285.

B.Ferry and H.J.Page (1984): The Proximate Determinants of Fertility and their Effect on Fertility Patterns - An Illustrative Analysis applied to Kenya, forthcoming in W.F.S.-Scientific Report Series, London and The Hague.

B.Ferry and D.P.Smith (1983): "Breastfeeding Differentials" in W.F.S.-Comparative Studies series, nr.23, London and the Hague.

O.Frank (1983): Infertility in sub-Saharan Africa, Center for Policy Studies working Paper nr.97, The Population Council, New York.

S.K.Gaisie (1981): "Child-spacing Patterns and Fertility Differentials in Ghana", in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.237-253.

S.K.Gaisie (1983): The Proximate Determinants of Fertility in Ghana, World Fertility Survey Technical Dossiers W.F.S.-TECH 1938, London, manuscript.

S.K.Gaisie (1983): Education, Social Structure and the Fertility Transition in Ghana, Institute of Statistical, Social and Economic Research, University of Ghana, Legon (unpublished manuscript).

S.K.Gaisie (1983): Contextual Analysis of Education and Proximate Determinants of Fertility in Ghana, Institute of Statistical, Social and Economic Research, University of Ghana, Legon (unpublished manuscript).

R.A.Henin, D.Ewbank and H.Hogan (eds) (s.d.): The Demography of Tanzania; An Analysis of the 1973 National Demographic Survey of Tanzania, Bureau of Statistics and BRALUP, Dar Es Salaam.

R.A.Henin, A.Korten and L.Werner (19823): Evaluation of Birth Histories: A Case Study of Kenya, World Fertility Survey Scientific Reports nr.36, London & The Hague.

A.Hill, S.Randall and O.Sullivan (1982): "The mortality and fertility of farmers and pastoralists in Central Mali, 1950-81", Center for Population Studies Research Paper 82-4, University of London, London.

K.Hill, R.Henin, L.Werner and J.Kekovole (s.d.): An Investigation of Recent Fertility Trends and Differentials in Kenya, Country Studies Working Group on Kenya, Committee on Population and Demography, US National Academy of Sciences, Washington DC (mimeo).

Shailendra K.Jain (1978): The Longitudinal Mortality and Fertility Survey in the Western Region of Ghana - Tabulations, Dept. of Demography, Australian National University, Canberra, 3 vols.

I.Kaplan et.al. (1967): Area Handbook for Kenya, US Government Printing Office, Washington DC.

I.Kaplan et.al. (1971): Area Handbook for Ghana, US Government Printing Office, Washington DC.

R.Lesthaeghe (1980): "On the Social Control of Human Reproduction",

Population and Development Review, Vol.6, Nr.4.

R.Lesthaeghe, P.O.Ohadike, J.Kocher and H.J.Page (1981): "Child-spacing and Fertility in sub-Saharan Africa: An Overview of Issues", in H.J.Page and R.Lesthaeghe, op.cit., pp.3-23.

R.Lesthaeghe, H.J.Page and O.Adegbola (1981): "Child-spacing and Fertility in Lagos", in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.147-179.

R.Lesthaeghe, I.H.Shah and H.J.Page (1981): "Compensating Changes in Intermediate Fertility Variables and the Onset of the Marital Fertility Transition", Proceedings of the I.U.S.S.P. World Conference (Manilla), I.U.S.S.P. - Ordina Editions, Liege.

R.Lesthaeghe, C.Vanderhoeft, S.Becker and M.Kibet (1983): "Individual and Contextual Effects of Education on Proximate Determinants and on Life Time Fertility in Kenya", Interuniversity Programme in Demography Working Papers 83-2 and 83-9 (abbreviated version), Vrije Universiteit, Brussels.

T.Locoh and G.Adaba (1981): "Child-spacing in Togo: the Southeast Togo Survey EFSE", in H.J.Page and R.Lesthaeghe (eds): Child-spacing in Tropical Africa, op.cit., pp.255-264.

A.L.Mabogunje (1981): "The Policy Implications of Changes in child-spacing Practices in Tropical Africa" in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.303-315.

A.Molnos (1973): Cultural Source Materials for Population Planning in East Africa, Institute of African Studies, University of Nairobi, Nairobi (3 vols).

W.H.Mosley, L.H.Werner, S.Becker (1982): The Dynamics of Birth-spacing and Marital Fertility in Kenya, World Fertility Survey, Scientific Reports Nr.30, London & The Hague.

A.M.Mpiti and I.Kalule-Sabiti (1983): "The Proximate Determinants of Fertility in Lesotho", W.F.S.-Technical report, WFS-TECH 2175 (manuscript), London.

M.Nag (1982): "The Impact of Socio-Cultural Factors on Breast-feeding and Sexual Behaviour", in Determinants of Fertility in Developing Countries, report nr.15, National Academy Press, Washington D.C.

H.D.Nelson et.al. (1973): Area Handbook for the Democratic Republic of Sudan, US Government Printing Office, Washington D.C.

H.D.Nelson et.al. (1974): Area Handbook for Senegal, US Government Printing Office, Washington DC.

H.D.Nelson et.al. (1974): Area Handbook for the United Republic of Cameroon, US Government Printing Office, Washington DC.

Ngondo a Pitshandenge (1978): Polygamie et fécondité dans la Société Zairoise - L'exemple des Yaka de la zone de Popokabaka, Département de Démographie, working papers series no.58, Université Catholique de Louvain, Louvain-la-Neuve.

P.Ohadike (1968): "A demographic Note on Marriage, Family and Family Growth in Lagos, Nigeria", in J.C.Caldwell and C.Okonjo (eds): The Population of Tropical Africa, Longmans, Green and Co, London, pp.379-392.

P.O.Olusanya (1969): "Nigeria: Cultural Barriers to Family Planning among the Yorubas", Studies in Family Planning, nr.37, pp.13--16.

P.O.Olusanya (1969): "Modernization and the Level of Fertility in Western Nigeria", in Proceedings of the International Popoulation Conference (London), Internatl. Union for the Scientific Study of Population, Liege.

H.J.Page (1977): "Patterns underlying Fertility Schedules: A Decomposition by both Age and Marriage Duration", Population Studies, Vol.31, nr.1, pp.85-106.

H.J.Page and A.J.Coale (1972): "Fertility and Child Mortality South of the Sahara" in S.H.Ominde and C.N.Ejiogu (eds): Population Growth and Economic Development in Africa, Heinemann Educational Books, London, pp.51-66.

H.J.Page and R.Lesthaeghe (eds) (1981): Child-spacing in Tropical Africa - Traditions and Change, Academic Press, London.

H.J.Page, R.J.Lesthaeghe,I.H.Shah (1982): Illustrative Analysis: Breast-feeding in Pakistan, World Fertility Survey Scientific Reports nr.37, London & The Hague.

D.I.Pool and S.P.Coulibaly (1977): Demographic Transition and Cultural Continuity in the Sahel, International Population Programme, Cornell University, Ithaca, New York.

A.Retel-Laurentin (1974): Infécondité en Afrique Noire - Maladies et conséquences sociales, Editions Masson, Paris.

A.Retel-Laurentin (1975): Infécondité et Maladies - Les Nzakara, Institut National de la Statistique et des Etudes Economiques, Paris.

A.Romaniuk (1968): "The Demography of the Democratic Republic of the Congo", in W.Brass et.al., op.cit., pp.241-341.

A.Romaniuk (1967): La fécondité des populations congolaises, Editions Mouton, Paris.

A.Romaniuk (1980): "Increase in Natural Fertility during the Early Stages of Modernization: Evidence from an African Study: Zaire", Population Studies, Vol.34, nr.2, pp.293-310.

M.Sala-Diakanda (1980): Approche Ethnique des Phénomenes Démographiques - Le Cas du Zaire, Doctoral dissertation in demography, Université Catholique de Louvain, Louvain-la-Neuve, 2 vols.

M.Sala-Diakanda and L.Lohlé-Tart (1980): "Zaire" in Studies on the Determinants of Fertility Behaviour for Population Policies Aiming at Reducing Fertility in Developing Countries, I.U.S.S.P. seminar in Colombo (1-8 Dec), Sri Lanka, mimeo, Liege, 2 vols.

J.F.Saucier (1972): "Correlates of the Long Postpartum Taboo: A Cross-Cultural Study", Current Anthropology, Vol13, nr.2, pp.238-249.

R.Schoenmaeckers, I.H.Shah, R.Lesthaeghe and O.Tambashe (1981): "The Child-spacing Tradition and the Postpartum Taboo in Tropical Africa: Anthropological Evidence", in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.25-71.

R.Schoenmaeckers (1984): The Onset of Changes in Fertility Behaviour in Kenya? A Birth Interval Analysis with the Use of a Relational Hazards Model. Doctoral dissertation, Interuniversity Programme in Demography, Vrije Universiteit, Brussels.

D.Tabutin, M.Sala-Diakanda, Ngondo A Pitshendenge and E.Vilquin (1981): "Fertility and Child-spacing in Western Zaire", in H.J.Page and R.Lesthaeghe (eds), op.cit., pp.287-302.

O.Tambashe (1984): La fécondité et ses variables intermédiaires à Kinshasa; Doctoral dissertation, Interuniversity Programme in Demography, Vrije Universiteit, Brussels.

T.J.Trussell and G.Rodriguez (1980): "Maximum Likelihood Estimation of the Parameters of the Coale Model Nuptiality Schedule from Survey Data", W.F.S.-Technical Bulletin nr.7, London and The Hague.

E.van de Walle (1968): "Marriage in African Censuses and Inquiries", in W.Brass et.al., op.cit., pp.183-238.

M.Vaessen (1981): "Knowlege of Contraceptives: An Assessment of World Fertility Data Collection Procedures", Population Studies, Vol.35, nr.3, pp.357-374.

C.Vanderhoeft (1983): "A Unified Approach to Models for Analysis of Zero-One Data, with Applications to Intermediate Fertility Variables", Interuniversity Programme in Demography Working Paper 83-5, Vrije Universiteit, Brussels.

P.Vimard (1980): Nuptialité et Fécondité sur le Plateau de Dayes; Sud Est-Togo - Principaux Résultats, Office de la Recherche Scientifique et Technique Outre Mer, Centre ORSTOM, Lomé.

H.Ware (1977): "Language Problems in Demographic Field Work in Africa: the Case of the Cameroon Fertility Survey", W.F.S.-Scientific Report Series, nr.2, London and The Hague.

E.M.Weiss (1981): The Calabar rural MCH-FP Project, Final Report, The Population Council and the Ministry of Health, Government of Nigeria, New York.

J.W.M.Whiting (1964): "Effects of Climate on Certain Cultural Practices" in W.H.Goodenough (ed.): Explorations in Cultural Anthropology - Essays in Honour of Peter Murdock, McGraw-Hill Publishing Co., New York.

NATIONAL SOURCE MATERIALS

Kingdom of Lesotho (1981): Lesotho Fertility Survey 1977, Central Bureau of Statistics, Maseru, 2 vols.

Kingdom of Swaziland (s.d.): Report on the 1976 Swaziland Population Census - Administrative and Analytic Reports, Central Statistical Office, Mbabane.

Republic of Botswana (1972): Report on the Population Census of 1971, Central Statistical Office, Gabarone.

Repoblika Malagasy (1967): Enquete démographique Madagascar 1966, Institut National de la Statistique et de la Recherche Economique, Tananarive.

Republic of Gambia (1981): Population Census of 1973 - General Report, Central Statistics Division,...

Republic of Ghana (1983): Ghana Fertility survey 1979-80, First Report, Central Bureau of Statistics, Accra, 2 vols.

Republic of Kenya: Kenya Fertility survey 1977-78, First Report, central Bureau of Statistics, Nairobi, 2 vols.

République de Haute Volta (s.d.): Enquête démographique par sondage en République de Haute Volta, 1960-61, INSEE-Cooperation, Paris, 2 vols.

République du Burundi (1974): Enquête démographique 1970-71, Ministère du Plan, Bujumbura, 2 vols.

République du Dahomey (1964): Enquête démographique au Dahomey 1961, Résultats définitifs, INSEE-Cooperation, Paris.

République du Sénégal (1974): Enquête démographique nationale 1970-71, Direction de la Statistique, Dakar.

République du Sénégal (1981): Enquête Sénégalaise sur la Fécondité 1978, Rapport National d'Analyse, Direction de la Statistique, Dakar, 2 vols.

République du Tchad (1966): Enquête démographique au Tchad 1964, INSEE-Cooperation, Paris, 2 vols.

République du Zaire (1968): Synthese des Etudes Démographiques de l'Ouest du Zaire, Département de démographie et Centre de recherches sociologiques de l'Université Catholique de Louvain & SICAI; Louvain-la-Neuve. Also 5 volumes of tabulations and regional analyses.

République Islamique de Maurétanie (1972): Enquête démographique 1965, Résultats définitifs, INSEE-Cooperation, Paris.

République Populaire du Congo (1078): Recensement Général de la Population du Congo 1974, Centre National de la Statistique et des Etudes Economiques, Brazzaville.

République Rwandaise (1982): Recensement Général de la Population et de l'Habitat, Bureau National de Recensement, Kigali.

République Togolaise (1974): Recensement Général de la Population - Mars/Avril 1970, Direction de la Statistique, Lomé.

République Unie du Cameroon (1983): Enquête Nationale sur la Fécondité du Cameroon - Rapport Principal, Direction de la Statistique et de la Comptabilité Nationale, Yaounde, 3 vols.

Somali Democratic Republic (1981): Report on the Demographic Survey of Banadir, Bay and Lower Shebelle Regions of Somalia, 1980-81, Central Statistical Department, Mogadishu.

The Democratic Republic of Sudan (1981): The Sudan Fertility Survey 1979 - Principal Report, Department of Statistics, Khartoum.

United Republic of Tanzania (s.d.): The 1973 National Demographic Survey of Tanzania, Bureau of Statistics and BRALUP, Dar Es Salaam, 3 vols.

Table A1 : Total Fertility Rates in Northern Sudan by Region - Comparison of Estimates 1955-79

Census of 1955-56 Demeny, Coale & Lorimer		1979 Sudan Fertility Survey	
Beja	5.7	Kassala & Red Sea	6.0
Arabs	6.1	Northern & Nile	5.4
		Gezira, Blue & White Nile	6.6
		Kordofan	5.9
		Khartoum	4.9
Westerners	5.9	Darfur	6.3
N. Sudan	5.9		6.0

Sources : - P. Demeny : "The Demography of the Sudan - An Analysis of the 1955-56 Census" & A.J. Coale, F. Lorimer : "Summary of Estimates of Fertility and Mortality" in W. Brass et al. : The Demography of Tropical Africa, Princeton University Press, Princeton NJ, 1968, p. 159, Table 4.2 Part A.

- The Democratic Republic of Sudan : The Sudan Fertility Survey 1979 - Principal Report, Ministry of National Planning, Dept. of Statistics, Khartoum 1981, Vol. 1, Table 5.18, p. 61.

Table A2 : Total Fertility Rates in Cameroon by Region - Comparison of Estimates 1960-78

Page & Coale		Fertility Survey 78		
			Household q.	Individual q.
North 1960-61	4.8	Northern	5.4	6.2
North Benué 1960-61	5.1			
South-East 1962-64	4.3	Littoral	6.2	6.1
		Central South	6.4	6.6
		East	6.5	6.3
West Cameroon 1964-65	6.5	North-West	6.2	6.9
		South-West	6.9	7.3
		West	7.0	7.3
		Yaounde	5.2	5.3
		Douala	4.9	5.5
Cameroon	-		5.9	6.4

Sources : H.J. Page & A.J. Coale : "Fertility and Child Mortality South of the Sahara" in S. Ominde & C. Ejiogu : Population Growth and Socioeconomic Development in Africa South of the Sahara, Heinemann, London, 1973, Table 9.1.

République Unie du Cameroun : Enquête Nationale sur la Fécondité du Cameroun 1978 - Rapport Principal, Direction de la Statistique et de la Comptabilité Nationale, Ministère du Plan, Yaounde 1983, Vol. I, Tables 5.34 & 5.35. Note : TFR's are based on $\sum_{15}^{34}$ ASFR(x,x+5) and national age schedule of fertility, given small sample sizes above age 35.

Table A3: Total Fertility Rates in Kenya by Province - Comparison of Estimates 1962-78

	1962 Census		1969 Census	National Demogr. Survey 77	Kenya Fertility Survey 78		1979 Census
	Coale & Lorimer	Page & Coale			Lesthaeghe	FC Report	K. Hill et al.
Central Province	6.6	7.1	-	-	8.6	8.6	-
Nairobi	-	6.3	5.7	-	6.1	6.1	5.4
Coast	5.4	5.9	-	-	6.5	7.2	-
Eastern	6.8	-	-	-	8.2	8.2	-
Nyanza	7.9	8.5	-	-	8.0	8.0	-
Rift Valley	6.5	7.5	-	-	8.8	8.8	-
Western	8.1	-	-	-	8.3	8.2	-
Kenya	6.8	6.8	7.6	8.1	8.1	8.2	8.2

A.J. Coale & F. Lorimer : "Summary of Estimates of Fertility and Mortality" in W. Brass et al : The Demography of Tropical Africa, Princeton University Press, Princeton NJ, 1968, Table 4.2 part B.

Country Study Group on Kenya (K. Hill, R. Henin, L. Werner, J. Kekovole) : An Investigation of Recent Fertility Trends and Differentials in Kenya, manuscript prepared for the U.S. Natl. Academy of Sciences, Committee on Population and Demography, 1982.

Republic of Kenya : Kenya Fertility Survey 1977-78, Central Bureau of Statistics, Nairobi, 1980
- Lesthaeghe : from standard recode tape KFS with adjustments
- First Country report : Vol. I, p. 101 Table 5.12

H.J. Page & A.J. Coale : "Fertility and Child Mortality South of the Sahara" in S. Ominde and C. Ejiogu (eds) Population Growth and Socio-economic Development in Africa South of the Sahara, Heinemann, London, 1972, Table 9.1.

Table A4 : Total Fertility Rates in Southern Kenya by District - Censuses of 1969 and 1979

		1969	1979			1969	1979
		Anker & Knowles	Hill et al			Anker & Knowles	Hill et al
	Nairobi	5.7	5.4	(Nyanza)	Kissii	10.6	9.8
					Kissumu	8.1	7.4
(Central Prov.)	Kiambu	8.6	8.2		Siaya	7.4	7.7
	Kirinyaga	7.8	9.0		South Nyanza	8.3	8.1
	Muranga	8.2	8.7				
	Nyandarua	8.6	10.1	(Western)	Bungoma	9.1	9.3
	Nyeri	8.4	8.5		Busia	8.5	7.7
					Kakamega	9.2	8.7
(Coast)	Kilifi	6.5	7.4				
	Kwale	6.8	7.4	(Rift)	Baringo	6.8	8.7
	Lamu	4.6	7.7		Elgeyo-Marakwet	7.0	8.0
	Mombasa	4.7	5.4		Kajiado	6.8	7.8
	Taita Taveta	7.6	8.0		Kericho	8.8	8.9
	Tana River	7.1	8.2		Laikipia	6.7	8.8
					Nakuru	8.1	8.7
(Eastern)	Embu	8.1	9.4		Nandi	6.9	8.5
	Kitui	7.1	8.3		Narok	6.2	7.9
	Machakos	7.9	8.6		Trans Nzoia	7.5	9.0
	Meru	7.8	8.1		Uasin Gishu	7.2	8.6
					West Pokot	6.0	8.0

Source : - Country Study Group on Kenya (K. Hill, R. Henin, J. Kekovole, L. Werner) : An Investigation of Recent Fertility Trends and Differentials in Kenya, US Natl. Academy of Sciences, Committee on Population and Demography, Washington DC - manuscript p. 55.

- R. Anker & J.C. Knowles : Fertility Determinants in Developing Countries - A Case Study of Kenya. Ordina Editions for the I.L.O., Liège, 1982, p. 8-9.

Table A5 : Total Fertility Rates in Tanzania by Region - Comparison of Estimates 1957-1973

	Census of 1957 Coale & Lorimer	Natl. Demogr. Survey 1973 Henin, Ewbank & Hogan		
Central	6.6	6.2[x]	Singida	5.5
			Dodoma	6.7
Eastern	5.7	5.4	Coast	5.1
			Dar Es Salaam	4.7
			Morogoro	6.0
Lake	6.9	6.6	Mara	6.9
			Shinyanga	6.4
			Mwanza	6.6
			West Lake	6.8
Northern	6.9	6.8	Kilimanjaro	7.0
			Arusha	6.5
Southern	5.5	5.5	Lindi	5.1
			Mtwara	5.2
			Ruruma	6.4
Southern Highlands	7.4	7.0	Iringa	6.9
			Mbeya	7.1
Tanga	6.2	7.0	Tanga	7.0
Western	5.9	5.6	Tabora	5.4
			Kigoma	5.9
Tanzania	6.4	6.3		

Note : x population weighted averages

Source : A.J. Coale & F. Lorimer : "Summary of Estimates of Fertility and Mortality" in W. Brass et al : The Demography of Tropical Africa, Princeton University Press, Princeton NJ 1968, Table 4.2 part B, p. 161.

R. Henin, D. Ewbank & H. Hogan : The Demography of Tanzania - An Analysis of the 1973 Natl. Demographic Survey of Tanzania, Vol. IV, Bureau of Statistics & BRALUP, Dar Es Salaam, s.d., Table 5.15, p. 91 final estimates.

Table A6 : Total Fertility Rates in Swaziland by District - Comparison of Estimates 1966-76

	Census of 1966 Page & Coale	Census of 1976 Blacker
Hhohho district	7.2	6.9
Lubombo	6.2	6.3
Manzini	7.4	7.0
Shiselweni	8.3	7.3
Swaziland	7.5	6.9

Sources : - H.J. Page & A.J. Coale : "Fertility and Child Mortality South of the Sahara" in S. Ominde & C. Ejoigu : Population Growth and Socioeconomic Development in Africa South of the Sahara, Heinemann, London 1972,

- Kingdom of Swaziland : Report on the 1976 Swaziland Population Census, Administrative and Analytic Reports, Central Statistical Office, Mbabane s.d., Vol. I, Table XIX.20 p. 96 and Table XIX.23 p. 97.

Table A7: Total Fertility Rates in Ghana by Region - Comparison of different estimates, 1960-79

	Census 1960 Page & Coale	Census 1970 Gaisie & Nabila	Ghana Fertility Survey 1979 Lesthaeghe		Ghana Fertility Survey 1979 FC Report
Northern & Upper	5.5		Northern	6.7	7.8
			Upper	5.7	5.8
Western & Central	6.6		Western	6.9	7.1
			Central	7.1	7.3
Eastern	7.2		Eastern	6.5	6.6
Volta	6.1		Volta	6.6	6.6
Ashanti	7.3		Ashanti	6.1	6.2
Brong Ahafo	7.5		Brong Ahafo	6.6	6.7
Accra Capital District	6.6		Greater Accra	5.2	5.1
Ghana	6.6		Ghana	6.4	6.5

Sources : H.J. Page & A.J. Coale : "Fertility and child Mortality South of the Sahara" in S. Ominde & C.Ejiogu (eds) : Population Growth and Socio-economic Development in Africa South of the Sahara, Heinemann Publi. Co., London 1972, Table 9.1.

Republic of Ghana : Ghana Fertility Survey 1979-80, Central Bureau of Statistics, Accra 1983

- estimates by Lesthaeghe from standard recode tape of GFS
- First Country Report estimates : Vol I, p. 45 Table 5.4 FERTRATE-estimates (WFS)

Table A8: Total Fertility Rates in Western Zaire by Sub-region-Comparison of Estimates, 1955-77

	1955-57 estimates Romaniuk	1955-57 estimates Page & Coale	1974-77 EDOZA-survey Tabutin et al.	
Bas Congo	6.4	6.8	Bas Fleuve	7.8
Cataractes	8.0	7.2	Cataractes	8.2
Kwango	7.9	7.5	Kwango	6.9
Kwilu	6.3	6.2	Kwilu	6.9
Lac Leopold II	6.1	6.2	Mai-Ndombe	7.2
Leopoldville	7.5	6.3	Kinshasa	7.5
Lulua	6.3	6.1	West Kasai	5.9
Equateur	4.2	4.0	Equateur	6.1
Tshuapa	3.7	3.5	Tshuapa	5.5

A. Romaniuk : "The Demography of the Democratic Republic of the Congo", in W. Brass et.al. The Demography of Tropical Africa, Princeton University Press, Princeton NJ, 1968, Table 6.48, p. 333.

H.J. Page & A.J. Coale : "Fertility and Child Mortality South of the Sahara" in S. Ominde & C. Ejiogu : Population Growth and Socioeconomic Development in Africa South of the Sahara, Heinemann, London 1972, Table 9.1.

Republique du Zaire : Synthèse des études démographiques de l'Ouest du Zaire 1974-77, Louvain-la-Neuve, 1978, Table 7.1.13, p. 142.

x Note that large urban centers were not surveyed by EDOZA so that estimates above are valid for rural and middle-size urban parts of the subregion; results for large urban centers, where available (Matadi, Kikwit, Bandundu, Kananga), tended to be higher than those reported above for the remainder of each region.

Table A9 : Total Fertility Rates in Other Countries with Estimates for at least two Periods

Senegal 1960-61 (Coale & Lorimer)	6.3	Enquête Féc. Sénég. 1978	7.2
Senegal 1970-71 (enquête démogr.)	6.4		
Gambia 1963 (Coale & Lorimer)	5.3	Census of Gambia 1973	6.4
Mali - Mopti-region 1957-58 (Coale & Lor.)	7.0	Niger Inland Delta (A. Hill, S. Randall & O. Sullivan) 1980-81	
		- Bambara farmers (majority)	8.0
		- Touareg nomads (minority)	6.0
Congo (Brazzaville) 1960 (Coale & Lor.)	5.9	Census Congo 1974	5.5
Rwanda 1952-57 (Coale & Lorimer)	7.0	Enquête démogr. 1970	7.7
		Census of 1978	8.6
Burundi 1952-57 (Coale & Lorimer)	6.4	Enquête démogr. 1970-71	5.9
Botswana 1964 (Page & Coale)	6.5	Botswana census 1971	6.5
Lesotho 1966 (Page & Coale)	5.3	Lesotho Fertility Survey 1977	5.7
Mozambique 1950 (Page & Coale)	6.1	Census Mozambique 1970	6.0 - 6.7

Sources :
- A.J. Coale & F. Lorimer : "Summary of Estimates of Fertility and Mortality", in W. Brass et.al. : The Demography of Tropical Africa, Princeton University Press, Princeton NJ, 1968, Table 4.2.
- H.J. Page & A.J. Coale : "Fertility and Child Mortality South of the Sahara" in S. Ominde & C. Ejiogu (eds) : Population Growth and Socio-economic Development in Africa South of the Sahara, Heinemann, London, 1972, Table 9.1.
- République du Sénégal : Enquête Sénégalaise sur la Fécondité 1978, Ministère de l'Economie et des Finances, Direction de la Statistique, Dakar 1981, Vol I, Table 9.2.
- République of Gambia : Population Census of 1973 - General Report, Vol III Central Statistics Division, 1976, Table 15.16 - p. 67.
- République Populaire du Congo : Recensement Général de la Population du Congo 1974, Centre National de la Statistique et des Etudes Economiques, Brazzaville 1978, p. 90.
- Republic of Botswana : Report on the Population Census of 1971, Central Statistical Office, G.P.O., Gaberone 1972, p. 187.
- République du Burundi : Enquête démographique 1970-71, Ministère du Plan, Dept. de la Statistique, Bujumbura, 1974, Vol I, p. 263-264.
- Kingdom of Lesotho : Lesotho Fertility Survey 1977, Central Bureau of Statistics, Maseru 1981, Vol I, Table 5.10.
- République Rwandaise : Enquête démographique 1970, Office Général de la Statistique, Kigali 1973, Vol 1, p. 87
- République Rwandaise : Recensement Général de la Population et de l'Habitat 1978, Bureau National du Recensement, Kigali 1982, Rapport de Synthèse, p.37.
- A. Hill, S. Randall, O. Sullivan : "The Mortality and Fertility of Farmers and Pastoralists in Central Mali - 1950-81", Center for Population Studies, University of London, Research Paper 1982-4, p. 38-39.
- C.A. da Costa Carvallo : Essai de détermination des niveaux de fécondité et de mortalité de la population noire du Mozambique à partir des résultats du récensement de 1970, Département de démographie, Université Catholique de Louvain, Document de Travail 1979 no. 73.

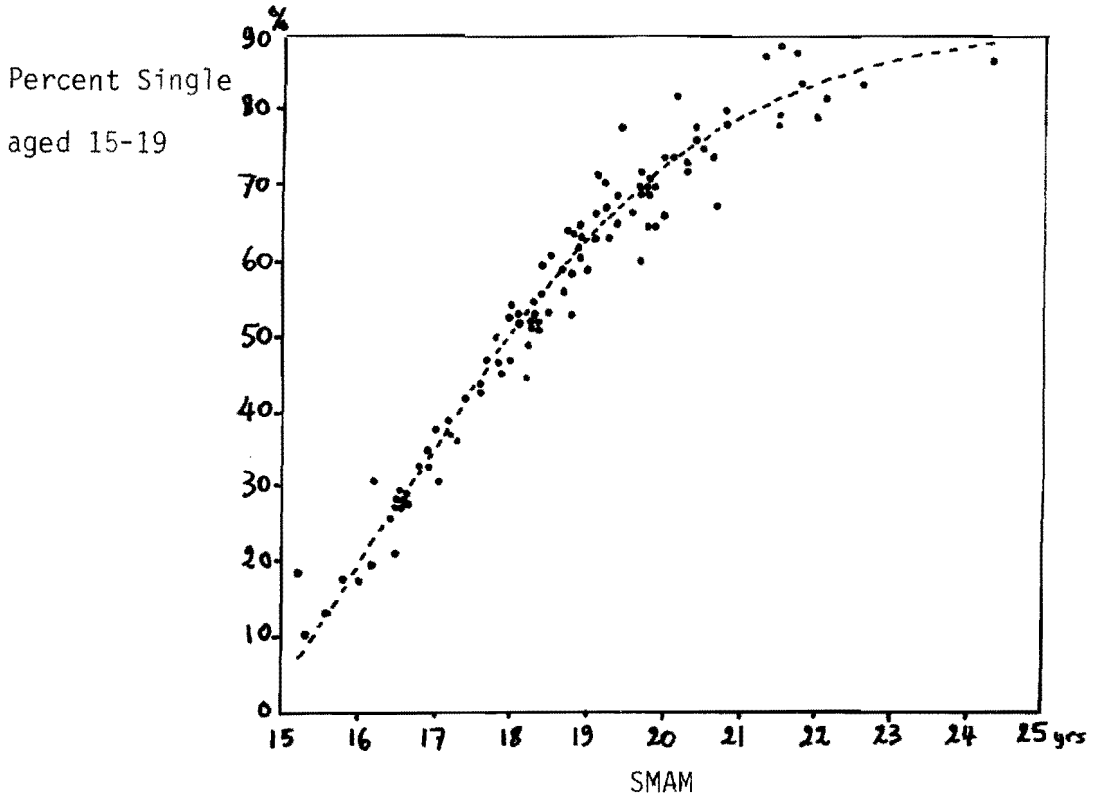


Figure A.1 : Plot of Percentage of Women aged 15-19 still single against singulate Mean Age at Marriage.