REPRINTED FROM

Culture and Reproduction

An Anthropological Critique of Demographic Transition Theory

edited by W. Penn Handwerker

Westview Press / Boulder and London

14

The Political Economy of Fertility Regulation: The Kusasi of Savanna West Africa (Ghana)

David A. Cleveland

Introduction

This paper analyzes high and increasing fertility among Kusasi intensive cultivators living in Bawku District in the extreme northeastern corner of Ghana. The Kusasi number about 250,000 and belong to the Mole-Dagbane language group found in the central area of savanna West Africa. The Kusasi homeland, known as Kusaok, consists of Bawku District and neighboring areas of Upper Volta and Togo. In good years, the rainy season between May and October can produce the illusion of prosperity, with thick green stands of millet and sorghum towering above the dispersed mud and thatch homesteads. The dry season, however, brings dramatic contrast, with the only relief from the barren, dusty fields being tiny isolated gardens watered by buckets carried from hand-dug wells. An increasing number of Kusasi make their living in this environment with short handled hoes, wooden flails, grinding stones, and an occasional ox-plow. Despite substantial emigration toward the coast, between 1948 and 1970 the Kusasi population grew by nearly 50 percent (Figure 1). Increasing population densities have been accompanied by soil erosion, severe reduction in natural vegetation, a reduced productive capacity of the land, and increasingly inadequate food supplies. This growth is partially explained by reduced mortality stemming from public health measures and improvements in transportation

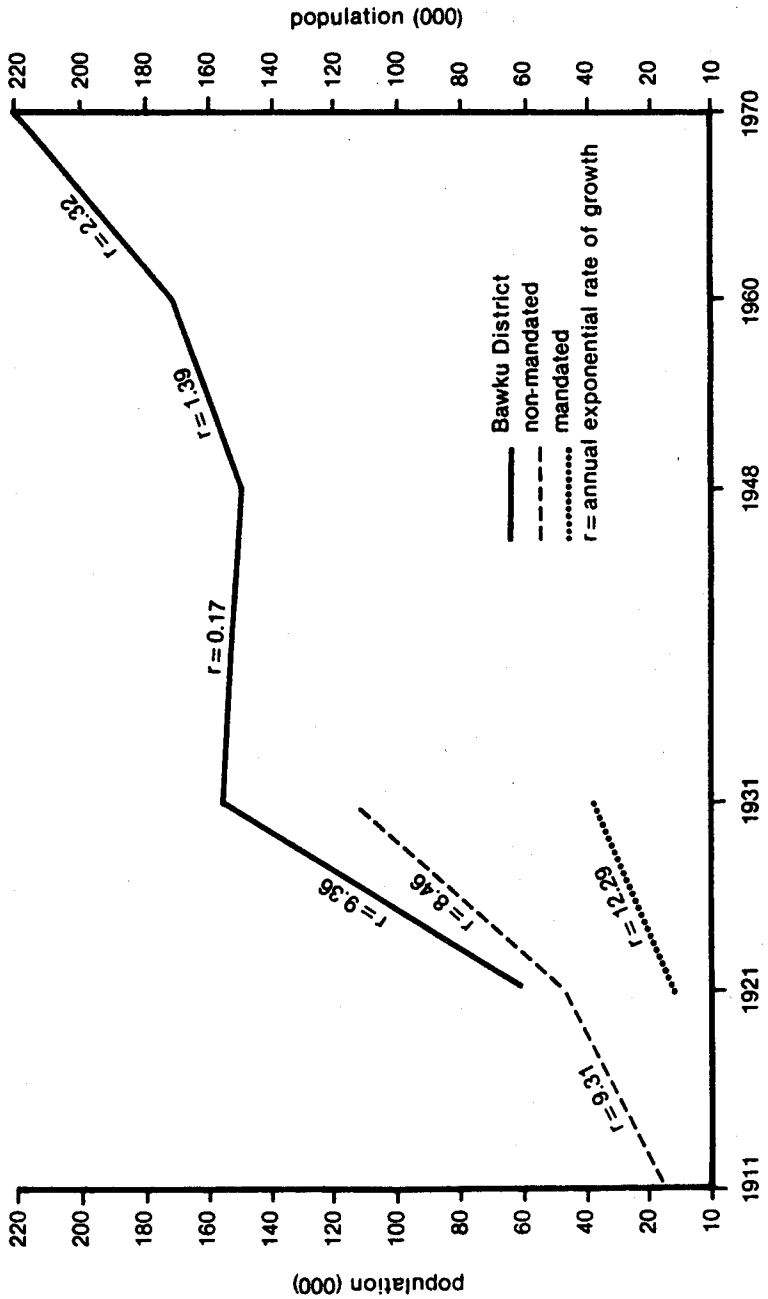

Figure 1. De facto population, Bawku District, 1911 to 1970. Based on census data from GNA (1911, 1921, 1931a, 1931b), GOGC (1923, 1932, 1950), and GCO (1964, 1975).

permitting freer movement of migrants, cash, and food (Gáisie 1976). However, this growth is also explained by a 44 percent increase in the total fertility rate since 1943.

I use the model developed by John Bongaarts (1982) to show that increasing proportions of married women and decreasing post-partum infecundability contribute to the observed increase in fertility. The most important determinant of increasing fertility has been decreasing postpartum abstinence. Although postpartum coital prohibitions have been described for other populations and appear to prevail over a wide area of West and Central Africa (Lesthaeghe 1980:540), this chapter shows how this institution can respond to ecological, agricultural, social, and demographic change to modify fertility levels. I discuss the changing political economy of Kusasi society and argue that the period of post-partum infecundability has been intentionally used to adjust birth intervals in order to maximize the number of children surviving to adulthood. As child health improved and personal security increased, couples could have children closer together without decreasing survival rates. Decreasing availability and productivity of farmland has led to higher demand for labor on the one hand, and increasing emigration (especially of young men) on the other. High fertility is supported both by the need to recruit household labor, and the uncertainty about children remaining at home to support parents in their old age. As in similar situations (see Hayden, Alexander, Ross, Weil, this volume), increasing fertility appears to be an attempt to alleviate increasingly intense resource stress.

Methodology

This paper is based on data collected between October 1976 through March 1978 in Zorse, a village of about 2,000 dispersed over an area between 5-11 kilometers outside of the District Capital, Bawku. Fieldwork was supported by the University of Arizona under a 211d grant from the Agency for International Development. Data were collected by participant-observation, informal and formal interviews, and several surveys from a 50 percent sample of houses. Houses were assigned numbers and the sample was selected using a table of random numbers. The resulting sample included 139 households with 1031 residents in January 1977. The number of households and residents changed during the year and there were 145 households with 989 residents in December 1977 (Figure 2).

I began fieldwork by conducting a census of these households, which was updated quarterly. Four quarterly child health surveys of children under 8 were also administered which included information on feeding status,

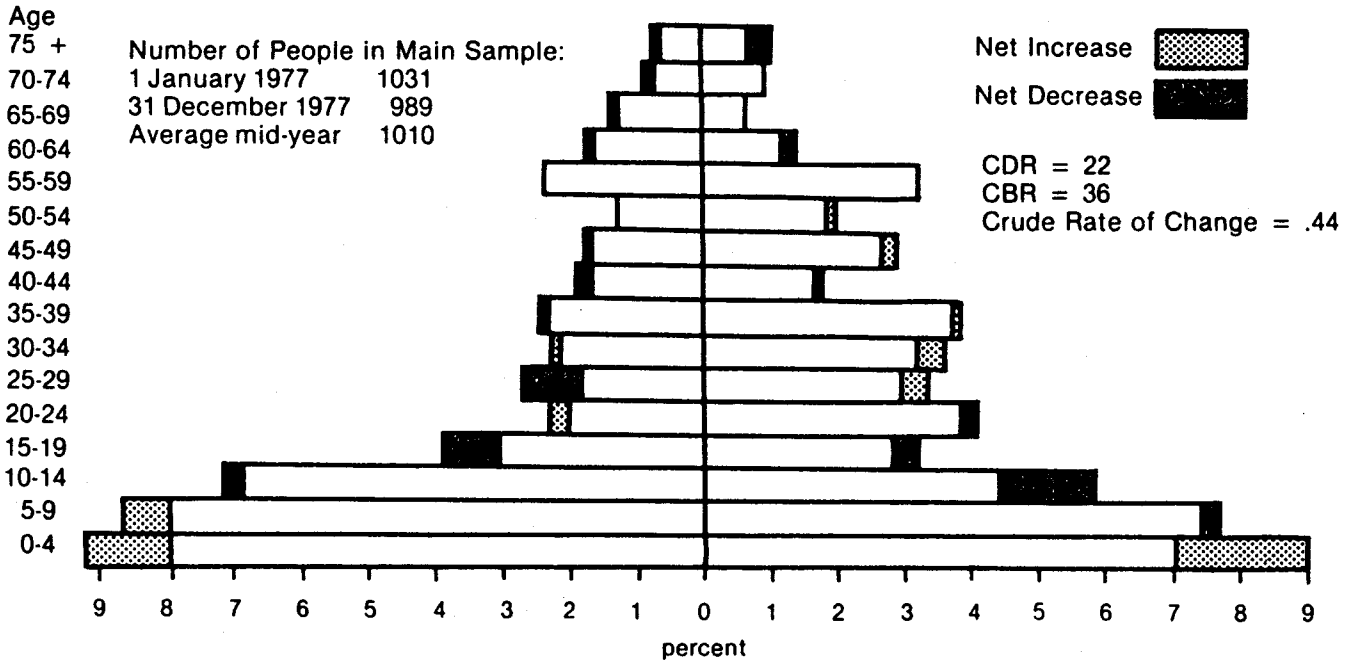

Figure 2. Change in Zorse population structure during 1977. Corrected to exclude those who became new residents and then former residents during the year. Changes due to increase in age are not shown.

AGE	YEAR													
	13-17	18-22	23-27	28-32	33-37	38-42	43-47	48-52	53-57	58-62	63-67	68-72	73-77	TOTAL
10-14	0	0	0	0	0	0	0	0	0	12	6	5	0	3
15-19		105	0	140	92	167	113	151	155	154	180	150	125	141
20-24			158	125	220	284	250	278	291	273	295	323	331	286
25-29				158	0	220	202	274	226	279	292	248	311	256
30-34					158	250	220	183	190	235	256	217	255	222
35-39						263	63	200	128	60	122	233	180	155
40-44							53	0	60	64	48	104	93	73
45-49								0	0	40	37	24	44	33
GFR								205	176	175	190	199	202	191

Figure 3. Age specific and general fertility rates. Zorse, pregnancy history survey. Includes live births only. GFR is for age groups 15-19 to 44-49. Rates are total woman years divided by total live births.

morbidity, health care, and four anthropomorphic measurements. I administered a migration, marriage, and fertility history to all adult men (aged 15 and over), and a pregnancy history survey to all adult women (aged 15 and over). The latter was begun in September 1977 after I had been in the field nearly a year and had extensive information on the sample households. For the pregnancy history survey I sampled all women aged 15 and older who had been resident in the 50 percent sample of households at any time during 1977 (N = 334). Thus, it included a number of women who were not residents either in January or in December of that year. Many were younger women who lived part of the year with their husband or father in Zorse, and the other part of the year with their father or husband in another village.

I completed pregnancy history interviews for 275 women (82 percent of the sample). The remainder could not be interviewed due primarily to their old age, but also because a few women were repeatedly absent. All interviews were conducted in Kusaal by myself and my research assistant, John Anyagre Nbod, a native of Zorse who had attended high school and is fluent in both written and spoken English. Women were first asked about living children, beginning with the youngest. We then enquired about children born between each two living children who had since died. Each pregnancy history was checked for internal inconsistencies and conflict with information collected in other surveys. Especially long or short intervals were checked with each woman on subsequent household visits. Almost all histories with one or more births were corrected by this process. Final determination of dates in all surveys was done by the use of a 100 year local annual calendar developed during the first 9 months of fieldwork, and a schedule of annual seasons recognized by the Kusasi. Although seasons vary somewhat from year to year, I felt it was possible to place birthdates accurately to within a month's time span (+/- 15 days). Each birth date (and death date for non living children) was assigned a decimal year equivalent. Because of the nature of the survey and the goodwill and cooperative spirit of the women and their households, I believe the data are quite accurate (see Cleveland 1980a for a more detailed discussion of methodology).

Kusasi Fertility

Age specific fertility rates were calculated from live births and total years of exposure to the risk of childbearing by five-year calendar intervals and five-year age groups (Figure 3). Analysis of these data demonstrate an increase in fertility among Kusasi women over time. The relatively high GFR for 1948-52 is partly artifactual, resulting from the relatively low

number of women-years in older age groups, due to the age pattern of mortality in my sample. When the GFR is calculated for age groups 15-19 to 30-34, a much stronger trend of increase through time emerges. The TFR, because it is by definition an age adjusted rate, gives a more accurate picture of changing fertility, showing a rise from about 4.5 in 1943-47 to 6.5 in 1973-77 (Figure 4). Figure 5 shows that the ASFR has been increasing through time, especially for those age groups (20-24 to 30-34) that contribute most to fertility. Figure 6 summarizes the increase in ASFR for the three time periods used in subsequent analysis.

Proximate Determinants of Kusasi Fertility

Following Bongaarts (1982), a population's total fertility rate can be expressed by the equation:

$$TFR = Cm \times Cc \times Ca \times Ci \times TF$$

where:

Cm = index of proportion married
Cc = index of contraception
Ca = index of induced abortion
Ci = index of postpartum infecundability
TF = total fecundity rate

As was apparent in Figure 4, there is no evidence that either contraception or induced abortion affect Kusasi fertility. Although Ghana has been a leader in West Africa in promoting family planning (Gwatkin 1975, Gaisie, Addo, and Jones 1975), there has been little increase in contraceptive use in rural areas, especially in Bawku and the rest of the north. Even where contraceptive use has become widespread in West Africa there has been no detectable impact on fertility. As Caldwell (1977b:93) pointed out, the primary use of contraceptives may not be to decrease numbers of children, but to substitute for abstinence or to allow for more sexual activity outside of marriage. There was almost no contact with the family planning program available in Bawku town by rural women in the adjoining district. In 1974-75, for instance, only 47 women living outside the town were seen at the clinic (BDMHS 1975), less than 0.1 percent of all rural women aged 15-45.

Similarly, Zorse women reported no induced abortions. Informal accounts suggest that because of strong negative social pressures and the high health risks, such abortions are very rare. When such abortions occur,

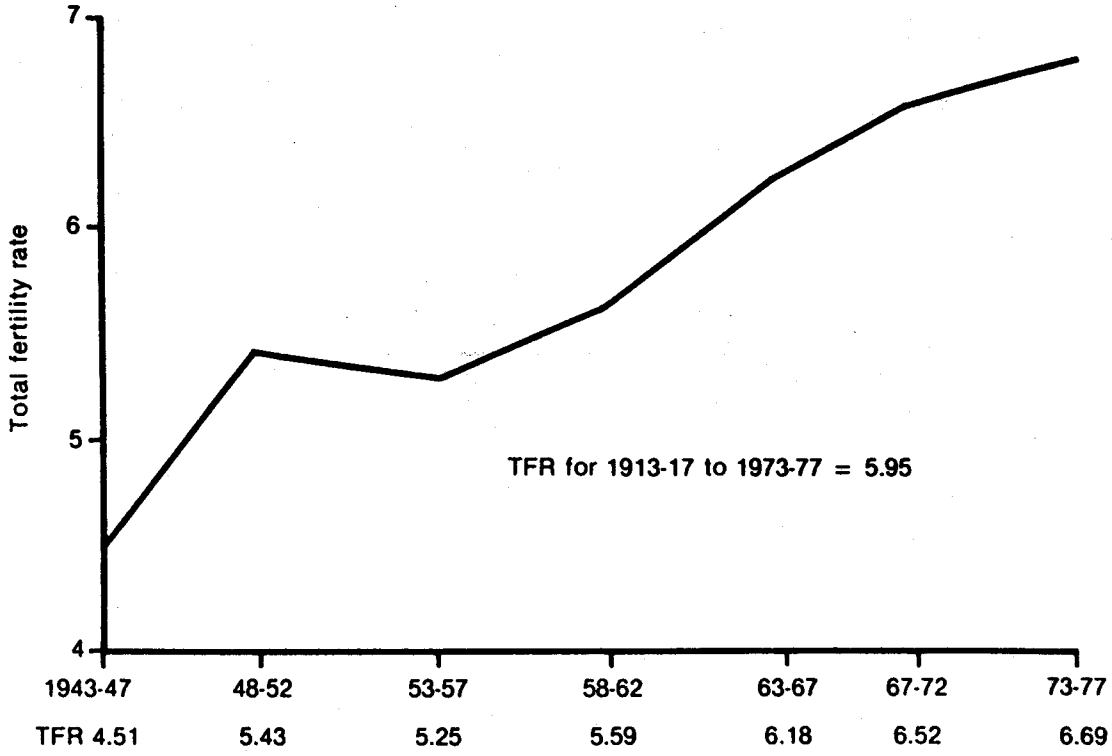

Figure 4. Total fertility rates, five year intervals, 1943-1977. Zorse, pregnancy history survey. Calculated for age groups 10-14 to 45-49, except for 1943-47 for which a rate of 0 for the 45-49 age group is assumed.

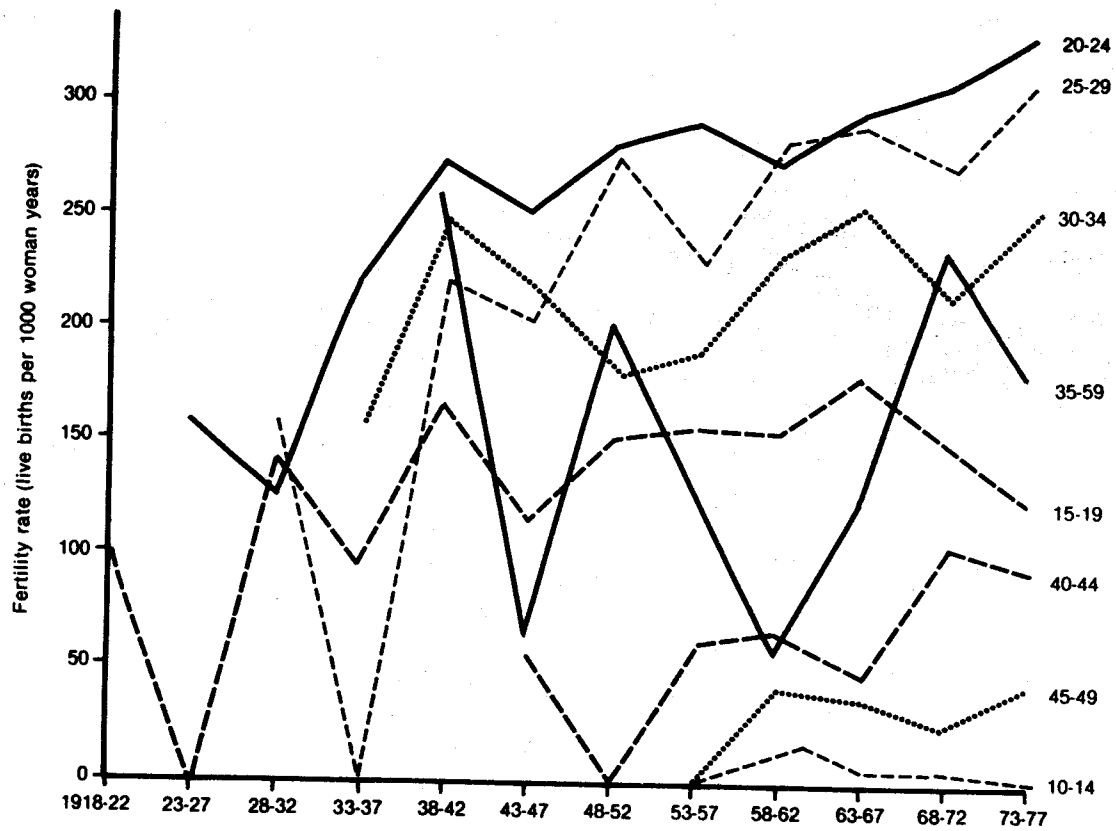

Figure 5. Fertility rates of age groups through time, Zorse, pregnancy history survey.

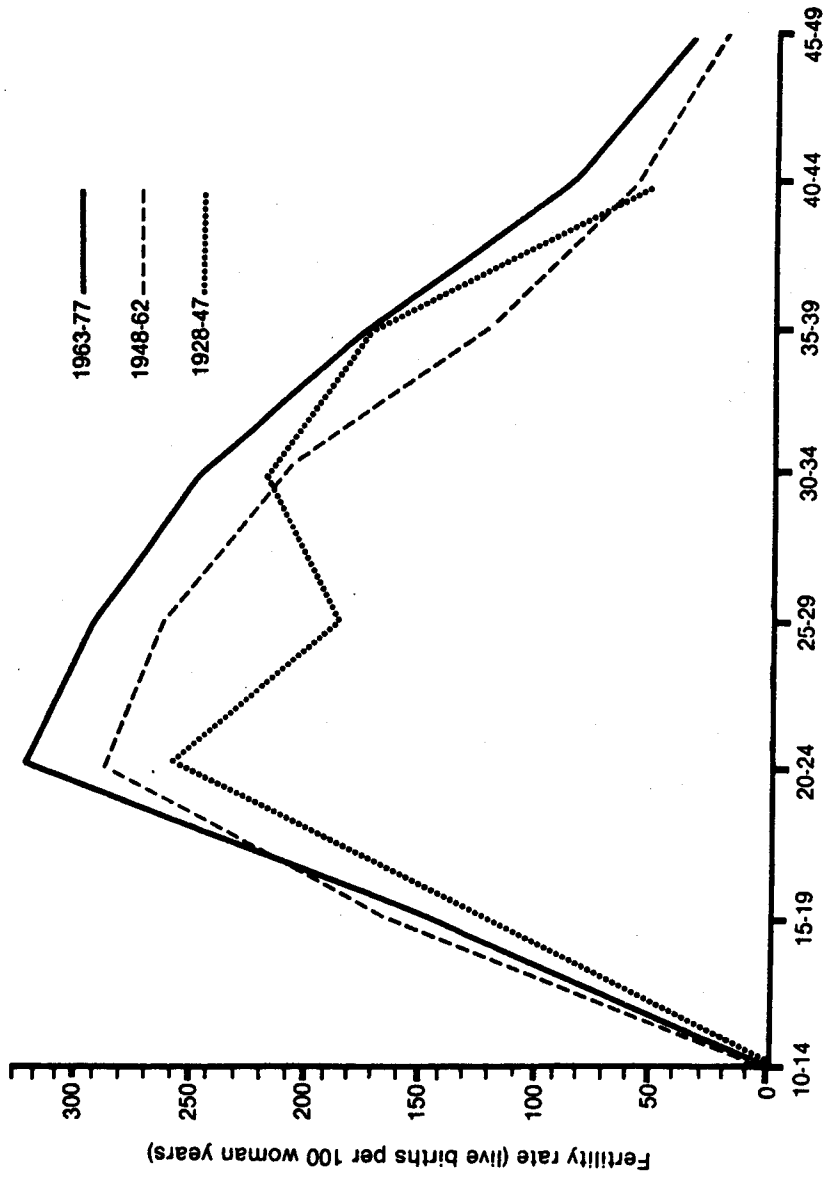

Figure 6. Age specific fertility rates for three time periods. Zorse, pregnancy history survey.

almost always they are undertaken by women whose youngest living child is too young or sickly. Fortes (1949:167) remarked about the neighboring Tallensi that abortion was only practiced to save a child that was still nursing.

Thus, Kusasi fertility can be modeled by the following equation:

$$TFR = Cm \times Ci \times TF$$

For the period 1963-77, TFR is calculated using the ASFRs for that period, Cm is calculated directly from my household sample (using TM derived from the proportion of currently married women in December 1977 and the TFRs for 1963-77), and Ci is an estimate of the extension of birth intervals beyond the minimum due to lactation and abstinence. TF is determined by the other variables in the equation, and an independent estimate is not required. For the periods 1948-62 and 1928-47, TFR and Ci can be calculated from sample data. Assuming that TF is the same for these earlier periods as for 1963-77, Cm is determined by the other parameters. Thus, for the three time periods under consideration:

$$\text{TFR (1963-77)}, 6.45 = .789 \times .518 \times 15.78$$
$$\text{TFR (1948-62)}, 5.48 = .680 \times .510 \times 15.78$$
$$\text{TFR (1928-47)}, 4.97 = .675 \times .466 \times 15.78$$

Figure 7 displays the changing relations between total fecundity (TF), total marital fertility (TM = TFR/Cm), and the total fertility rate (TFR) over this 50 year time span. Total fertility has risen from 31 to 35 to 41 percent of total fecundity due to decreased fertility regulation. The result has been an increase of 1.48 live births per woman, of which .67 result from an increase in proportion married and .81 result from a decrease in postpartum infecundability. The contribution of non-marriage to fertility regulation has decreased from 22 to 18 percent, while that of postpartum infecundability has increased from 78 to 82 percent.

Social Organization and Fertility

The decrease in age at marriage and the shortening of birth intervals among the Kusasi during the last 50 years must be interpreted in light of an understanding of changes in the political economy, social organization, and agricultural ecology. I discuss these changes in this and the following section. In the two subsequent sections, I then analyze the mechanisms by which these large scale changes have affected individual behaviors and

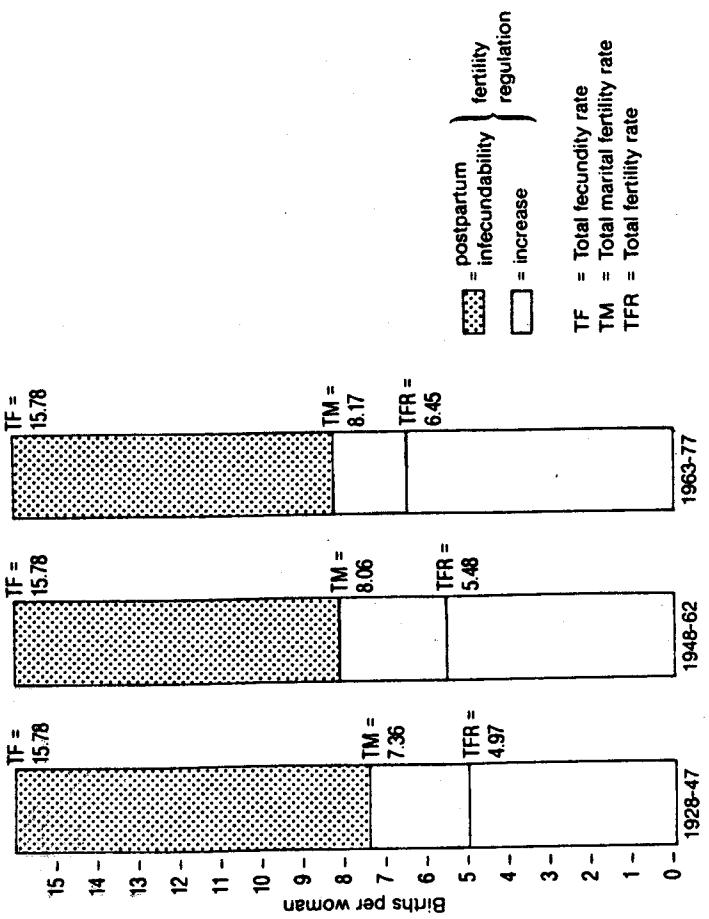

Figure 7. Relationships between the fertility inhibiting effects of intermediate variables and various measures of fertility. Zorse, pregnancy history survey.

decision-making, and how these in turn have modified the proportion of Kusasi women married, and the length of their postpartum infecundability.

Kusasi political history has been strongly influenced by their position as a small acephalous tribe between the powerful kingdoms of Mossi to the north and Mamprussi and Dagomba to the south. These kingdoms were established by invading warrior bands from the north and east sometime between the 13th and 16th centuries (Fage 1964, Hilton 1962) who found the Kusasis, Tallensi, and related small tribes living where they do today in northeast Ghana (Fortes 1949, Syme 1932). Because of its position in a buffer zone, the direct control one or another of these kingdoms exercised over Kusaok ". . . may never have been very extensive and probably lapsed entirely for a while"(Hilton 1962:82). The Mamprussi from the south sought primarily to secure the major north-south trade route passing through Kusaok, but the Kusasis and their neighbors resisted fiercely.

At this time, Kusasi political organization, as with the other acephalous societies of northern Ghana (Fortes 1953, Hunter 1968, Rattray 1932), consisted of a system of segmentary patrilineages. Alliances followed lines of descent and common interest. Each level of segmentation constituted a potential point of cleavage, with the size and genealogical depth of the opposing factions reflecting the size of the conflict. In his history of Kusaok, based on extensive interviews, Syme (1932:ii) records that "In the old days every village was at enmity with its neighbors, and the idea of anybody crossing from Toendema to Agolle [the two sections of Kusaok], or vice versa, was almost unheard of."

People in Zorse told me similar stories of the past. Several of the clans in Zorse still did not have amicable relations. Raids had been frequent, and people travelled beyond home areas only in armed groups. Casualties in these former conflicts probably were not heavy (Fortes 1945:239; Netting 1973). Nonetheless, when working in distant fields, men kept bow and arrows handy and a lookout was posted. Except to visit their father's house in the dry season, women travelled little and were always accompanied by armed men. A premium was placed on birth intervals long enough for the next to the youngest child to be able to escape from raiding parties on their own. A warrior ethic, shared with other African groups (e.g., Netting 1973, Fortes 1949), abjured early or frequent sexual intercourse. Fifty years ago, Rattray's Kusasi informants reported that men took "great pride in resisting such temptations" and sought the test (1932:392). Although young men and women were joined together in games, dancing, and swimming, a young man's ambition was to be renowned as a hunter, farmer, wrestler, and warrior. There was a "firm belief," Rattray reported, that a "profligate" man would be killed by an arrow in his first fight or bitten by a snake. A young woman would have sexual intercourse only with the man

she was to marry (1932:396).

The main source of conflict among the Kusasi was over labor: replacing daughters and sisters with wives, and adding more children to the lineage. Conflict frequently centered on the four cows constituting the major part of bridewealth payments. At the turn of the century it was still common among the neighboring Tallensi to attempt to settle such debt disputes by raiding for cattle (Fortes 1945:238-9; 1949:83). The level of violence was much increased in northern Ghana after the establishment of the slave trade with Europeans on the coast, for Kusasi villages were frequently raided by slaving parties.

The British did not establish a station at Bawku until 1909 (Syme 1932:ii-iii). Their arrival halted a major conflict that had been developing between the Mamprussi kingdom and the Kusasi villages at Kugri and their allies (Syme 1932:ii,1-2). However, as they did with the Mamprussi earlier, the Kusasi resisted British attempts to impose a system of indirect rule through chiefs, and the process of establishing British rule was often bloody and violent. The British successfully established the institution of the chief only by bringing to bear superior military force. There followed a period when labor was forcibly recruited for work in southern Ghana in private mines and for government construction of railroads, harbors, and motor roads (Thomas 1973).

Although the initial impact of British colonialism was to increase violence, by the end of World War II there was more personal security in the area than there had ever been when intervillage feuding and warfare were the norm. One of the supports for long birth intervals was thus removed.

Moreover, earlier marriage was encouraged by the elimination of warfare which decreased the importance of the warrior ethic that had formerly existed. The British also made young people more aware of sex by separating girls and boys in schools (Rattray 1932:392) and by prohibiting bare breasts in Bawku market.

Although forced recruitment of men from northern Ghana for work in the south stopped in the late 1920s, migration has increased, and is an important factor affecting marriage and fertility in Kusaok. For the Upper Region in 1970, 30-48 percent of males and 23-75 percent of females in the age groups 15-19 to 40-44 were residing outside of the region, mostly in southern Ghana (GCO 1975). Data on present long term residence (6 months or longer) of 705 children born to women in the Zorse pregnancy history survey show the same pattern. By the 1930s, new roads made traveling easier, and young men had developed a curiosity about the outside world (GNA 1931a). The newly created possibilities to migrate to the south to earn money to purchase brideprice cattle, or even eloping with a young woman, freed young men from their dependence on their lineage elders to supply cattle and arrange a wedding, thus allowing them to marry earlier (cf. Fortes 1949:73). The increase in population density and food shortages since World War II have provided strong incentives for young people to leave, thus creating additional uncertainty among parents about having children around to support them in old age, and acting as a support for high fertility (cf. Weil, this volume).

Agriculture and Increasing Labor Demand

The increased supply of children generated by declining infant and child mortality has not kept pace with the demand for their labor (see Weil, this volume). Increasing lifespans mean that there is a larger proportion of old people (Gaisie 1976:137-39) who rely on their children and grandchildren for support. The Kusasi are intensive subsistence farmers, depending on an average rainfall of 1044 mm to grow sorghum, millet, cowpeas, and other legumes on upland farms. They sell little food and grow almost no cash crops. The center of the Kusasi intensive agricultural system is the field next to the house, often called the "compound farm," referred to in Kusaal as the *saman*. Every year a mixture of crops is cultivated on this field, with early millet being the most important. Manure collected from animal pens and household trash is applied to the *saman* before planting. Although some farmers have many, more distant, outlying fields, it is the *saman* that supplies the major portion of food for the year, and is the only one to get regular applications of manure. The majority of farmers use only short-handled hoes, knives, and fire as their tools. Women prepare food using wooden flails and stone grinding tools. Cattle, small ruminants, and poultry are also an important component of farms.

Although men do the major share of the farm work, all household members contribute, and children are net producers by about age 10. Girls release their mothers for more complicated and heavier work by helping them with child care, water and fuel gathering, cooking, washing dishes, sweeping the house, and gathering food in the garden and bush. Boys perform the same function for their fathers by tending animals, a very important task in the rainy season when loose goats or a cow can quickly decimate the family's crops. As harvest approaches, boys also spend long hours in the fields scaring away birds and other predators. Children of both sexes also assist in field preparation and planting, and by age 15 have assumed adult work loads. There is a labor bottleneck during weeding from June to August, but during the six month dry season only farmers with small irrigated valley gardens are involved in food production.

Production risks associated with variable rainfall, high rates of evapotranspiration, topography, and soil, are reduced by having fields in different locations. Farmers also control water by terracing and planting grass in eroding areas. Lack of land, however, has led to the cultivation of steep slopes and marginal land, as well as to the shortening of fallow periods on outlying fields, all of which have increased erosion. The beginning and end of the rainy season are marked by great irregularity, which means that farmers must try not to plant until they think that the rains will continue regularly. Sporadic rains at the beginning of the season in April can mean replanting or loss of crops, especially the more drought sensitive, like early millet. Line squalls, which occur during the months of heaviest rainfall, August and September, can severely damage standing crops with their strong winds. Thunderstorms produce extremely variable rainfall over even short distances. Unusually heavy rains at the end of the rainy season in October, when millet and sorghum are in flower, can also produce poor yields.

Although northeast Ghana experienced the drought that afflicted much of the rest of the West African savanna in the late 1960s and early 1970s, there does not appear to be a long term trend toward decreasing precipitation in Bawku District (Beer et al. 1979:19-20). Rather, the increasing soil degradation and loss of vegetative cover ("desertification") are mainly due to human activitiy: excessive cultivation, grazing, and burning. The stable vegetation in this region is ". . . broad leaved deciduous trees, densely distributed in a continuous ground cover of perennial bunch grasses and associated forbs" (Rose Innes 1977:13). After many decades of increasing exploitation and decreasing fallow periods, none but selected trees survive, resulting in a park-like landscape with low status annual grasses, undergoing continual short rotation cultivation. If pressure on the land continues, a "super-mature" parkland develops, with even the desired species of trees being lopped off or felled, and increasing soil exhaustion and denudation resulting in extensive soil erosion. The ". . . resulting treeless depauperate annual grassy disclimax on impoverished eroding soil can be seen all around Bawku" (Rose Innes 1977:20).

Although the Kusasi depend on continuously cultivated fields for the major portion of their food, under rising population pressure outlying fields become increasingly important and are fallowed for shorter and shorter periods. Thus, the maintenance of soil fertility through the addition of organic matter and nutrients and the control of water are extremely important. In Bawku District, ferruginous soils are the most common (Adu 1969), and subject to erosion and rapid deterioration of productive capacity when over-cultivated. Because they are inherently well drained and respond well to fertilizer application, there is a danger in increasing production with non-organic commercial fertilizers alone which can lead to rapid depletion of organic matter, loss of soil structure, and increasing erosion. These soils can be completely lost to agriculture when erosion of surface layers exposes soil rich in sesquioxides of iron, which may harden irreversibly to form iron pan (Ahn 1979:101).

Sheet and gully erosion are widespread in Bawku District and the rest of northeast Ghana, especially in the most intensively farmed areas around Bawku town, Pusiga, and Kulungungu, comprising in 1962 over 40,000 hectares of previously arable land (Adu 1969:4,31-32, Map 4). The consequent loss of top soil and formation of iron pan has greatly lowered agricultural potential. Moreover, the increasing population has led to the breaking up of land holdings into smaller parcels, over-cultivation, and environmental degradation. Under existing environmental conditions, Kusasi agriculture is unable to provide adequate food supplies or to check the loss of productive capacity of the resource base. The diet, therefore, although qualitatively adequate, suffers from seasonal shortages and occasional famines (Gordon 1973; Cleveland 1980a).

In Kusaok, as elsewhere in Africa (see, e.g., Netting 1974; Handwerker 1981c; Weil, this volume), the household is the unit of production, and as the intensity of farming has increased household size has decreased. Extended households have broken up, or never formed, because increasing scarcity of land has led to more disputes, a process facilitated by the increasing economic and social independence of young men who migrate for work elsewhere. Many older parents complained bitterly to me that they could not farm enough to feed themselves, while they had grown sons working in the south who did not support them. Parents have little or no money with which to hire farm workers, and there are few people to hire. Parental anxiety is unallayed by the fact that this lack of support results more from the inability of migrants to earn much in Ghana's chronically deteriorating economy than from selfishness on the children's part.

Strains such as this raise questions about the argument that schooling is an investment that will be returned with interest in a parent's old age if their child obtains a high paying job. The cost of schooling is much higher than the cost of the required books and clothes, for schooling takes children away from farm chores. In Ghana's present economic state there is little opportunity for employment after graduation and, rather than improve children's skill or interest in farming, most current school programs direct children's interests away from farming. Understandably, attendance at the Zorse primary school has dropped dramatically since it was opened in 1961. Kusasi parents thus find themselves in a labor bind made more intense by decreasing productivity. Increasing population densities have meant increasing intensity of land use: decreasing fallow periods, cultivation of

marginal land, and increasing labor input to counter the falling productivity of the land. As we have seen, soil erosion and degradation of tree and range vegetation are increasing under this population pressure (also see Weil, this volume). This means that households want to have more children instead of less, and people want as many children as they can have (cf. Caldwell 1967; Gaisie and David 1974). People in Zorse say that however many children god sends will be good, that one cannot have too many children. Indeed, there is no difference between small, nuclear family households and large extended family households in the proportion of children constituting the unit: in the former (62 percent of the sample, mean size 6.2 people) 32 percent of the members were under 10 years old; in the latter (25 percent of the sample, mean size 10.6 people), 31 percent were under 10 years old.

Increasing Proportion Married

The Index of Proportion Married (Cm) is the ratio of the total fertility rate to the marital fertility rate (TFR/TM). The increasing proportion of married women apparent in the changes in Cm has come about primarily by a decline in the age of marriage, and possibly increasing frequency of coitus among the young. This accounts for a portion of the fertility increase between ages 15-29 (see Figures 5 and 6).

Marriage in Kusaok is central to social life. The marriage process itself is a series of events that may take many years, and becomes a contract between the woman's and man's lineage, which are in different clans. The latter exchanges four cows and various smaller gifts for the reproductive powers of the woman. All children belong to their father's patrilineage, which tries to maximize its growth by marrying off its daughters at an early age so that the cows they receive can be used to obtain young brides for its men. When a lineage daughter is divorced or widowed, she is encouraged to remarry if she is of childbearing age, and if one of their own members dies leaving a widow, she will be encouraged to remarry within the lineage. Infertile wives are often divorced. If the husband proves to be sterile, a lineage brother is found to impregnate the wife.

Figures 8a and 8b compare the marital status history of women and men in Zorse. Whereas 60 percent of all women have been married by age 20-24, for men it is not until age 25-29 that 60 percent have been married. Women who are divorced or widowed during their reproductive years remarry quickly. Beyond this period, women usually do not remarry (cf. Weil, this volume). In 1977, 87 percent of the women aged 15 to 49 were married, and 94 percent of the women aged 20-44 years were married. The corresponding percentages for men were 51 and 64.

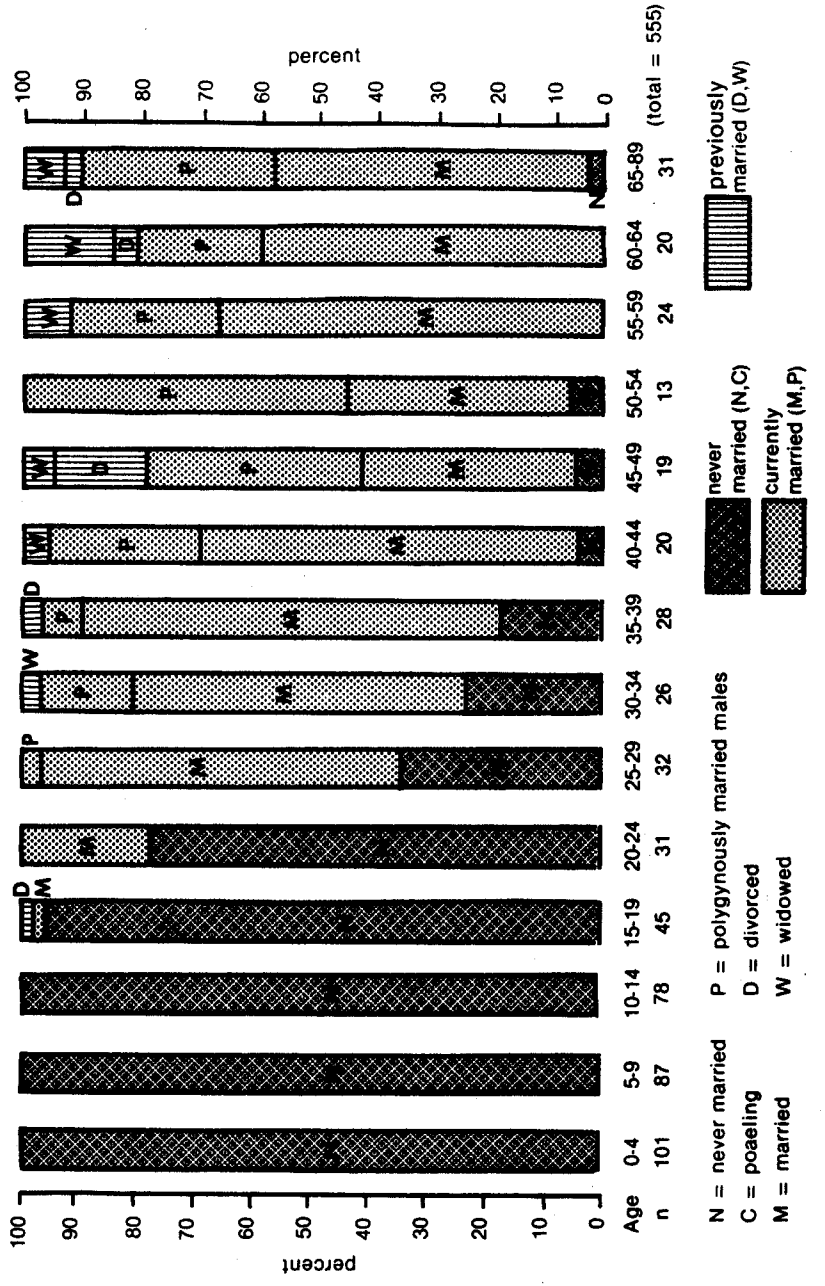

Figure 8a. Marital status of males by age groups. Zorse, household survey.

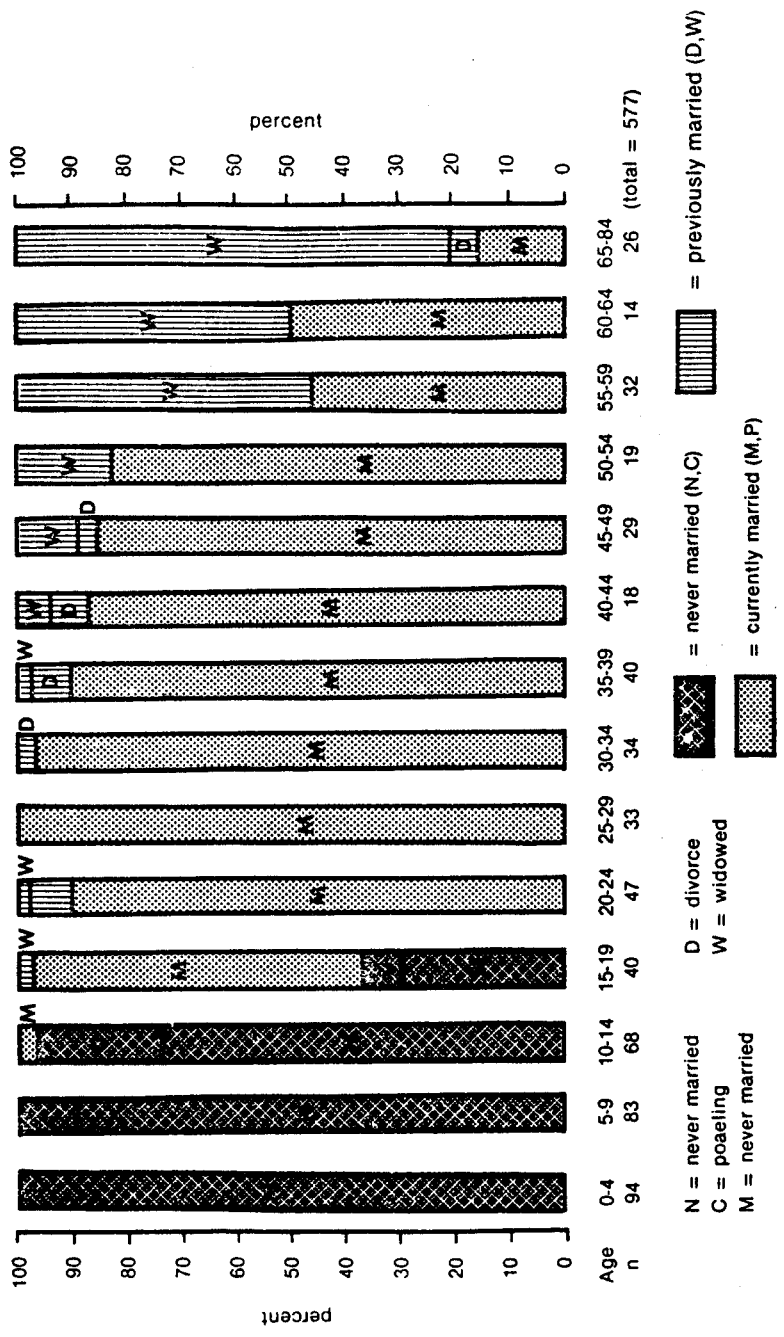

Figure 8b. Marital status of females by age groups. Zorsé, household survey.

The difference in the average age of marriage of men and women combined with the age structure of a rapidly growing population (Figure 2) accomodated the practice of polygyny. In December 1977, 35 percent of the men in the Zorse sample had more than one wife. Most such men, however, had no more than two wives.

As elsewhere in Africa, "marriage" in Zorse is difficult to define precisely. Unlike birth dates, I did not try to improve the precision of the marriage date estimates reported. People in Zorse say that women are marrying at younger ages than they did in the past. Although their account cannot be tested against precisely defined ages at marriage, it is consistent with an observed reduction in the age at first birth. Thus, whereas prior to 1948, 66 percent of first births occurred to women under 20 years of age, between 1948 and 1977, 79 percent of first births occurred to women under 20 years of age. The mean age at first birth for women born between 1908 and 1957 fell 1.5 years from 19.5 to 18.0.[1]

Decreasing Postpartum Infecundability

The increasing value of the Index of Postpartum Infecundability (Ci) reflects the decreasing effect of lactation and abstinence. The period of postpartum infecundability includes the minimum post-natal infecundability, lactational infecundability, and voluntary abstinence. Together with waiting time to conception, time added by intrauterine mortality, and gestation, they make up the birth interval. Ci is estimated as: 20/18.5 + i (Bongaarts 1978:115-116). The numerator is the average estimated birth interval without lactation or postpartum abstinence. The denominator is the 20 months minus 1.5 months of infecund period following birth, and i is the total infecund period, i.e., 1.5 plus the effect of lactation and postpartum abstinence. Thus, Ci estimates the increase in the birth interval added by lactation and abstinence. In 1963-77, the mean birth interval in Zorse was 38.6 months, so that i = 20.1 months, and Ci = 20/38.6 = .518. In 1948-62, the mean birth interval was 39.2 months, and Ci = .510. In 1928-47, the mean birth interval was 42.9 months and Ci = .466.

As seen in Figure 7, postpartum infecundability reduces TF by 50 percent, and is much more important than the increasing proportion of married women. As elsewhere in Africa (Caldwell 1977b, Retel-Laurentin and Benoit 1976; Dorjahn, this volume; contrast Weil, this volume) of the two components of Ci, lactational infecundability is of negligible importance. Breastfeeding is universal in rural northeastern Ghana and Kusasi women breastfeed their infants freely, and sleep with them at night.

Nonetheless, lactational amenorrhea is consistently shorter than the period of breastfeeding. For instance, Mondot-Bernard's (1977:23) review of seven studies of lactational amenorrhea in Africa revealed a range of .76 to 1.56 years duration of amenorrhea. In all but one study breastfeeding lasted from .19 to .68 years long than the amenorrhea. In Zorse, 86 percent of all birth intervals are two years or longer, and probably are not greatly influenced by lactational amenorrhea.

Sexual abstinence is not only the most important determinant of postpartum infecundability, it has long been consciously used by Kusasi to regulate their fertility and so maximize the number of surviving children. As explained in the previous section, the personal insecurity caused by local feuding and the initial impact of colonialism placed a premium on birth intervals long enough so that the next to youngest was fully capable of running away on his own. Men had to carry bow and arrows and were not expected to help with the children. More important, however, people understand that if the woman becomes pregnant before the youngest child is mature and healthy enough, breast milk will dry up, the child will not receive as much of his mother's attention, and the child's health will be in even greater jeopardy. The unfortunate child whose younger sibling is born too early is recognized by his big belly, leaness, and weeping.

The length of abstinence is not formally specified. The decision to resume sexual relations is a joint one and depends primarily on the health of the youngest child and restraint of the married couple. A Kusasi child should be able to walk and talk before the parents resume intercourse, and this generally occurs by age 1.5 to 2. In addition, however, a child also must be healthy enough to take care of himself. This emphasis on the health of the child is not new in Kusasi culture. Rattray's Kusasi informants of 50 years ago pointed out that a man does not have intercourse with his wife for two or three or more years postpartum: "it depends on how soon the child is walking about"(1932:387), and walking may be delayed because of chronic poor health. Indeed, this conscious use of birth spacing to maximize the number of surviving children may be widespread in Africa. The nearby Tallensi, among whom nursing mothers do not have sexual intercourse, have views very similar to those of the Kusasi. Fortes (1949:20) states that it is "not a ritual matter, subject to mystical sanctions, but a practical necessity in order to prevent the women from conceiving again too soon." Coitus interruptus is sometimes practiced by the Tallensi to this end. Retel-Laurentin and Benoit came to equivalent conclusions in their study of the Bobo-Oule of Upper Volta (1976). They criticize other studies of African populations for assuming that there is a uniform period of abstinence until the child is walking. The official criterion is "that the infant is toddling or that the mother has ceased lactating. . . .If the infant is not doing well, however, breast feeding may be continued until the danger to its life is past" (1976:291,292).

If the Kusasi husband tries to have intercourse against his wife's wishes, she is justified in refusing him and will tell his mother and father who will reprimand him if they agree with their daughter-in-law. One informant said that in the old days if a young man's wife had children too close together, his household head would beat him. Some men have sexual access to other women, either their other wives or a single woman. In this case, it may be the woman who tries to force herself on her husband before the youngest child is old enough. In one group interview with a husband and his two wives, all agreed that a woman may take the initiative to resume intercourse because she feels sexually deprived.

Increasing Supply of Children

Because postpartum abstinence is a socially controlled behavior that to a great extent is consciously adjusted to maximize the number of surviving children, it has changed through time as factors affecting survival have changed. Improvements in nutrition, public health, and medical care in the West African savanna, especially since World War II, have been the major cause of declining infant and child mortality (Figure 9) and increased longevity (Gaisie 1976: 137-39).

In Kusaok, Western medicine is increasingly popular for treating children because children have the highest mortality rates and have not become completely integrated into the social system. In 1974-75, for instance, out of an eligible population of about 50-60,000 children in the eastern (Agolle) portion of Bawku District, there were 23,000 new attendees at child welfare clinics (BDMHS 1975). In Zorse, over 50 percent of the children under 8 had attended the clinic at least once, and many had been vaccinated against polio, measles, diptheria, and tetanus. Out of 148 illnesses occurring during the previous two weeks reported for 579 Zorse children in April and July, only 20 percent received no treatment. Traditional Kusasi medicine was obtained for 13 percent, Western medicine for 61 percent, and 7 percent utilized both traditional and Western medicine.

Not only do children become ill less frequently in Kusaok, many people have taken the view that if a child does become sick he can be cured more easily now than in the past. Consequently, some people now believe that the health of the child is no longer particularly important in making the decision to resume coitus postpartum. Under increasing resource stress, Kusasi parents generally have taken advantage of declining child mortality to increase fertility by shortening the period of postpartum abstinence.

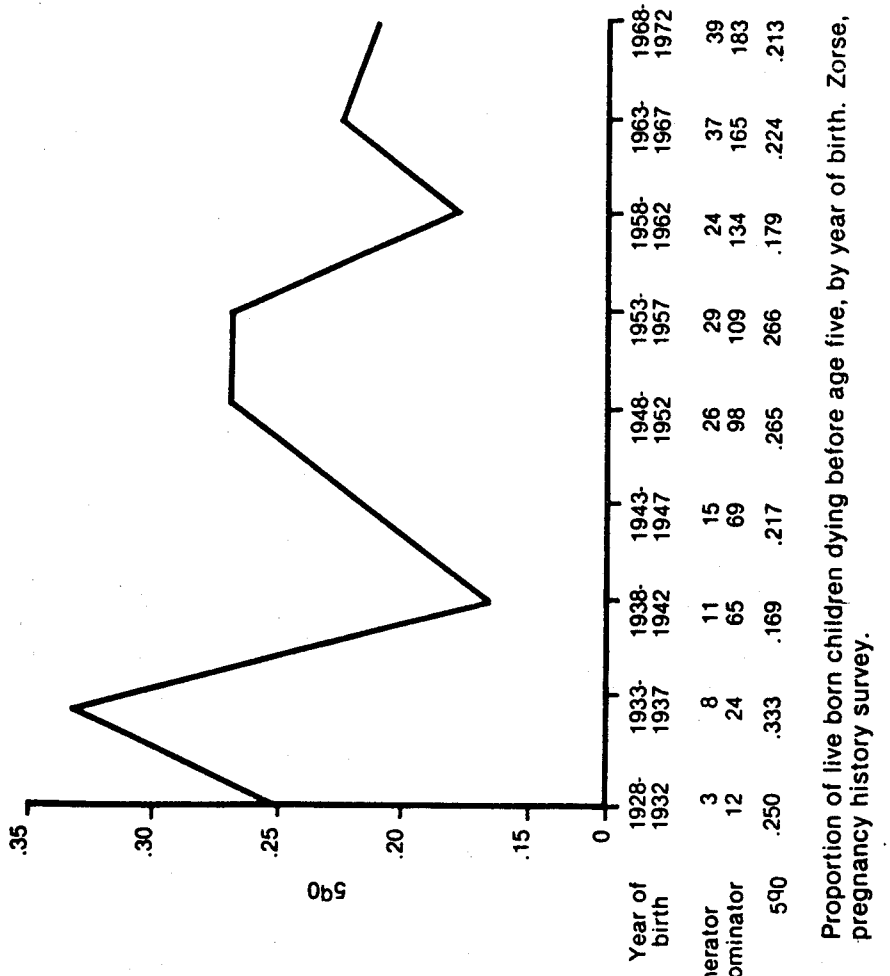

Figure 9. Proportion of live born children dying before age five, by year of birth. Zorse, pregnancy history survey.

Figure 10 demonstrates that most of the deaths associated with short birth intervals occur before the conception of the next child. Below the death-age = birth-to-conception interval the correlation between birth interval and death age is .72 ($P < .001$). Because the child's death shortens postpartum infecundability, shorter birth intervals are to be expected. However, above the death-age = birth-to-conception interval, shorter birth intervals increase the probability of the older child's death, and the correlation is .78 ($P < .001$). Most of the correlation is due to the strong relationship at younger ages at death, when the influence of another birth has a greater effect on the older sibling. For deaths occurring only up to age 3.5, r increases to .92 ($P < .001$). It is in the critical birth interval lengths of around 3 years that changes through time have occurred.

There has been a significant reduction of birth interval over the 50 year period on which this chapter focuses. Only those intervals in which the older child was alive when a new child was conceived were used in this analysis, thus controlling for the determination of interval length by child mortality. Also, birth intervals longer than 5 years were eliminated, thus controlling the effect of extreme values and confining the analysis to those intervals that would be influenced by child health and postpartum abstinence. Birth interval lengths have fallen by an average of 0.14 months for every year of increase in date of the mother's birth, or a total of 8 months for this 55 year period. There is no linear relationship between birth interval and mother's age or parity, and partial correlations controlling for these variables do not improve the strength of the relationship. Figure 11 groups the data into five-year intervals by mother's birth year to illustrate this relationship.

Figure 12 demonstrates that Zorse parents have been able to reduce postpartum abstinence without increasing infant and child mortality. The interval lengths of 3-3.5 and 3.5-4.0 years are the most important because the number of events is relatively large and this is a critical birth interval length in terms of change through time. Between 1928-47 and 1948-77, there is a marked decrease in mortality for the shorter of these intervals.

Discussion

Cost-benefit models of fertility developed by economists have thus far not incorporated Caldwell's (1977b) observation that children may yield parents a net economic gain. Budget constraint lines have negative slopes because it has been assumed that increasing income allows parents to indulge in these costly *consumer* goods (children) (see Easterlin 1978:101-4). Because they start with this assumption, most economic models also posit that increasing survival rates will lead to decreasing birth rates (Easterlin

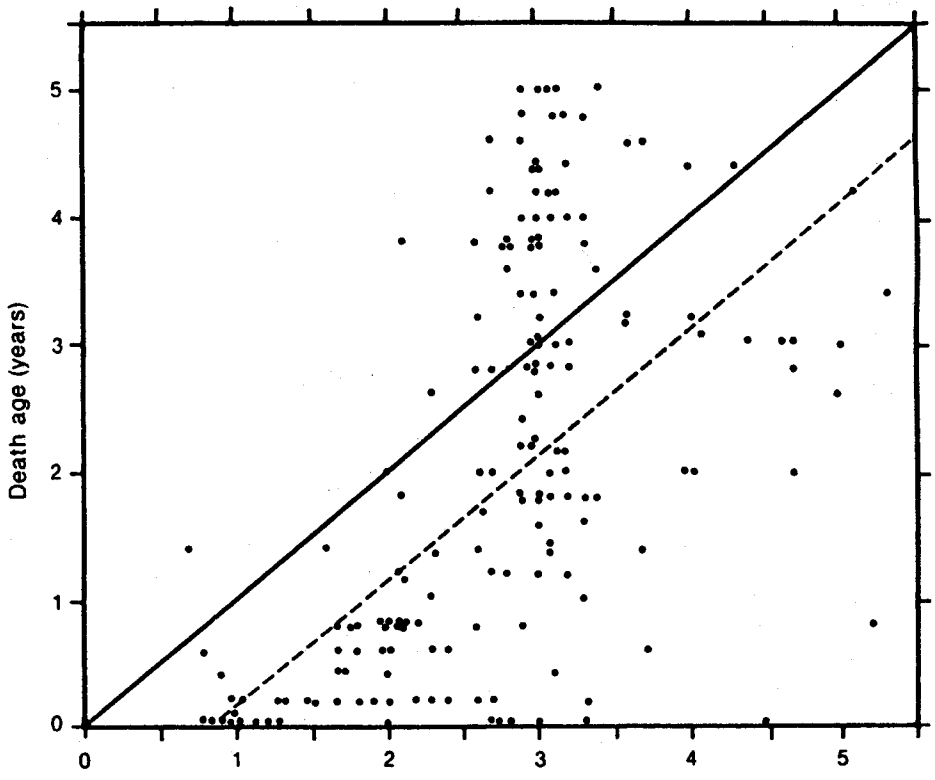

Figure 10. Scattergram of death age by birth interval. Those not exposed to risk of death to age 5 removed. Zorse, pregnancy history survey.

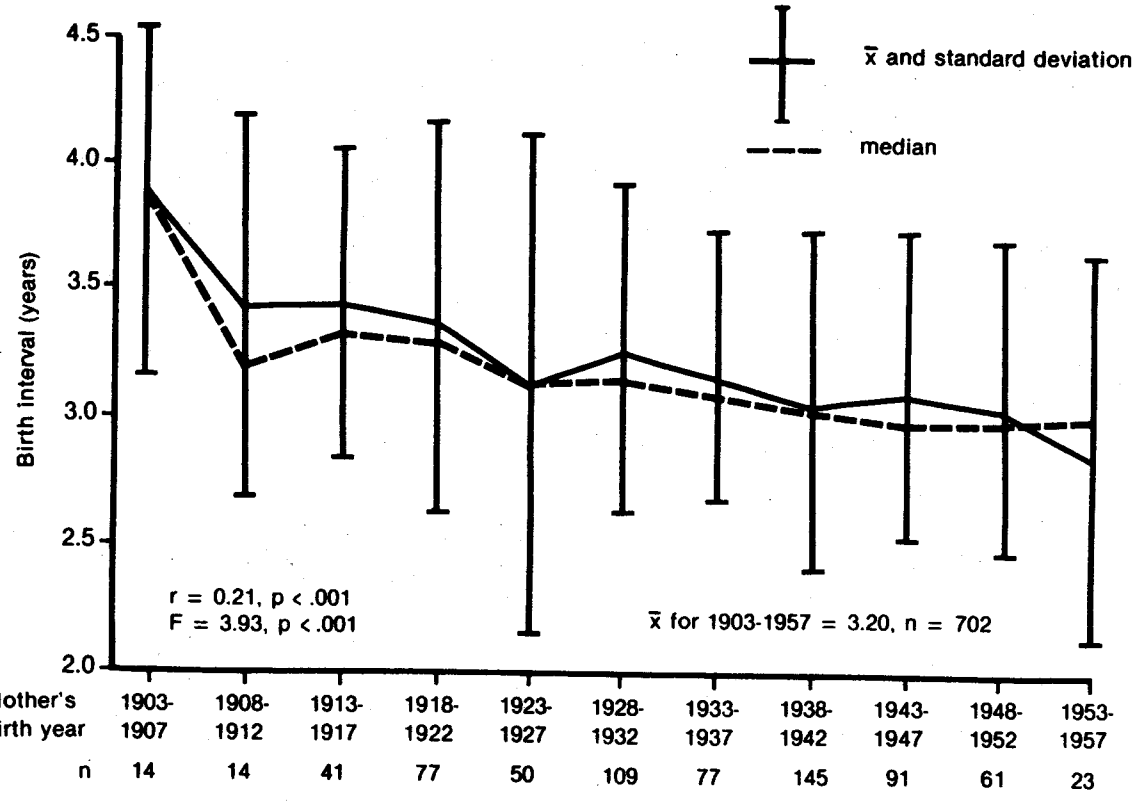

Figure 11. Birth intervals to the next youngest for mother's birth year, grouped in five-year intervals, 1903-07 to 1953-58. Includes only children alive when next youngest conceived, and only birth intervals less than 5 years. Zorse, pregnancy history survey.

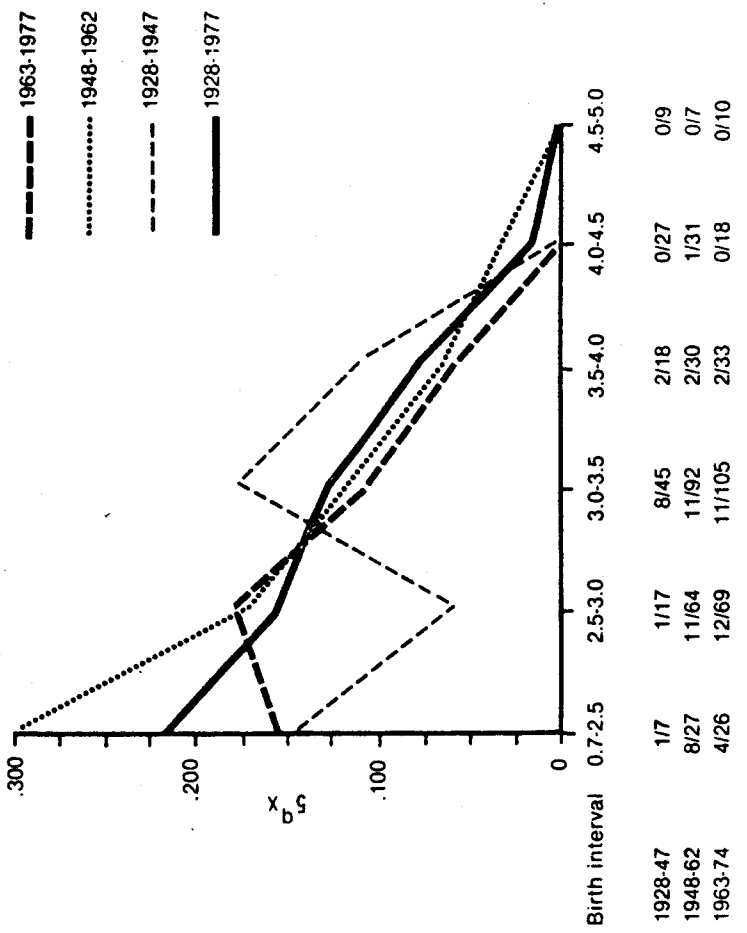

Figure 12. Mortality rates to five years by birth interval for those alive when next youngest conceived. $_5q_x$ is the mortality rate of the first born from the time second is born (x) to 5 years. Zorse, pregnancy history survey.

1978:96-97). In the Kusasi case, however, children do not necessarily consume more than they produce, and increased survivorship need not shift households from a situation of excess demand to one of excess supply. That shift is a function of the relative costs and benefits of births and children, and those costs and benefits are relative to specific productive conditions.

Figure 13 indicates the relationship between the number of live births (B), and the number of surviving children (Cs) and parental consumption (Gp), when children produce more resources than they consume. The first figure (1aa) shows that there is a threshold level beyond which the number of surviving children decreases as the number of births increase. This threshold is the result of increasing mortality of young children born at very short intervals in societies where their survival during the critical first 2-3 years depends on their mothers' constant attention. The second figure (13b) shows that past this threshold, the goods and services parents consume decreases as the number of births increase. This threshold appears to vary with the available health care and with production technologies, i.e., with the supply of births, survivorship, and the demand for births and the labor of children. As intensity of agriculture increases, returns to labor often decrease as more labor is invested in each unit of land (Boserup 1965). Under these conditions, children become labor resources for the household at an early age, alleviating the strain on their parents.

In labor-intensive farming communities throughout the world (see Cain 1977 for Bangladesh; Ho 1979 for the Philippines; Nag, White, and Peet 1978 for Java and Nepal; and Caldwell 1976, 1977a,b, 1978, for broader analyses), children appear to be producers of wealth, not consumer durables. Where fertility controls exist in these communities, they plausibly are used, as they are among the Kusasi, to maximize the number of surviving children, and thereby to maximize the resources available to parents. Where, as among Kusasi, resource stress increases, it is not reasonable to suppose that an increasing supply of births and/or children will alter reproductive strategies. Demand for births can decrease only with a change in the labor value of children and a reduction of resource stress (see Hayden, this volume). For the Kusasi, a change in farm technologies that increases the productivity of labor, and a change in social organization that links households' short-term demand for labor with long-term management of community agricultural resources are the most plausible stimuli for a fertility transition.

Notes

Acknowledgements. I thank the people of Ghana, Bawku District, and especially the chief, elders, and all the residents of Zorse, for their support of my work with them.

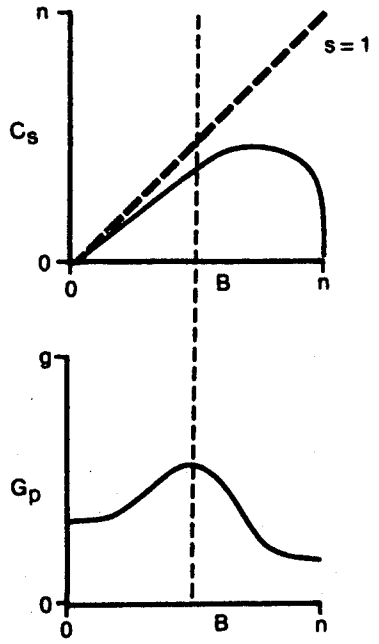

Figure 13. Relationship between number of live births and key variables in the cost benefit model. B = live births, s = survival rate, C_s = surviving children, G_p = parental consumption.

References Cited

Adu, S. V.
1969 Soils of the Navrongo-Bawku Area, Upper Region, Ghana. Soil Research Institute Memoirs Number 5. Kumasi, Ghana: Soil Research Institute.

Ahn, Peter M.
1970 West African Soils. London: Oxford University Press.

Bawku District Mobile Health Service (BDMHS)
(1975) Annual Report, 1974-75. Manuscript (in my files).

Beer, T., *et al.*
1979 Report of the Climatology, Agroclimatology and Water Resources Availability Sub Project. CSIR Northeast Ghana Savanna Project. Accra, Ghana: Water Resources Research Unit (C.S.I.R.).

Bongaarts, John
1978 A Framework for Analyzing the Proximate Determinants of Fertility. Population and Development Review 4:105-32.

1982 The Fertility Inhibiting Effects of the Intermediate Fertility Variables. Studies in Family Planning 13:179-89.

Boserup, E.
1965 The Conditions of Agricultural Growth: The Economic of Agrarian Change Under Population Pressure. Chicago: Aldine.

Cain, Mead T.
1977 The Economic Activities of Children in a Village in Bangladesh. Population and Development Review 3:201-27.

Caldwell, J. C.
1967 Fertility Attitudes in Three Economically Contrasting Rural Regions of Ghana. Economic Development and Cultural Change 15:217-38.
1976 Toward a Restatement of Demographic Transition Theory. Population and Development Review 2:321-66.
1977a The Economic Rationality of High Fertility: An Investigation Illustrated with Nigerian Survey Data. Population Studies 31:5-27.
1977b Towards a Restatement of Demographic Transition Theory. An Investigation of Conditions Before and at the Onset of Fertility Decline Employing Primarily African Experience and Data. *In* The Persistence of High Fertility, John C. Caldwell, ed. Pp. 25-119. Canberra: Australian National University Press.
1978 A Theory of Fertility: From High Plateau to Destabilization. Population and Development Review 4:553-77.

Cleveland, David A.
1980a The Population Dynamics of Subsistence Agriculture in the West African Savanna: A Village in Northeast Ghana. Unpublished doctoral dissertation, University of Arizona.
1980b Demographic and Agricultural Change in Northeast Ghana. Paper presented at the Annual Meeting of the American Anthropological Association, Washington, D.C., December.

Easterlin, Richard A.
1978 The Economics and Sociology of Fertility: A Synthesis. *In* Historical Studies of Changing Fertility, C. Tilly, ed. Pp. 57-133. Princeton: Princeton University Press.

Fage, John D.
1964 Reflections on the Early History of the Mossi-Dagomba Group of States. *In* The Historian in Tropical Africa. J. Vansina, R. Mauny, and L. V. Thomas, eds. Pp. 177-91. London: Oxford University Press.

Fortes, Meyer
1945 The Dynamics of Clanship Among the Tallensi. London: Oxford University Press.
1949 The Web of Kinship Among the Tallensi. London: Oxford University Press.
1953 The Structure of Unilineal Descent Groups. American Anthropologist 55:17-41.

Gaisie, S. K.
1976 Estimating Ghanaian Fertility, Mortality, and Age Structure. University of Ghana Population Studies, No. 5. Legon, Ghana: The Population Dynamics Program, University of Ghana.

Gaisie, S. K., N. O. Addo, and S. B. Jones
1975 Population Policy and its Implementation. *In* Population Growth and Socioeconomic Change in West Africa, John C. Caldwell, ed. Pp. 408-24. New York: Columbia University Press.

Gaisie, S. K., and A. S. David
1974 Planned Fertility Reduction in Ghana: Structural Interrelationships, Potential Socio-economic Impact, and the Magnitude of the Needed Programs. Thana Population Series No. 6. Legon, Ghana: Population Dynamics Program, University of Ghana.

Ghana Census Office (GCO)
1964 Demographic Characteristics of Local Authorities, Regions and Total Country. 1960 Population census of Ghana, Volume 3. Accra: Ministry of Broadcasting and Information on behalf of the Central Bureau of Statistics.
1975 Demographic Characteristics of Local Authorities, Regiona and Total Country. 1970 Population Census of Ghana, Volume 3. Accra: Ministry of Broadcasting and Information on behalf of the Central Bureau of Statistics.

Ghana National Archives (GNA)
n.d. [c. 1911] Census taking 1911. ADM 56/1/109.
n.d. [c. 1921] Census taking 1921. ADM 56/1/241, case number 52/1919.
n.d. [c. 1931a] Census report on the Kusasi District, excluding the mandated area of Togoland. ADM 57/5/8. (From the District Commissioner's Office, Bawku.)
n.d. [c. 1931b] Census in the mandated area of Togoland which is incorporated in the Kusasi District. ADM 57/5/8. (From the District Commissioner's Office, Bawkuu.)

Gordon, Gillian Mary
1973 An Evaluation of Nutrition Education Given to Pregnant and Nursing Women in Six Communities in the Upper Region of Ghana. M.Sc. Thesis, Department of Nutrition and Food Science, Faculty of Science, University of Ghana.

Government of the Gold Coast (GOGC)
1923 1921 Population Census of the Gold Coast Report. Accra: Crown Agents for the Colonies.
1932 1931 Census of the Gold Coast Report. Accra: Crown Agents for the Colonies.
1950 1948 Population Census of the Gold Coast Report. London: Crown Agents for the Colonies.

Gwatkin, Davidson R.
1975 Governmental Population Policies. *In* Population Growth and Socioeconomic Change in West Africa, John C. Caldwell, ed. Pp. 169-84. New York: Columbiia University Press.

Handwerker, W. Penn
1981c Productivity, Marketing Efficiency, and Price- Support Programs: Alternative Paths to Rural Development in Liberia. Human Organization 40:27-39.
Hilton, Thomas Eric
1962 Notes on the History of Kusasi. Transactions of the Historical Society of Ghana 6:79-96.
Ho, T. J.
1979 Time Costs of Child Rearing in the Rural Philippines. Population and Development Review 5:643-62.
Hunter, John M.
1968 The Clans of Nangodi. Africa 38(4):377-412.
Leridon, H.
1977 Human Fertility: The Basic Components. Chicago: University of Chicago Press.
Lesthaeghe, Ron
1980 On the Social Control of Human Reproduction. Population and Development Review 6(4):527-48.
Mondot-Bernard, Jacqueline M.
1977 Relationships Between Fertility, Child Mortality and Nutrition in Africa. Paris: Development Center of the Organization for Economic Co-operation and Development.
Nag, Moni, B. N. F. White, and R. C. Peet
1978 An Anthropological Approach to the Study of the Economic Value of Children in Java and Nepal. Current Anthropology 19:292-306.
Netting, Robert M.
1973 Fighting, Forest, and the Fly: Some Demographic Regulators Among the Kofyar. Journal of Anthropological Research 29:164-179.
1974 Agrarian Ecology. Annual Review of Anthropology 3:21-56.
Odunton, S., O. Olu, O. Ayeni, and O. O. Kale
1976 The Age of Menache in Nigerian Girls. Annals of Human Biology 3(3):269-74.
Rattray, Robert Sutherland
1932 The Tribes of the Ashanti Hinterland. 2 Volumes. London: Oxford University Press.
Retel-Laurentin, Anne, and Daniel Benoit
1976 Infant Mortality and Birth Intervals. Population Studies 30:279-293.
Rose Innes, R.
1977 A Manual of Ghana Grasses. Surrey, England: Land Resource Division, Ministry of Overseas Development.
Syme, J. G. G.
1932 The Kusasis. A Short History. Manuscript (in my files).
Thomas, Roger A.
1973 Forced Labor in British West Africa: The Case of the Northern Territories of the Gold Coast 1906-1927. Journal of African History 14(1):79-103.

I also thank Penn Handwerker and the participants and discussants of the conference out of which this book grew. This paper has been improved by comments by John Bongaarts, John C. Caldwell, Pat Caldwell, Penn Handwerker, W. Gerald Matlock, Robert M. Netting, and an anonymous referee.

[1]This decreasing age at first birth may also be influenced by decreasing age of menarche. Such a decrease has been demonstrated for other African populations and is probably due to a somewhat more stable nutritional effect. Oduntan, Ayeni, and Kale (1976), for instance, found that the average age of menarche in a sample of southern Nigerian rural girls in 1974 was .8 years greater than that for urban girls (13.7 vs. 14.5). The age for privileged girls had declined to 13.4 from 14.1 recorded by another investigator in 1961. The decrease in age at first marriage in Zorse is at the high end of the range of decline in age of menarche shown by several other studies (Leridon 1977:9-10), but below that reported by Oduntan et al. (1976). Although the normal fecundity level may not be reached until about age 20 (Leridon 1977:37), the mean age at first birth for the Zorse sample seems too high to be the result of decreasing age at menarche. In light of the ethnographic evidence and poor nutritional status, the decline in the age at first birth is most plausibly due to decreasing age at marriage.