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Pastoralists, agropastoralists and migrants: Interactions between fertility and mobility in northern Burkina Faso

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Abstract. Seasonal rural to urban migration of young men is becoming an increasingly important part of the rural economy of the West African Sahel, yet little is known about how the short-term contact of men with urban centres might affect reproductive decisions and outcomes in sending areas. In northern Burkina Faso, substantial variation in short-term migration rates of young Fulani men to cities provides an opportunity to explore interactions between migration and fertility in this area. The groups most involved in seasonal labour migration experience substantially lower fertility than non-migrating groups. Fertility differentials arise largely from higher rates of secondary sterility among migrating groups, probably caused by an increased incidence of sexually transmitted diseases. Such mechanisms as changes in attitudes and knowledge regarding birth control, and the undermining of traditional practices of marriage, breastfeeding, and sexual abstinence are far less important.

INTRODUCTION

Rural to urban migration in sub-Saharan Africa is a well established and well documented phenomenon. A considerable amount of research has been carried out over the last few decades into the impacts of large-scale migration on fertility, much of which has focused on the permanent movements of whole families to cities (e.g. Brockerhoff and Yang 1994). It is found that migrants rapidly adopt the fertility practices of the cities: increased use of contraceptives, decline of breastfeeding and traditional periods of sexual abstinence. However, several recent studies have shown that, particularly in the West African Sahel, short-term, seasonal, movements of young men to cities are becoming increasingly important (e.g. Maliki et al. 1984; Findley 1989; 1994; Cleveland 1991; Painter 1992; David 1995; de Bruijn and Van Dijk 1995; Davies 1996; Cordell et al. 1996; Guilmoto 1998; Hampshire and Randall 1999). As yet, the study of the consequences of temporary out-migration of men on the fertility of sending rural communities is still in its infancy.

Existing studies of the effects on fertility of short-term out-migration of men have produced conflicting results. Several studies have shown it to have a depressing effect on fertility through a number of mechanisms. Timæus and Graham (1989) found that temporary male migrants in Botswana and Lesotho delayed marriage and were more likely to experience marital breakdown, thus reducing fertility substantially in a context where pre- marital and extra-marital fertility are relatively uncommon. The fertility reducing effects of spousal separation were also found to be important in that study (ibid.), and similar results have been documented among temporary male migrants from Mexico to the United States (Massey and Mullman 1981). David and Voas (1981) found that fertility was very low among Fulani communities in Cameroon that engaged in temporary migration of men owing to a raised incidence of sexually transmitted diseases causing sterility, particularly gonorrhoea, resulting from the increased sexual freedom associated with migration.

Temporary rural to urban migration may also lower fertility by changing attitudes towards the value of children and the acceptability of modern methods of birth control. Timæus and Graham (1989) speculate that men's out-migration has increased women's economic decision-making roles. Resultant increases in the opportunity cost to women of child-bearing combined with exposure to Western ideas and values may have removed barriers to the adoption of family planning. Timæus and Graham also argue that the increase in the wage economy, resulting from temporary economic migration, undermines some of the traditional supports to the rationale of high fertility. Similar points are made by Gould (1994b) in the context of temporary out-migration of men in Nigeria.

However, in other situations, temporary out-migration of men has been found to raise fertility in sending areas. Cleveland (1986; 1991), found short-term out-migration of men in north-eastern Ghana to result in a lowering of age at first marriage, since

migrants were able to use their migration earnings to make bridewealth payments themselves instead of being dependent on their lineages for provision. While Timæus and Graham (1989) found the social and economic changes resulting from migration tended to undermine the rationale for high fertility, Cleveland (1991) found the reverse to be true. Not only did children remain valuable economic assets and sources of social security in old age, but the increasing uncertainty that children would stay at home to help their parents rather than migrate was an important support to continued high fertility in that area. Gould (1994a) also found that, in western Kenya, high fertility is not perceived to be a problem as long as the remittances keep coming in. A large family is seen as important for 'producing the next generation of migrants and remittance earners that will ensure long term household sustainability' (Gould 1994b).

Gould (1994b) tries to reconcile the apparent contradictions in the literature on out-migration of men and fertility by distinguishing between 'dynamic' and 'lagging' regions. In the former, which includes southern Africa, migration is accompanied by rising incomes, substantial social change, and 'modernisation', which promote fertility decline as part of overall social and economic development. Conversely, in 'lagging' regions (in which Gould includes north-eastern Ghana and western Kenya), circulation of men seems to be a factor in the persistence of high fertility. Characterised by low levels of remittances and limited rural commercialisation, these areas become nevertheless dependent on remittances, which sustains a high demand for large families to produce future migrants.

This paper draws on detailed fertility and migration data among the Fulani of northern Burkina Faso to shed further light on this debate. Under Gould's classification, northern Burkina Faso would certainly constitute a 'lagging' region: remittance levels are low to negligible, commoditization of the labour market is extremely limited and there is little evidence of social changes associated with 'modernisation'. However, the results presented in this paper quite clearly show lower fertility among the groups most strongly associated with temporary out-migration of men, with implications for the long-term sustainability of the migration system.

THE FULANI OF NORTHERN BURKINA FASO AND TEMPORARY OUT-MIGRATION OF MEN

This paper presents a study carried out in 1995–96 among the Fulani of northern Burkina Faso. The study area covers a corridor some 150 km long and 70 km wide in Oudalan and Séno, two of the three provinces in the Sahel Region of Burkina Faso. It is inhabited by a number of different ethnic groups, of which the Fulani constitute about a quarter of the population (INSD 1994). The Sahel Region is a semi-arid area, between the 300mm and 500mm isohyets. Rainfall in the area is highly seasonal, almost all falling in the short rainy season from June to September (Barral 1977; Claude et al. 1991). The main economic activities in the area are extensive pastoralism and rain-fed agriculture growing pearl millet and sorghum. There is no crop irrigation and cultivation outside of the rainy season is impossible. The major livestock types owned by the Fulani are cattle, sheep, and goats.

The Fulani are well known to be a highly mobile population. In common with other Sahelian pastoralists, they are particularly associated with large-scale transhumance, moving substantial distances with herds of cattle in search of pasture and water (e.g. Gallais 1975; Barral 1977; 1984; Bernus 1988; 1991; Milleville 1991). However, since the major droughts of the early 1970s, when herd numbers were drastically reduced, the Fulani of northern Burkina Faso have been engaging increasingly in temporary migration to cities. With fewer animals to tend, the dry season has become a slack season for many, and a good window of opportunity to travel to cities to seek alternative sources of livelihood to supplement an agropastoral mode of subsistence. Today, large numbers of young Fulani men leave each year in the dry season, mostly to work in Abidjan in the Côte d'Ivoire. In the 1995 survey, 15.8 per cent of men aged 18–64 had been to work in cities during the 12 months preceding the survey, and 36.6 per cent of men in this age group had done so at some point in their lives (see Hampshire and Randall 1999).

However, involvement in this temporary migration is not uniform across all the Fulani. Variables associated with propensity to migrate include: age, economic activity, household size and composition and, most importantly, ethnic subgroup. There are four major ethnic subgroups of the Fulani in this region. The FulBe DjelgoBe, found mostly in the north of the area, are the most pastorally-oriented group. Although today few FulBe DjelgoBe depend for survival exclusively on their herds, they are still strongly associated with pastoralism and are the most pastorally mobile, engaging in transhumant movements in search of pasture and water. The FulBe Liptaako are a much more sedentary group of agropastoralists, living mostly in stable villages in the southern part of the

Table 1. *Seasonal economic migration characteristics of Fulani men aged 18–64 by ethnic subgroup, northern Burkina Faso 1995*

Ethnic subgroup	N	Per cent migrating 1994–95	Per cent lifetime migration	Mean duration of migration in 1994–95 (months)
FulBe DjelgoBe	303	2.0	3.6	8.7 (N=6)
FulBe GaoBe	665	19.1	36.3	4.9 (N=124)
FulBe Liptaako	504	11.1	33.9	8.3 (N=53)
RiimaaiBe Liptaako	343	17.2	59.2	6.8 (N=58)
ALL	1815	13.7 $Chi^2 = 58.1$ $p<0.00005$	34.5 $Chi^2 = 221$ $p<0.00005$	6.2 (N=241) F ratio = 13.1 $p<0.00005$

NOTES:
Seasonal economic migration is defined as migration outwith the Sahel Region of Burkina Faso, for a period of between 1 and 24 months with the intention of earning money.
Analysis of variance on mean duration of migration excluded the FulBe DjelgoBe because of the very small number of DjelgoBe migrants.
"All" includes small numbers of other Fulani groups in the sample.
Source: Single-round demographic survey, northern Burkina Faso, April–June 1995.

area alongside the RiimaaiBe Liptaako, a largely cultivating group and the erstwhile slaves of the FulBe Liptaako. Finally, the FulBe GaoBe are also agropastoralists and occupy a position intermediate between the FulBe DjelgoBe and the FulBe Liptaako, both geographically and in terms of their subsistence strategies.

There is a very strong association between ethnic subgroup and the propensity of young men to migrate to cities (Table 1). It is extremely rare for FulBe DjelgoBe men to engage in seasonal economic migration compared with the three other groups. Among those three there is some variation both in propensity to migrate and annual duration of the migration. FulBe GaoBe men migrate frequently, but the duration of migration is shorter than for the Liptaako groups, particularly FulBe Liptaako migrants, who spend almost two thirds of a year away on average. While other explanatory variables correlate with ethnic subgroup (particularly subsistence system), multiple logistic regression models show these results to be robust and not merely an artefact of other relationships (Hampshire and Randall 1999). This variation in temporary out-migration of men within a single broad ethnic category in a fairly small geographical area provides a good 'natural experiment' to test the hypothesis that temporary out-migration of men has impacts on fertility strategies and outcomes.

METHODS AND DATA QUALITY

We use a proximate determinants approach to identify and explore fertility differentials within these Fulani populations (see Bongaarts 1978; 1982; Bongaarts and Potter 1983) and assume that no differences in natural fecundity are experienced between ethnic subgroups (owing, for example, to different energy balances; see Ellison 1995). The data used in this paper were collected in two main phases of fieldwork. A single-round demographic survey was carried out in April-June 1995 in 40 villages, ranging from nomadic camps of one or two households to large permanent villages of over fifty compounds and covering 8834 Fulani (834 households). All members of each sample household were enumerated and, wherever possible, interviewed separately. Interviews were conducted by three trained Fulani enumerators under carefully supervised conditions. Cross-checks minimized errors and ambiguities. Refusal rates were extremely low (less than 1 per cent of households).

Demographic and socio-economic data (including marital status) were collected in the single-round survey. As it was not possible to collect full birth histories, fertility was estimated indirectly using the P/F method (UN 1983) and the relational Gompertz method (Zaba 1981). All men over 15 years old and women over 12 were questioned on children ever born by sex and survival status, along with details of the most recent birth. Using these data it was also possible to obtain an indirect estimation of infant and child mortality using proportions dead and the Coale-Trussell regression equations (Brass 1968).

The single-round survey was followed up by an intensive multiple round study of a structured subsample of the population: two villages from each major subgroup of Fulani (DjelgoBe, GaoBe and Liptaako) covering a total population of 1224 individuals in 117 households. Each sample village was visited for one week bi-monthly for a year (six

visits). During these visits further quantitative data were collected as well as a range of qualitative data using semi-structured interviewing techniques. Detailed birth histories and marriage histories were taken from every individual over the age of 12, both to verify the single-round survey data and to provide further information about the timing and spacing of births. Added to the birth history questions were supplementary questions about the most recent birth: duration of post-partum abstinence and breastfeeding status. Further information on the breastfeeding status of each woman and child was sought on each subsequent visit over the year. Marriage histories asked for details on the timing and duration of each marriage, reason for the termination of any marriage, kinship between spouses, number of co-wives, and further details on bridewealth payments. In order to explore the impact of spousal separation on fertility, detailed movements of spouses over the year were recorded. A large number of informal discussions were held with individuals and small groups about attitudes towards marriage, childbirth, and family planning.

Overall, given the nature of the population surveyed and the techniques used, the quality of the data collected is surprisingly good. This was largely a result of careful supervision of enumerators and the performance of simple tests on the data as they were being collected, which enabled most potential problems to be identified and resolved. There was some under-reporting of girls, particularly by the FulBe Liptaako; corrections have been made for this in the results which follow by adding in 'missing girls' to bring the sex ratios of children ever born for the population as a whole within an acceptable range[1]. There is no evidence that dead children were systematically under-reported. Proportions dead of children ever born are consistent with other similar populations (e.g. Randall 1984), and those groups reporting the fewest dead children are also those reporting the highest numbers of children ever born; if they were also under-reporting dead children their fertility would be unrealistically high.

FERTILITY LEVELS AND DIFFERENTIALS

Women begin their childbearing earlier than men (Figures 1 and 2). This pattern is largely explicable by the marriage regime (see below); the male age-specific fertility schedule is quite compact, with relatively few births to older men. The age-specific data on reported parity and current fertility for women provide estimates of the total fertility (Table 2), using the P/F method (UN 1983) and the

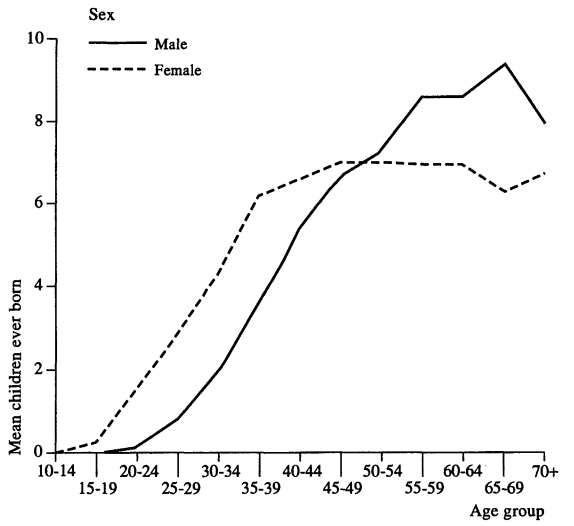

Figure 1. Reported parity of Fulani men and women.
Source: Single-round demographic survey, northern Burkina Faso, 1995.

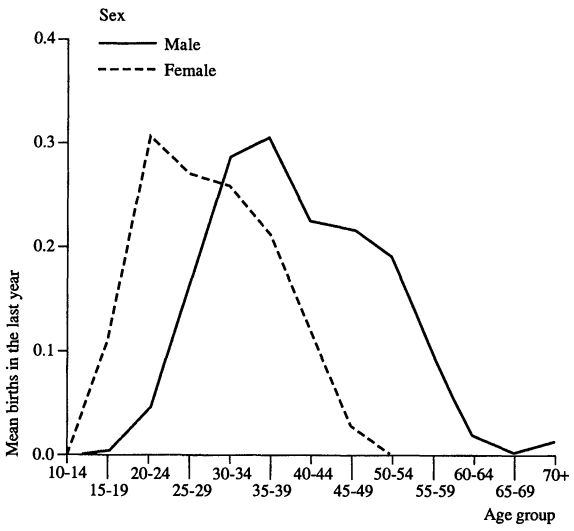

Figure 2. Reported age specific fertility of Fulani men and women.
Source: As Figure 1.

Table 2. *Total fertility estimates of Fulani in northern Burkina Faso using P/F and Gompertz methods*

Method	Estimate	N (women)
P/F	6.6	1566
Relational Gompertz	6.5	1566
Reported completed parity: women 40–54	6.9	444

NOTES:
P/F estimates include 'missing girls'. All estimates were made using United Nations Mortpak Lite package.
The relational Gompertz estimates use cumulated age-specific fertility rates. It was not possible to correct for 'missing girls'. The parameters (α and β) are estimated from the cumulated fertility of women aged 20–39.
Source: As Table 1.

relational Gompertz method (Zaba 1981). The fact that both total fertility estimates are slightly below the reported mean completed parity might indicate a recent minor decline in fertility, but could just be an artefact of the relatively small sample sizes used.

Analysis of fertility by ethnic subgroup reveals substantial differences (Figures 3 and 4; Table 3). In particular, the FulBe DjelgoBe have much higher fertility than any of the other groups. DjelgoBe men start reproducing at an earlier age and maintain higher parity in all age groups. The differences are less pronounced for women, but they are still noticeable, particularly among the older age groups of women. This is reflected in the higher total fertility estimates of DjelgoBe women. These findings run contrary to expectations from studies in other populations with similar overall levels of fertility, where highly mobile pastoral populations usually have lower fertility than sedentary populations living in the same area (Henin 1968, 1969; Swift 1977; Randall 1984; Campbell & Woods 1986; Bentley et al. 1993; Roth 1993).

The remainder of this paper will be devoted to exploring the mechanisms behind these observed fertility differentials between ethnic subgroups. The specific aim is to ascertain the extent to which the fertility differentials between ethnic subgroups can be attributed to their different patterns of temporary out-migration of men. Can the higher fertility of the FulBe DjelgoBe be attributed to the fact that DjelgoBe men rarely migrate to cities? Can differences in fertility outcomes between the other groups be explained at all by the differences in use of temporary out-migration? Through what mechanisms might migration be affecting fertility decisions and outcomes?

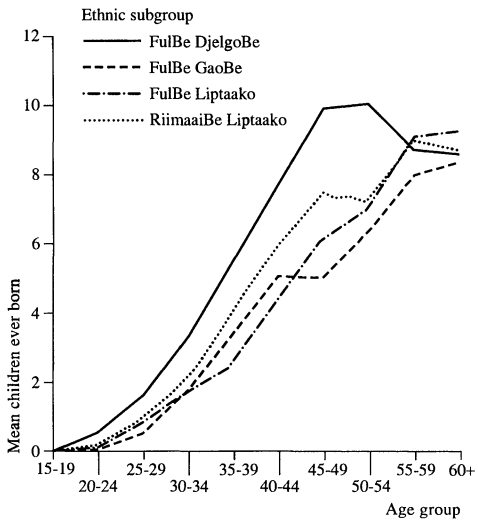

Figure 3: Reported parity of Fulani men by ethnic subgroup. *Source*: As Figure 1.

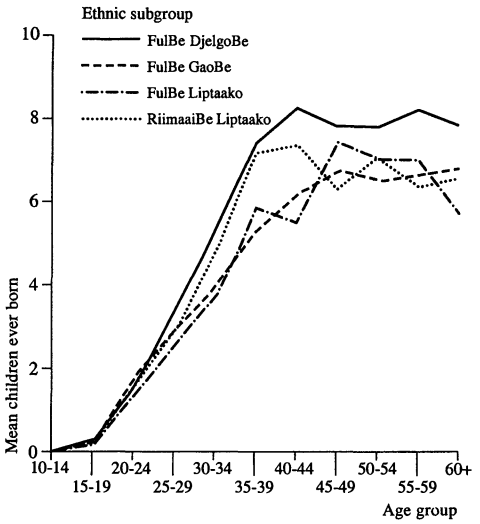

Figure 4: Reported parity of Fulani women by ethnic subgroup. *Source*: As Figure 1.

Table 3. *Indirect estimates of total fertility of Fulani by ethnic subgroup*

	Total fertility: women aged 15–49		Completed parity: women 40–54		
Ethnic subgroup	P/F	Gompertz	N	Mean	N
FulBe DjelgoBe	9.2	9.4	302	8.0	66
FulBe GaoBe	6.3	6.3	570	6.5	145
FulBe Liptaako	6.4 (6.0)	5.6	395	6.9 (6.6)	99
RiimaaiBe Liptaako	7.1 (7.0)	6.4	299	7.1 (7.0)	65
ALL	6.6	6.5	1566	6.9	444

NOTES:
P/F and mean completed parity are corrected for missing girls. Uncorrected figures, where different to one decimal place, are shown in brackets.
FulBe DjelgoBe P/F estimate is adjusted to 25–29 age group only.
Source: As Table 1.

PROXIMATE DETERMINANTS ANALYSIS OF FERTILITY DIFFERENTIALS

In this section, each of the major proximate determinants of fertility (as identified by Bongaarts 1978; 1982) will be explored to establish:

(i) which appear to explain the observed inter-ethnic fertility differentials;

(ii) whether there is any connection between these differentials and temporary out-migration of men.

(*a*) *Contraception and Induced Abortion*

It has been widely suggested that contact with urban areas and 'modern ideas' as a result of

temporary migration to cities might produce shifts in attitude towards the value of children or changes in the awareness and acceptability of birth control among the sending population. The results of these changes on fertility are not straightforward: depending on the situation, fertility might fall (e.g. Timæus and Graham 1989) or rise (e.g. Cleveland 1991; Gould 1994a). Regardless of the direction of change, however, it is reasonable to assume that those Fulani populations engaging most in migration to cities will have higher levels of awareness of modern methods of birth control and might be more predisposed to using them.

In fact, the numerous informal interviews with individuals and small groups of men and women showed that, as yet, this contact with cities has done little either to increase awareness about modern methods of birth control or to alter fertility preferences. The desire for lots of children and large families is ubiquitously expressed by this Fulani population, and there are no apparent differences between migrating and non-migrating groups. Children are seen as conferring status in their own right and are a source of economic wealth and security. To have no children at all (or none of one sex) is a social disaster. Without children, it is difficult for a Fulani (man or woman) to become a full social being and form an independent household. Even for those who already have several children, it is always better to have more. Moreover, there are no perceived disadvantages in having lots of children. They are never seen as a drain on resources and, should there be a problem in providing for them, there is always a large unmet demand for adoption or fostering by relatives who do not have children of their own. This unmet demand can act as a safety valve, allowing children to be offloaded, either temporarily or permanently, if it becomes necessary.

Given these attitudes, it is not surprising that none of the Fulani in the sample had ever used any form of contraception for the purpose of birth control. A large number of Fulani interviewed (particularly women, but many men also) claimed to be completely unaware of the existence of contraceptive methods. While migrants were more likely than non-migrants to have heard of contraception, none thought they were ever likely to use it. Induced abortion was confined exclusively to young unmarried women and even then was extremely rare. It is clear that volitional changes in fertility, mediated through birth control, are not responsible for the fertility differentials observed between ethnic subgroups.

(*b*) *Post-Partum Abstinence*

In several West African societies, post-partum abstinence is prolonged and can be an important constraint on fertility (e.g. Page and Lesthaeghe 1981). Cleveland (1991) identified the relaxation of the traditional extended post-partum abstinence in Ghana as being an important mechanism through which the temporary migration of young men to cities resulted in increased fertility in the sending areas.

Fulani women often return to their natal homes to give birth, particularly for the first few births or while the woman's mother is still alive. During this time there is no sexual contact with the husband; sexual contact is resumed when the woman returns to her husband's home with no reason for further prolonging sexual abstinence. However, the mean length of stay at the parental home following a birth is only just over three months, and even for first births it is only four months. This is not long enough to influence fertility, given the long duration of breastfeeding (see below). Older women, who stay in their husbands' homes to give birth, only abstain from sexual contact following birth for the 40 days prescribed by Islamic law.

(*c*) *Marriage*

In societies where fertility outside marriage is very low, the amount of her fecund life that a woman spends in a married state is an important determinant of her fertility. This is the case among the Fulani who have strong sanctions against fertility outside marriage, particularly pre-marital fertility. Changing marriage patterns have been identified by several researchers as being an important mechanism through which temporary out-migration of men has an impact on fertility. Timæus and Graham (1989) found that migrants delayed marriage and were more likely to experience marital dissolution than non-migrants, thus limiting their fertility. On the other hand Cleveland (1991) found earlier marriage among migrants, who were able to overcome bridewealth barriers.

Marriage among the Fulani of Burkina Faso is universal (Figure 5). By age 20 most women are married. In the large sample used for this study only one woman over age 30 – one who was severely disabled – had never been married. Men always marry too, although rather later. While there are no differences between the ethnic subgroups in the universality of marriage, there are differences in age at first marriage (Table 4). FulBe DjelgoBe men marry significantly earlier than those of the other

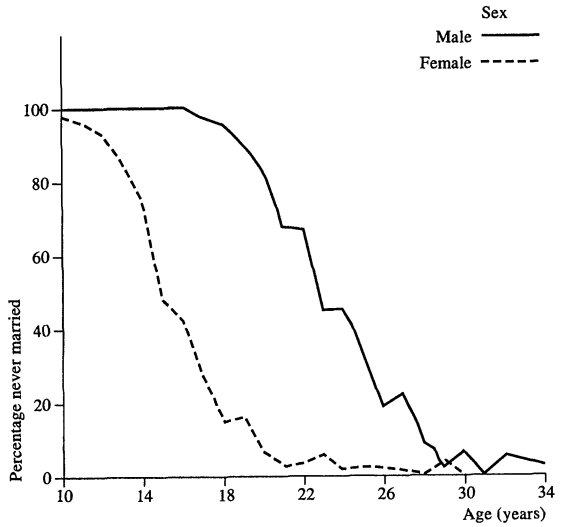

Figure 5: Proportions never married of Fulani men and women by age.
Source: As Figure 1.

ethnic subgroups who are involved in temporary out-migration. It may be that, as found by Timæus and Graham (1989), men are delaying marriage for reasons connected with their seasonal migrations to cities.

The Fulani are mildly polygynous: 7.6 per cent of currently married men and 13.5 per cent of currently married women were in polygynous unions with no differences between ethnic subgroups. This polygyny decouples any simple relationship between age of marriage of men and that of women, since all women can be married without all the men needing to be married. Differences in women's age at marriage are small (Table 4) and, if anything, FulBe DjelgoBe women marry slightly later than the other groups (the opposite of the trend for men), though the differences are too small to have any significant effect on fertility. A consequence of marriage being earlier for the FulBe DjelgoBe men and slightly later for women is that DjelgoBe spouses are, on average, closer together in age. It is possible that this has a positive effect on coital frequency, but the data available do not allow such a hypothesis to be tested.

There are also differences in marriage outcomes by ethnic subgroup. Fulani marriage is relatively unstable. Divorce is common and most people remarry following divorce or widowhood. For women in their first marriages, divorce is a more likely outcome than widowhood; after thirty years, more than half of first marriages of surviving women had ended in divorce.

Marital dissolution is slightly more common among the FulBe GaoBe and FulBe Liptaako than among other groups (Table 5). Linear regression models (not shown) imply this is a real effect, not simply a function of different age distributions. This finding supports those of Timæus and Graham (1989) that higher rates of marital breakdown might be linked to temporary out-migration of men. This finding is further strengthened by analysis within each ethnic subgroup (not shown) which shows that lifetime migrants have had more marital mobility than non-migrants.

However, again, because of the flexibility offered by the existence of polygyny, it is quite easy for most people, particularly women, to remarry very quickly. Subsequent marriages are less formal than first marriages and can be arranged rapidly. Life

Table 4. *Age at first marriage of Fulani men and women*

	Men			Women		
Ethnic subgroup	N	Singulate mean age at marriage	Median age at marriage	N	Singulate mean age at marriage	Median age at marriage
FulBe DjelgoBe	471	21.2	21.5**	461	17.1	16.2
FulBe GaoBe	953	25.5	25.2*	867	16.4	15.7
FulBe Liptaako	734	25.1	24.6	597	15.8	15.9
RiimaaiBe Liptaako	518	23.9	23.3	461	16.4	15.6
ALL	3139	24.5	24.4	2795	16.3	15.8

NOTES:
Medians are calculated from reported age at first marriage, using a life table approach.
Wilcoxon Gehan Statistics: medians significantly different from all other groups: * p-value < 0.05; ** p-value < 0.01.
"All" includes small numbers of other Fulani groups in the sample.
Source: As Table 1.

Table 5. *Mean number of marriages ended of Fulani by ethnic subgroup*

	Ever married men		Ever married women	
Ethnic subgroup	Marriages ended	N	Marriages ended	N
FulBe DjelgoBe	0.38	269	0.38	333
FulBe GaoBe	0.58*	570	0.56	674
FulBe Liptaako	0.62	425	0.43	496
RiimaaiBe Liptaako	0.48	306	0.42	367
ALL	0.54 $p < 0.0005$	1570	0.47 $p < 0.005$	1870

NOTES:
* Indicates significantly different from all other groups ($p < 0.05$).
"All" includes small numbers of other Fulani groups in the sample.
Source: As Table 1.

Table 6. *Years spent in married state by Fulani women marrying for the first time by age twenty, by ethnic subgroup*

	Proportion of years between ages 20 and 30 spent in married state (ever-married women aged 30+)		Proportion of years between ages 20 and 40 spent in married state (ever-married women aged 40+)	
Ethnic subgroup	Mean	N	Mean	N
FulBe DjelgoBe	0.97	31	0.97	19
FulBe GaoBe	0.93	32	0.93	17
FulBe Liptaako	0.94	27	0.97	14
RiimaaiBe Liptaako	0.92	24	0.96	9
ALL	0.94	114	0.96	59

NOTES:
No statistically significant differences found between the subgroups.
The 2% of women still single at age twenty were excluded in order to distinguish the effects of marital mobility from those of age at first marriage.
Source: Multiple round study, northern Burkina Faso, 1995–96.

table analysis on the first inter-marital gap (i.e. the time between the end of the first marriage and the start of the second) for women gives a median figure of 1.80 years. Subsequent gaps are slightly longer but rarely exceed two or three years. This is short in terms of the reproductive lifespan of a woman.

Rapid remarriage means that, although marital dissolution is common, and higher among particular ethnic subgroups, the effects of marital mobility on the proportion of women's reproductive lives spent in a married state is minimal and

Table 7. *Estimated values of total fertility, total marital fertility and C_m for Fulani women by ethnic subgroup*

Ethnic subgroup	Total fertility	Total marital fertility	C_m	N
FulBe DjelgoBe	9.2	10.1	0.92	302
FulBe GaoBe	6.3	7.3	0.88	570
FulBe Liptaako	6.4	6.8	0.94	395
RiimaaiBe Liptaako	7.1	7.6	0.90	299
ALL	6.6	7.3	0.90	1566

NOTES:
All fertility estimates are made using the P/F method, adding in "missing girls".
Direct estimates are used for the 15–19 age group, rather than the adjustment suggested by Bongaarts (1992), since a high proportion of women in this age group are married and bearing children.
Source: As Table 1.

shows no significant differences between subgroups (Table 6).

In summary, temporary out-migration of men may well have impacts on marriage patterns, by delaying men's first marriage and by increasing marital instability and mobility. However, because of polygamy, the effects on the amount of women's reproductive lives spent in the married state, and thus on fertility, are small. This is reflected in estimated values of total marital fertility and C_m, the proportion of reduction in fertility resulting from a proportion of reproductive-aged women not being in formal sexual unions at any one time (Bongaarts 1982): Table 7. It is clear that little, if any, of the observed inter-ethnic fertility differential can be explained by differences in marriage patterns.

(*d*) *Breastfeeding*

Breastfeeding is the main determinant of post-partum infecundity and, where breastfeeding is extended, this can contribute significantly to birth intervals and reduce total fertility (Bongaarts 1978; 1982). Duration of breastfeeding is a function of two components: age at weaning and the proportion of children who die before they are weaned, thus curtailing their mothers' breastfeeding. In this population, where infant and early child mortality are high, the difference between the two is substantial (Figure 6).

Median lengths of breastfeeding, estimated graphically, are:

(i) Children's Perspective: median = 25 months (N=199).

(ii) Mothers' Perspective: median = 23 months (N=243).

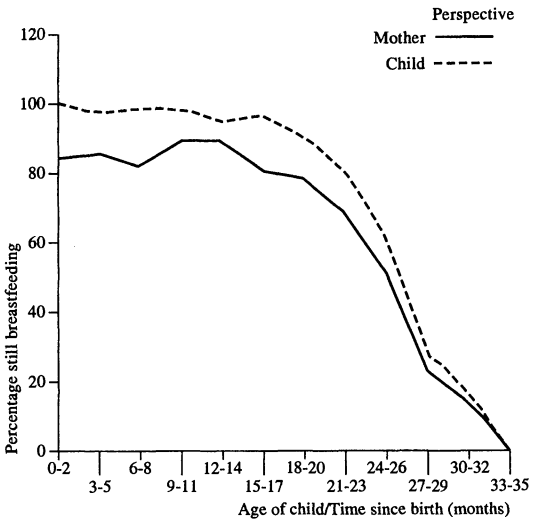

Figure 6: Duration of Fulani breastfeeding from mothers' and children's perspectives.
Source: Multiple round demographic study, northern Burkina Faso, 1995-96.

It is clear that, with such extended breastfeeding, the impact on post-partum infecundity, and thus on fertility, is substantial. Using Bongaarts' (1982) model, the mean length of post-partum infecundity conferred by breastfeeding for 23 months is 16 months, and the value of C_i, the proportion of reduction in fertility resulting from this length of post-partum infecundity, is 0.58. No differences in the norms governing length of breastfeeding or timing of weaning and the introduction of supplementary foods were observed between subgroups. There are differences between ethnic subgroups in ${}_2q_0$, the probability of a child dying before age 2 (approximate age of weaning), but these are not large enough to have a substantial impact on C_i (Table 8). Although breastfeeding has a large impact on limiting Fulani fertility as a whole, it cannot explain the differences between ethnic subgroups.

(e) *Spousal Separation*

In Bongaarts' (1978) original proximate determinants framework, coital frequency was not seen to be an important determinant of fertility. However, various studies using both theoretical models (Menken 1979; Bongaarts and Potter 1979; Hill and Shorter 1979; Millman and Potter 1984) and empirical data have led to a re-evaluation of the importance of the impact on fertility of reduced coital frequency when populations are subject to seasonal spousal separation. In both Mexico (Massey and Mullman 1981) and southern Africa (Timæus and Graham 1989), spousal separation has been found to be an important mechanism for depressing the fertility of seasonal migrants.

Of the 211 women of reproductive age continuously married for a whole year (1996), 117 were separated from their husbands for at least part of that year (for more than one continuous week in any two-month period). The most important single reason for spousal separation was migration of men to cities (57 cases). Transhumance accounted for fewer cases of separation (24 cases) because much transhumance involved whole households, particularly among the FulBe DjelgoBe, who were most actively engaged in such movements. Other reasons for separation of spouses included: returning home for childbirth, visiting relatives and, occasionally, trips associated with the treatment of illness. Various logistic and linear regression analyses (not shown) show that the incidence of spousal separation is unrelated to the state of susceptibility of the woman to pregnancy, using months since the last birth as a proxy. (The only exception to this is women returning home to give birth. Because such separations obviously have no impact on fertility, they are excluded from further tabulations). Men, it seems, were not timing their

Table 8. *Estimated median length of breastfeeding for Fulani women by ethnic subgroup, and the impacts on birth interval length and total fertility*

Ethnic subgroup	Age at weaning (months)	${}_2q_0$	Length of breast-feeding for mothers (months)	Length of post-partum infecundity (i)	C_i
FulBe DjelgoBe	25	0.140	23.8	16.9	0.57
FulBe GaoBe	25	0.224	23.0	16.2	0.58
FulBe Liptaako	25	0.217	23.1	16.3	0.58
RiimaaiBe Liptaako	25	0.186	23.4	16.5	0.57
ALL	25	0.181	23.5	16.6	0.57

NOTES:
Values of ${}_2q_0$, the under-two mortality rates, are calculated indirectly from proportions dead of children ever born to women by age group, using Coale Trussel regression equations based on the Coale Demeny "North" life table (Coale and Demeny 1983). Calculations were performed using the United Nations Mortpak Lite package.
Source: As Table 6.

Table 9. *Spousal separation data for married Fulani women aged 15–49*

Ethnic subgroup	N	Involved in spousal separation during 1996	Separations caused by temporary out-migration of men	Mean proportion of year with husband	C_s
FulBe DjelgoBe	57	13	1	0.94*	0.98
FulBe GaoBe	64	36	19	0.84	0.95
FulBe Liptaako	38	25	16	0.73	0.91
RiimaaiBe Liptaako	41	24	15	0.81	0.94
ALL	200	98 Chi^2=23.8 p<0.00005	51 Chi^2=25.8 p<0.00001	0.84 F ratio = 6.3 p<0.0005	0.95

NOTES:
Spousal separations are defined as separations for at least one continuous week in any two-month period. Separations due to childbirth are excluded, since they do not affect fertility.
* Indicates significantly different from all other groups ($p < 0.05$).
Source: As Table 6.

migrations to coincide with their wives' infecund periods. This increases the likelihood that these separations influence fertility.

Given that seasonal economic migration of men to cities is strongly associated with ethnic subgroup, it is no surprise that FulBe DjelgoBe women spend a significantly higher proportion of the year with their husbands than any other ethnic group (Table 9). Using models derived by Millman and Potter (1984), it is possible to translate the separations into values of C_s, the proportion of reduction in fertility resulting from spousal separation (Table 9). The value of C_s for the whole population, 0.95, is small but not inconsequential. Unlike breastfeeding, which exerts a large impact overall on fertility but shows little inter-ethnic differentiation, the effects of spousal separation on fertility are small overall, but vary substantially between ethnic subgroups as a direct result of different amounts of temporary out-migration of men. The impact is largest for the Liptaako groups, for whom migration is both frequent and relatively extended (Table 1). The differences are in the right direction to explain the observed fertility differentials, but are not large enough to explain all of the differences observed.

(*f*) *Sterility*

Primary and secondary sterility have been found to have a substantial impact on the fertility of a number of African populations (Larsen and Menken 1989; 1991; Larsen 1989; 1994). A band of countries south of the Sahara, known as the 'African infertility belt' is particularly affected. It has been estimated that the total fertility of countries such as Cameroon or Gabon might be increased by two or three live births per woman if sterility rates were reduced (Larsen 1994).

A number of sexually transmitted diseases (particularly gonorrhoea and chlamydia) are known to lead to reduced fecundity and, ultimately, secondary sterility (e.g. Retel-Laurentin 1979; McFalls and McFalls 1984; Brunham and Embree 1992). David and Voas (1981) explained differential fertility among Fulani populations in Cameroon in terms of the higher prevalence of sexually transmitted diseases among seasonal migrants. Other research (Bakouan et al. 1991; Painter 1992; Anarfi 1993; Garenne et al. 1995) has found migrants to engage in high-risk sexual contacts and thus be more exposed than non-migrants to various sexually transmitted diseases.

Sterility is a major source of concern to the Burkinabè Fulani, but problems of sterility are always blamed on women and no explicit connection is made between sexual promiscuity, sexually transmitted diseases, and sterility. Extra-marital affairs are tolerated as long as they are conducted with discretion. It is widely accepted that seasonal trips to cities are what offer most opportunities for extra-marital sexual relations for men. Informal interviews with migrants revealed that virtually all migrants had frequent and unprotected contacts with prostitutes while away. It is also widely acknowldged that the absence of husbands affords women the opportunity of having regular sexual contacts with other men. The hypothesis that sexually transmitted diseases, acquired by migrants and passed on to others, are leading to high rates of secondary sterility and subfecundity is certainly plausible.

Levels of primary sterility vary slightly between ethnic subgroups (Table 10). They are extremely low for the FulBe DjelgoBe and at the higher end of the expected normal range for the other groups, particularly the FulBe Liptaako. Reasons for these

Table 10. *Primary sterility of Fulani men and women by ethnic subgroup*

Ethnic subgroup	Women aged 25–54 married at least 5 years		Men aged 30–64 married at least 5 years	
	N	Per cent with no live births	N	Per cent with no live births
FulBe DjelgoBe	163	1.2	157	1.9
FulBe GaoBe	297	4.4	348	3.7
FulBe Liptaako	237	7.6	254	7.1
RiimaaiBe Liptaako	168	4.8	183	3.8
ALL	865	4.7	942	4.4
	$Chi^2 = 8.8$, $p<0.05$		Not significant at 5 per cent level	

Source: As Table 1.

differences are unclear, but it should be noted that it is difficult to distinguish primary sterility from early secondary sterility and that some of the sterility observed here may be acquired after the onset of sexual activity but before any live births.

There is substantial variation in age-specific sterility by ethnic subgroup (Figures 7 and 8). FulBe DjelgoBe have much lower sterility at all ages than the other FulBe populations. The levels of DjelgoBe sterility, particularly among the younger age groups of women, differ little from Burundi levels, which have been found to be the lowest of all African populations (Larsen 1994). RiimaaiBe Liptaako also have low levels of sterility among younger women, although there is a sharp rise in sterility among women over 35 in this ethnic subgroup. Sterility is highest overall among the FulBe GaoBe and the FulBe Liptaako.

As a method of assessing the impact of sterility on fertility, Larsen (1994) proposes comparing the actual fertility schedule with the fertility schedule under low-sterility conditions. The Hutterites of north America have the lowest measured sterility levels, but their pattern of fertility and sterility is not comparable with most African populations. For this reason, the reference population chosen is Burundi women, who have the lowest recorded sterility levels in sub-Saharan Africa (Larsen 1994). Hypothetical fertility rates under low (Burundi) sterility conditions are then estimated by multiplying Fulani age-specific marital fertility rates (ASMFRs) by proportions subsequently infertile in the corresponding age groups of Burundi women, divided by the proportions subsequently found infertile in the Fulani population. Dividing observed ASMFRs by these hypothetical ASMFRs (summed over all age

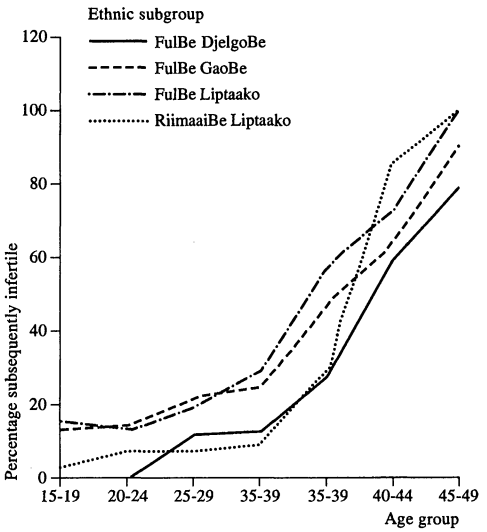

Figure 7: Proportions subsequently infertile of Fulani women by ethnic subgroup.
Source: As Figure 1.

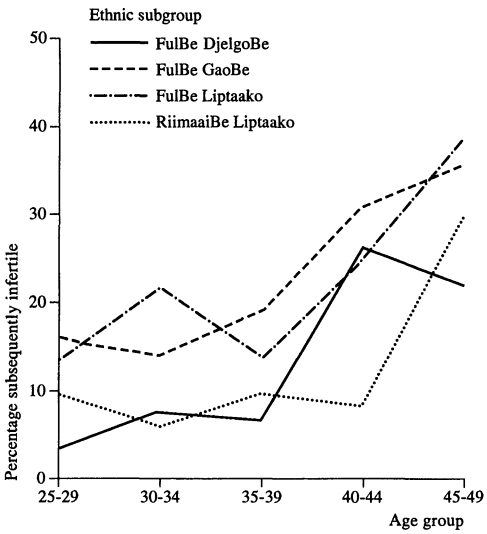

Figure 8: Proportions subsequently infertile of Fulani men by ethnic subgroup.
Source: As Figure 1.

groups) under low sterility conditions gives a value of C_{st}, the proportion of reduction in fertility arising from 'excess' sterility above the Burundi levels.

The impacts of sterility on Fulani fertility are shown in Table 11. Compared with the other proximate determinants, the effects of sterility (above the Burundi levels) on Fulani fertility are large. Moreover, the magnitude of the impacts varies substantially between the ethnic subgroups, in the right direction to explain fertility differentials. DjelgoBe fertility is relatively unaffected by sterility, while the impacts on the

Table 11. *Estimated impacts of sterility on Fulani fertility*

Ethnic subgroup	Total marital fertility (i)	Total marital fertility under Burundi sterility conditions (ii)	Impact on fertility C_{st} (i)/(ii)	N
FulBe DjelgoBe	10.66	11.38	0.94	302
FulBe GaoBe	7.44	9.02	0.82	570
FulBe Liptaako	6.07	7.90	0.77	395
RiimaaiBe Liptaako	6.95	9.51–7.04	0.73–0.99 (0.86)	299
ALL	7.19	8.60	0.84	1566

NOTE:
When the RiimaaiBe Liptaako age-specific marital fertility schedule is adjusted to Burundi sterility levels, expected total marital fertility increases to 9.51, an increase of nearly 50 per cent. However, this figure is misleading because of the unusual shape of the RiimaaiBe age-specific sterility curve. Except for the oldest age groups, levels of sterility among the RiimaaiBe are very low (Figure 7), and comparable even with the Burundi population. It is only among the over-40s that sterility rates become extremely high (above Burundi levels), but these exceptional rates might be artificially inflating the estimates given. If the calculation is repeated using only women below 40, the impact on RiimaaiBe fertility is negligible (total marital fertility rises to only 7.04, a 1 per cent increase). The reasons for this discrepancy are unclear. It could be simply a function of the small sample sizes used, but any over-reporting of age by older women could easily produce this result. The true impact of sterility on RiimaaiBe fertility almost certainly lies between these two estimates. In future tabulations, a mean C_{st} of 0.86 will be used.
Source: As Table 1.

fertility of the FulBe GaoBe and FulBe Liptaako are large: reducing sterility to Burundi levels would increase the average number of live births per woman by nearly two. (The impact on RiimaaiBe fertility is harder to assess and is probably intermediate).

Sterility levels are found to be higher among those populations engaging more in temporary rural to urban migration, and this has a depressing effect on fertility. Given what is known about the sexual behaviour of migrants and the prevalence of sexually transmitted diseases among prostitutes in destination areas (Bakaoun et al. 1991; Painter 1992; Anarfi 1993; Garenne et al. 1995), the supposition that the high levels of sterility among migrating groups are due to sexually transmitted diseases contracted is not unreasonable.

However, within each of the ethnic subgroups, there is no difference in sterility level between lifetime migrants and non-migrants. There are two possible explanations for this. One is that the observed sterility is unconnected with migration participation. This seems unlikely. A more plausible explanation is that, because of the high degree of marital fluidity and extra-marital and inter-marital sexual relations within populations, sexually transmitted diseases brought back by migrants spread rapidly through villages which send migrants, affecting individuals who have never migrated themselves and are not married to a migrant. Unfortunately, no clinical or epidemiological data are available to test this hypothesis.

Why the RiimaaiBe Liptaako should be much less affected by secondary sterility than the other migrating groups is also unclear. The apparent difference could simply be an artefact of the relatively small sample sizes. Certainly there were no obvious differences between RiimaaiBe and FulBe men in the extent of their reported unprotected sexual contacts on migration. Their lifetime migration rates are higher than the other groups, because they have been migrating for longer (most FulBe groups only began migrating to cities in the mid seventies). More research is needed to establish whether these differences are real and, if so, why they exist.

SUMMARY OF THE PROXIMATE DETERMINANTS OF FERTILITY AND THEIR IMPACTS

Table 12 presents a summary of the proximate determinants analysis of fertility, with the aim of testing the hypothesis that the fertility differences between the ethnic subgroups of Fulani in northern Burkina Faso can be attributed, at least in part, to differences in migration of young men to cities.

Of the proximate determinants, it is C_i, post-partum infecundity, that has the greatest overall impact on Fulani fertility, but there is little apparent variation between ethnic subgroups. Marriage exerts a relatively minor impact, and there is little variation between the subgroups owing to polygyny. It is sterility which shows the greatest variation between subgroups, and in the right direction to explain the observed fertility differences. While the evidence on the causes of sterility remains

Table 12. Summary of proximate determinants of fertility of Fulani women by ethnic subgroup

Ethnic subgroup	C_m	C_i	C_s	C_{st}	C_c	C_a	Product	Total fertility estimate	Calculated total fertility
FulBe DjelgoBe	0.92	0.57	0.98	0.94	1	1	0.48	9.2	7.3
FulBe GaoBe	0.88	0.58	0.95	0.82	1	1	0.40	6.3	6.1
FulBe Liptaako	0.94	0.58	0.91	0.77	1	1	0.38	6.4	5.8
RiimaaiBe Liptaako	0.90	0.57	0.94	0.86	1	1	0.41	7.1	6.2
ALL	0.90	0.57	0.95	0.84	1	1	0.41	6.6	6.2

NOTES:
Key to proximate determinants of fertility:
C_m: effects of marriage;
C_i: post-partum infecundity;
C_s: spousal separation;
C_{st}: sterility;
C_c: contraception;
C_a: induced abortion.
Values of C_{st} are calculated following the method described by Larsen (1994), using Burundi women's age-specific sterility schedule as a standard.
The product of the proximate determinants gives an estimate of the overall impact on fertility of all the proximate determinants considered. Strictly speaking, the values for sterility and spousal separation are not multiplicative, since they are not mutually exclusive (i.e. some proportion of sterile women may also be unmarried or separated from their husbands). However, because the impact of spousal separation on fertility is not very large, and because there is no known interaction between spousal separation and sterility, any discrepancy should be very small.
Estimates of total fertility refer to estimates made using the P/F method, accounting for under-reporting of girls (table 3).
Calculated total fertility values are made by multiplying values for Hutterite total fecundity by the products of the proximate determinants Bongaarts (1982).
Source: As Table 1.

circumstantial, it is highly likely to be closely connected with male labour migrants picking up sexually transmitted diseases through unprotected sexual contacts while away. Spousal separation also shows variation in the same direction as the fertility differences, but the size of the effect, and of the differences between groups, is too small to contribute much to an explanation of the fertility differentials.

Together, the differences in the proximate determinants explain much, but not all, of the fertility variation: the estimated fertility of the FulBe DjelgoBe is still substantially higher than that calculated using proximate determinants. It seems that the total fertility estimate for the FulBe DjelgoBe is inflated, probably as a result of the small sample sizes and random annual variability.

Nevertheless, it is clear from all the different data sources that the FulBe DjelgoBe **do** have higher fertility than any of the other groups, and a contributing factor is that DjelgoBe men do not engage much in seasonal labour migration to cities. The differences do not arise, as was predicted, from changes in ideas and values about the desirability of children and knowledge of and attitudes towards modern contraception. Nor do they arise through the undermining or changing of traditional practices of marriage, breastfeeding, and post-partum abstinence. There is some indication that this migration could be causing some changes to marriage patterns but, owing to the existence of polygyny, the impact of these on fertility, as yet, extremely limited. Instead, the fertility changes associated with temporary out-migration of young men arise non-volitionally, through secondary sterility, which is highly undesirable from the perspective of local ideals.

The data on fertility preferences fit Gould's (1994b) model well. The supports to high fertility among temporary migrants in this classic 'lagging region' are sustained, if not enhanced, by the migration. However, fertility preferences do not translate directly into fertility outcomes, and the actual effect of the migration is a lowering of total fertility.

Of course, the balance of these effects may shift with time. The Fulani have been migrating to cities from this area in significant numbers only for the last 25 years, and even during that time the numbers going have been increasing sharply. It could be that attitudes take longer than this to change and that, in the future, there may be more fertility changes attributable to volitional mechanisms.

In the meantime, the trends observed are worrying. The results from this study strongly suggest potentially serious risks to health associated

with temporary out-migration of men. The consequences of an increased prevalence of sexually transmitted diseases are potentially damaging in a number of different ways. Most immediately, there are the direct morbidity and mortality risks to migrants and their families from contracting sexually transmitted diseases. It is very likely that those who contract gonorrhoea and chlamydia are also exposed to HIV (cf. Garenne 1995). Secondly, there are important social consequences of sterility in this society where having children is a prerequisite to becoming a full social being. Where the status and security of women depend largely on their ability to produce children, the gender implications are serious. At the moment, the widespread institution of fostering and adoption buffers the problem of childlessness for many people, but if sterility became more widespread, it could become increasingly difficult to find children to adopt.

Thirdly, the economic consequences of sterility are potentially serious. Since the major droughts of the 1970s and 1980s dramatically increased the vulnerability of agropastoral livelihoods in the area, dry-season labour migration has been an important means of enabling people to maintain and increase the security of rural livelihoods. However, it has been shown elsewhere (Hampshire and Randall 1999) that in order to engage successfully in this sort of migration, it is necessary to have large families – both large households and good extended kin networks. If there is indeed an association between temporary out-migration of men and increased incidence of sexually transmitted diseases in the population, and particularly if it becomes more pronounced, the extensive kin networks upon which successful migration depends could become undermined. If sterility rates continue to rise, the economic security of future generations of migrants, as well as the health status of current ones, will be compromised.

Of course, it is far too early to predict whether, in Sahelian Burkina Faso, sterility rates will continue to rise or become large enough for speculations to become reality, but there are other places where the trend is already much further advanced. A good example is the Cameroon Fulani where, largely as a result of sexually transmitted diseases associated with young male migrants, sterility rates in some areas were over 50 per cent (David and Voas 1981). It is too early to say whether HIV will become the catastrophe in West Africa that it is in parts of East Africa, but the data available from Abidjan (Painter 1992; Garenne et al. 1995) suggest that it might already be posing a threat to some migrant communities.

NOTES

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[1] The following technique was used. Where the sex ratio exceeded 1.10, girls were added to reduce the ratio to this figure. This conservative sex ratio was chosen to avoid simply modifying the consequences of random fluctuations from small sample sizes. In fact, only FulBe Liptaako had systematically excessive sex ratios and only in this group did the adjustments alter fertility estimates.

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