A COMPARATIVE DEMOGRAPHIC STUDY OF THREE SAHELIAN POPULATIONS: MARRIAGE AND CHILD CARE AS INTERMEDIATE DETERMINANTS OF FERTILITY AND MORTALITY

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Thesis submitted for the examination for
Doctor of Philosophy degree, London School of
Hygiene and Tropical Medicine, University of London

April 1984

ABSTRACT

The literature on the demography of pastoral populations tends to consider pastoralism as an independent determinant of the levels and patterns of fertility and mortality. Despite a general lack of adequate data, there is a pre-occupation with the low fertility of pastoral populations.

Demographic data are presented for three Malian populations: sedentary Bambara cultivators and two Kel Tamasheq groups of nomadic pastoralists. These populations are compared and contrasted and internal social class differentials are examined. Bambara have higher fertility than the two pastoral populations and all three groups have different patterns of mortality. Child mortality levels vary significantly between Kel Tamasheq social classes.

An examination of the intermediate determinants of fertility identifies marriage as the most important differentiating factor. For mortality a similar approach is unable to identify any particular intermediate variable as the dominant determinant of the observed patterns. The principal mortality differentials occur, however, within the pastoral populations, where high status, rich social classes have higher child mortality than poor, low status ex-slaves.

Intensive, qualitative studies of marriage and social class variation show that although the pastoral Kel Tamasheq are demographically different from the Bambara, these differences are caused as much by socio-cultural factors as by economic ones. Kel Tamasheq kinship, household formation patterns and the importance of prestige and status mean that women may spend many of their childbearing years between marriages, either divorced or widowed. This contrasts with the Bambara pattern of continuous marriage maintained through low

divorce rates, polygyny and widow inheritance, where much status and wealth is acquired through having children.

The same socio-cultural factors create variation in Tamasheq child care patterns. Social constraints on high status mothers operate in the opposite direction from economic constraints, producing unexpected patterns of social class mortality differentials.

The study concludes that nomadic pastoralists are not demographically different from cultivating populations because of their production system. To understand why the observed differences do occur, intensive qualitative studies are needed to supplement and explain the quantitative data.

Acknowledgements

First I would like to thank Allan Hill who supervised me and supported me throughout the research programme both in Mali and in London, and without whom I would have never finished this thesis.

I thank also:

- Jeremy Swift, whose ideas generated the whole Malian demographic programme and all the other staff and researchers of ILCA Mali, both in Bamako and Niono, for their support, help and advice throughout the surveys.
- The Bureau Central de Recensement in Bamako; in particular M. Balla Diallo for his help and encouragement, and M. Hamidou Toure for his help during the Bambara survey.
- All the Malian administrators in the areas where we worked, who provided us with the introductions, advice, information and guides, all of which were essential for doing the surveys.
- The teams of interviewers who worked very hard under tough and uncomfortable conditions, and also Baba Ahmed who was my interpreter during my stay in the Tamasheq camps.
- Mike Winter, Duncan Fulton and Camilla Toulmin whose comments, advice and detailed knowledge about their villages and camps were invaluable both in undertaking the surveys and interpreting the results.
- The other PhD students and staff at the Centre for Population Studies for their help and support; particularly Colin Newell and Ian Timaeus for all their hours spent helping me fight the computer, and Rona for her sympathy.

The Social Science Research Council gave me a three year studentship which enabled me to do these studies. Much of the research was supported by an award under the Population Council's International Research Awards Program on the Determinants of Fertility. The Awards program is supported by USAID funding to the Population Council. Some of the survey fieldwork was financed and supported by ILCA as part of their Malian socio-economic research programme.

Finally I thank all the people from the Bambara villages and Tamasheq camps who received us, offered hospitality and answered all our questions; with special thanks to Hodda, Bintou, Sama, Waddey and Hati.

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Introduction

This thesis developed out of a demand by the International Livestock Centre for Africa (ILCA) for demographic data on several pastoral and agro-pastoral communities in Mali. The Centre for Population Studies at the London School of Hygiene and Tropical Medicine was approached for advice on collection and analysis of these data, and I became a member of the team which undertook the surveys in Mali in 1981 and 1982.

The original aims of the surveys were to measure the fertility and mortality of communities with different production systems, for whom data on labour, budgets and nutrition were also being gathered. Two of the communities studied are pastoral nomads, a category of populations about whose demography little is known and for whom few reliable data exist. Thus, the measurement of their demographic parameters was, in itself, one aim of the project.

Beyond this, I wanted to compare the demography of the pastoral nomads with that of the sedentary cultivators, to try and understand how and why the similarities and differences between them existed, and to challenge the premise that the production system (pastoral or agricultural) was the prime determinant of their demography.

This involved two further studies; an analysis of some of the intermediate determinants of fertility and mortality, followed up by intensive qualitative research on two aspects of these, for which the quantitative data provided inadequate information.

The structure of the thesis follows these three themes, for each of which the theoretical background and justifications are presented in Chapter 1. Chapter 2 provides a summary description of the three populations studied. Chapters 3 to 6 describe the methodology and results of the demographic surveys. These results are brought together and compared in Chapter 7 from which emerges the need for an examination of the determinants of both fertility and mortality. These are considered separately. Chapters 8, 9 and 10 deal with fertility, moving from quantitative measures of the intermediate determinants through to a qualitative description of the most important of these, marriage. From this perspective it is shown that, although the quantitative measures indicate where each populations' marriage patterns differ, and how this affects fertility, only the intensive, qualitative study can show how and why these marriage patterns are maintained, and what are the important cultural values which determine them. Chapters 11 to 14 treat mortality in the same way, moving from the intermediate determinants framework, through a quantitative exploration of some factors which may be important in determining the levels of mortality, namely, patterns of infant and child mortality, and seasonal variation. In each case, the data available for these populations are considered in relation to detailed long itudinal studies from elsewhere in West Africa. This detailed examination is, however, unable to explain certain of the mortality differentials within the populations. Chapter 14 shows how, for mortality, intensive studies and observations of peoples' day to day behaviour, social relationships and values, are able to elucidate otherwise anomalous and inexplicable results.

The thesis shows overall, how quantitative data about different types of populations can be explored and compared using the frameworks of intermediate determinants of fertility and mortality. These only identify through which means socio-economic factors affect the demographic parameters; they do not indicate how they do so nor the socio-cultural factors which determine why certain populations at the same level of technological development may manifest different levels and patterns of fertility and mortality. To answer this, intensive studies, dependent on anthropological methods have been used. The questions asked were whether pastoral populations are demographically different from non-pastoralists; if so, how are these differences achieved and maintained, and are they dependent on economic determinism alone or also on specific social and cultural factors?

CHAPTER 1 - THEORETICAL BACKGROUND

Theories of pastoral demography

Malthusian approaches to the demography of pastoral populations are rife, possibly because of the appeal and apparent ease of linking human to animal heads and dividing one by the other. Physical limitations on herd reproduction, as compared with agricultural expansion for example, provide a ready made positive check on population growth in terms of food supply, if one ignores flexibility at the household level, or the solution of migration.

Two major preoccupations in the study of pastoral populations and of the relation between demography and constraints on population growth, have been the environment and the household. The environmental approach argues that pastoral populations expand until the environment reaches saturation point (de Planhol 1979) and the population can no longer reproduce the current model of society. Carrying capacity of the land and physical boundaries set the limits, and once they are exceeded, either migration, social change or physical expansion must follow (Legesse 1973). The prosperity of the pastoralist is seen to be dependent on the maintenance of the habitat's productivity (Monod 1975). For environmentalists, the global pastoralist strategy must be a balance between environment, animal heads and human heads, but their analyses do not take into account the relationship between the individual pastoralist and his livestock. This relationship is taken up in the household approach which operates from the micro to the macro level demographically, and outlines a strategy of balance between household size and the herd (Dahl 1979, Stenning 1958). Ecology enters into this argument in that a large family with a large herd is less vulnerable to environmental hazards than a small family with a small herd.

In the same way that purely ecological definitions and explanations of nomadism itself are inadequate (Bourgeot 1979, Dyson-Hudson 1972) so too for demographic characteristics, ecology and the environment offer only a very partial picture. The ecological arguments which presuppose Malthusian type checks on pastoral populations are inconsistent with the flourishing belief in the low fertility of nomadic pastoralists. It is this low fertility which is more frequently cited as the cause for low growth rates in pastoral populations rather than high mortality (Gallais 1975, Swift 1975, Bernus 1981). Gallais for example, on the pastoral Peul of the inner Niger Delta says that they are "comme ceux de la plupart des autres régions de l'Afrique de l'Ouest, très médiocrement expansifs" and he relates this to their fertility.[1]

The household level approach to the demography of nomadic pastoralists does provide a forum for some coherent theories about why pastoralists' fertility should be low, in terms of the need for a balance between human and animal populations. However, this attractive theory becomes unrealistic at the level of behaviour determined largely by chance factors and variation. Simulations can show that certain pre-inheritance systems, herd growth rates and levels of human fertility and mortality will provide a young man aged 25 with a herd sufficient for marriage payments and creation of a new household, but these factors only operate at the population level. They are completely invalid at the household level where decisions are made, and they bear no resemblance to micro-level reality. Anyway, fertility control or changes in fertility are mechanisms too slow to respond to immediate crises either at the population or the household level. Social responses, such as institutionalised lending of animals (Maliki 1981), or migration are far more effective ways of surmounting crises. Spencer (1973) shows how the Rendille population which, at the household level, suffers from the low herd growth rate of camels, reacts with socially acceptable out-migration and cultural absorption into the neighbouring Samburu, whose cattle economy is less restricted in terms of physical increase in numbers. This individual level solution to demographic pressures is supplemented by cultural practices such as monogamy and infanticide.

The various intermediate variables cited as the principal factors behind the presumed lower fertility of pastoral nomads can be

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1. There is strong evidence now (Hill et al. 1983) that, in fact, this population suffers from very high levels of child mortality, although the obvious wealth of the population precludes an interpretation of this mortality in terms of Malthusian checks. It seems rather, that in this particular case, there are some very specific environmental problems.

fitted into both the environmentalist and household approaches. For example, in Sudan, marriage patterns explain about half of the nomad-sedentary groups' fertility differences (Henin 1968, 1969); and for the Twareg, Swift (1981) considers that marriage patterns may be an important component of low fertility through late age at first marriage. Marriage is a socially controlled institution and is crucial at the household level, not only for the creation of new households but also for the procreation of the future generations. It is possible to envisage household level adaptations of the marriage pattern in response to the household's demographic and economic situation, particularly through control of bridewealth. This microlevel approach differs from that of the environmentalists for whom responses to demographic constraints operate in terms of change at the societal level as in Legesse's Borana system.[2]

Breastfeeding is another intermediate variable cited by Henin as being a cause of lower nomad fertility. Yet, not even a micro-level household approach would consider breastfeeding a conscious act of fertility control aimed at balancing the population and resources. It is for feeding children with fertility reducing side effects. An environmentalist might say that at the population saturation point, a lack of food would mean that mothers would breastfeed longer and more intensely, and have longer birth intervals thus reducing population growth rates. But worldwide evidence suggests that breastfeeding duration tends to be culture specific rather than economy and wealth specific.

Other biological mechanisms cited in low nomad fertility are sterility and spontaneous abortion. Both at the folk and research levels, African nomads are frequently said to have high levels of syphilis

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2. Legesse (1973) claims that the complex Borana age-grade system was adopted as a result of a huge population explosion in Ethiopia in the sixteenth century. The system ensured territorial expansion through institutionalised wars and raids, at the same time as population growth control through substantial restrictions on male marriage, as well as the practice of selective infanticide. Not only are there problems in accepting some of the reasoning behind Legesse's analysis, but it is difficult to imagine the practical imposition of such a stringent population policy which must have been very unacceptable at the household level. Even today "the Borana woman wants children more than anything in the world and yet many demographic and institutional limitations prevent her from having as many children as she would like."

leading to their sterility and low fertility (UN, 1960-76; Henin 1969) although few medical studies have been undertaken amongst pastoral populations.[3] Similarly, pastoral nomadic populations have been said to have high levels of intra-uterine mortality, variously cited as due to malnutrition, migration on camels (Henin op. cit.) or venereal diseases. There is no medical evidence to confirm either of these hypotheses, nor is there any sound reason to link either venereal diseases or intra-uterine mortality particularly to a pastoral nomadic way of life. The folk perception of nomads as disease ridden is more of a general statement about the ideological distance between the nomadic and sedentary populations, where each lacks understanding and experience of the other, and thus fears and condemns them.

The ideas and theories outlined above all stem from the belief that pastoral populations have low fertility, although throughout there is a lack of sharp evidence and data to confirm the points being made. This permits the opposite point of view to be taken as well. De Planhol's classification of nomadic pastoral societies into saturated and non-saturated places most African pastoral groups in the latter category. He alone considers that pastoral populations may have had high fertility and growth rates when he says that "la croissance démographique des sociétés nomades semble bien avoir été forte dans la situation sanitaire traditionelle" (1979 p. 31) particularly for non-saturated groups who have yet to fill their environment. Although the evidence for lower pastoral fertility is scarce, data to back up de Planhol's statements of high fertility are non-existent.

It is pertinent to mention one other aspect of attitudes to pastoral demography, particularly as related to Sahelian pastoralists. For the Sahel, there is a pre-occupation with demographic problems: population pressure, aggravation of environmental problems, degradation of pastures, desertification due to the excess burden of increasing

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3. Studies have been undertaken amongst sedentary groups in Upper Volta which showed a high incidence of gonorrhoea to be linked with low fertility and high rates of sterility (Armagnac & Retel-Laurentin 1981)

herds along with the human population, conflict between pastoral and sedentary populations (see for example, Gallais and Swift in Monod 1975). Yet many of the authors preoccupied with these ideas are the same ones who cite the low, or even negative growth rates of the populations concerned.[4] To be sure, there is a tendency towards increased pressure on land because of the expansion of cultivating populations, but the rapid demographic expansion of the pastoral populations themselves is also perceived as a major cause of Sahelian population-environment problems by Frantz (1975), Monod and others; this is inconsistent with their assumptions of low fertility and growth rates.

Thus we see that neither is there a comprehensive body of data on the demography of pastoral nomads, nor a coherent set of theories relating their demography to their economy, environment and socio-cultural systems. Should we even expect such a theory to exist when it has been shown that not only is there no homogenous category of "nomadic pastoralists" (Dyson Hudson, Monod op. cit.), but also, for all other populations the determinants of fertility and mortality have proved to be very complex?

Intermediate determinants of fertility and mortality

Attempts to disentangle conceptually the cause and effect mechanisms of mortality and fertility patterns and levels, (Davis and Blake, 1956) and to link the environmental and socio-economic determinants with the emerging demographic numbers, led to Bongaarts' development of a framework for the analysis of fertility determinants (Bongaarts 1978). He demonstrates that fertility can only be determined by socio-economic variables operating through (quantifiable) biological factors, and that one can measure the different importance of each of these biological factors in reducing total fertility from its technical biological maximum to the observed level. At the same time the complexity of the socio-economic components becomes

4. Often expressed in uncorrected crude birth rates using data obtained from large scale sample surveys where it is very likely that the well-founded mistrust felt by the pastoral populations led them to underestimate and deliberately omit children. The other data source for growth rates of pastoral populations are the administrative and tax records which are nowhere famed for their accuracy.

more apparent, because not only can different combinations of intermediate factors produce the same total fertility rates, but each of the socio-economic and environmental determinants can shift the effect of the intermediate factors in one way or another.

For mortality a similar framework has been proposed (Mosley 1980). Here the complexity of the relationships means that the socio-economic factors operate at each stage of the process between 'exposure' and the mortality outcome. Thus a simple, exhaustive list of quantifiable intermediate variables is much harder to define. The outcome of the whole process is either death or continued life; the intervening stage is morbidity, determined by three pathological processes (direct variables): infection, accidents and malnutrition. These are not themselves independent, the synergy between malnutrition and infection being well documented. Susceptibility and exposure are the two intermediate variables through which socio-economic variables operate, and they may operate either dependently or independently. With suitable data, the direct variables on which these intermediate variables operate can be measured using incidence and prevalence rates, but the individual effect of each intermediate factor can only be determined qualitatively. Even measurements of the pathological processes are unable to demonstrate completely the contribution of, say, malnutrition to mortality, because of (a) the synergy between the processes and (b) the effect of therapeutic interventions at the morbidity stage.

Use of these approaches, which encapsulate fertility and mortality in a linked system progressing from the large scale environment and social system through individual relationships and biological processes to birth and death, enables us to isolate some particular factors relevant to different populations without getting bogged down in the general morass of economic, environmental, micro and macro level determinants. We can begin to isolate important components of demographic variation for separate populations and then follow these up with more intensive studies of the actual processes of demographic determination.

Quantitative and qualitative data

The nature of demographic measures, which are population based, means that large scale, qualitative data collection techniques must be used. Numerical data collected this way, through questionnaires, suffer from two major limitations; the first, an aspect of all questionnaire based surveys, is that the questions to be asked are selected before the research is done, whilst important aspects of the system are still unknown. Secondly, in the case of a single-round survey, the picture produced is largely a static one and the dynamics of the system are ignored. Although statistical analyses may indicate possible links between components of the system, they have only a limited ability to move from the level of day to day behaviour to population measures. Use of survey techniques and questionnaires for anything other than simple quantifiable facts poses a series of problems.

The objectivity of questionnaires is supposedly one of their advantages, yet even this may be in doubt. The fact that certain questions are included in a questionnaire presupposes the importance of answers to them. In the case where the questionnaire designer has little knowledge of the population to be studied, crucial factors may be omitted simply because the researcher cannot envisage them as important within his own preconceived ideas and previous experience. Questionnaires are often unable to cope adequately with exceptions and extremes, yet it is often these which are the key to important aspects of the system. Simple demographic questions such as age and sex are relatively unambiguous, but in the field of marriage and divorce, culturally-specific definitions may confuse the issues.

Moving from the relatively simple, objective demographic questions towards collecting data on ideas, perceptions and reasons for actions, the responses tend to reflect the accepted social norms rather than being factual accounts of events. Culture-specific taboos which affect even the responses to simple demographic questions, tend to complicate matters much more when the topics investigated become more complex.

There are three levels to the perception of any particular action and how it is reported:

(i) what an individual thinks ought to happen
(ii) what he/she thinks did happen
(iii) what actually happened.

In a questionnaire based study, responses (i) and (ii) are the most frequent, and it takes more intensive and persistent research to piece together the third component. In the case of demography, we need to know people's perception of the population level factors, of their roles and power in these matters, and also the individual level of behaviour and events that eventually constitute the demography of the group, to understand why certain patterns emerge and how they are maintained.

The ideal tool for this type of study is participant observation, which, combined with a series of flexible in-depth interviews, can provide information on the norms, as well as data on actual events and the reactions to them. Participant observation also creates a forum for observing how different aspects of behaviour are interlinked, particularly in situations which are far removed from the observer's personal experience; for example, a Western observer's position vis à vis slaves and their owners.

An argument often launched against participant observation and intensive studies is their lack of objectivity. This encompasses the observer's personal relationships with the observed, and his or her own biases, as well as the fact that an intensive study can only cover a very small population. The latter is offset by the flexibility of the method. Interviews and observations of people of various ages, sex, positions of power and so on, lead to an awareness of repeated patterns of behaviour as well as individual variation. The emergent pattern of images of a single event or form of behaviour cannot be obtained through a questionnaire. Through day to day observation of behaviour and relationships, dominant values can be identified which may never have been envisaged by a researcher limited to an analysis of the numerical patterns.

In this project, the scope of the intensive research was limited to factors related to the anomalies and questions arising out of previous quantitative analysis. The demographic anomalies became less enigmatic once the everyday behaviour within the cultural framework was considered; at the same time it became possible to identify where and how social and cultural factors were involved in the demographic processes and where economic determinants were more important. This was relevant in the consideration of whether there is a particular form of "pastoral demography" with fertility and mortality levels and patterns largely determined by economic constraints.

CHAPTER 2 - THE POPULATIONS STUDIED

Bambara

The Bambara are one of the major ethnic groups in Mali in terms of population, and although many are educated and working in the modern sector, the vast majority are still traditional dry-land millet farmers living throughout central and southern Mali. Their villages are compact and surrounded by permanent fields; with other, more temporary, fields cultivated further out in the bush. Millet is the main crop although sorghum is also grown, and individuals may have small plots of tomatoes, groundnuts and chillies. Ox-drawn ploughs were introduced about 40 years ago and recently many families have started to build up cattle herds, a process which began in the last century. Despite these herds, and goats and chickens, the Bambara are primarily agriculturalists.

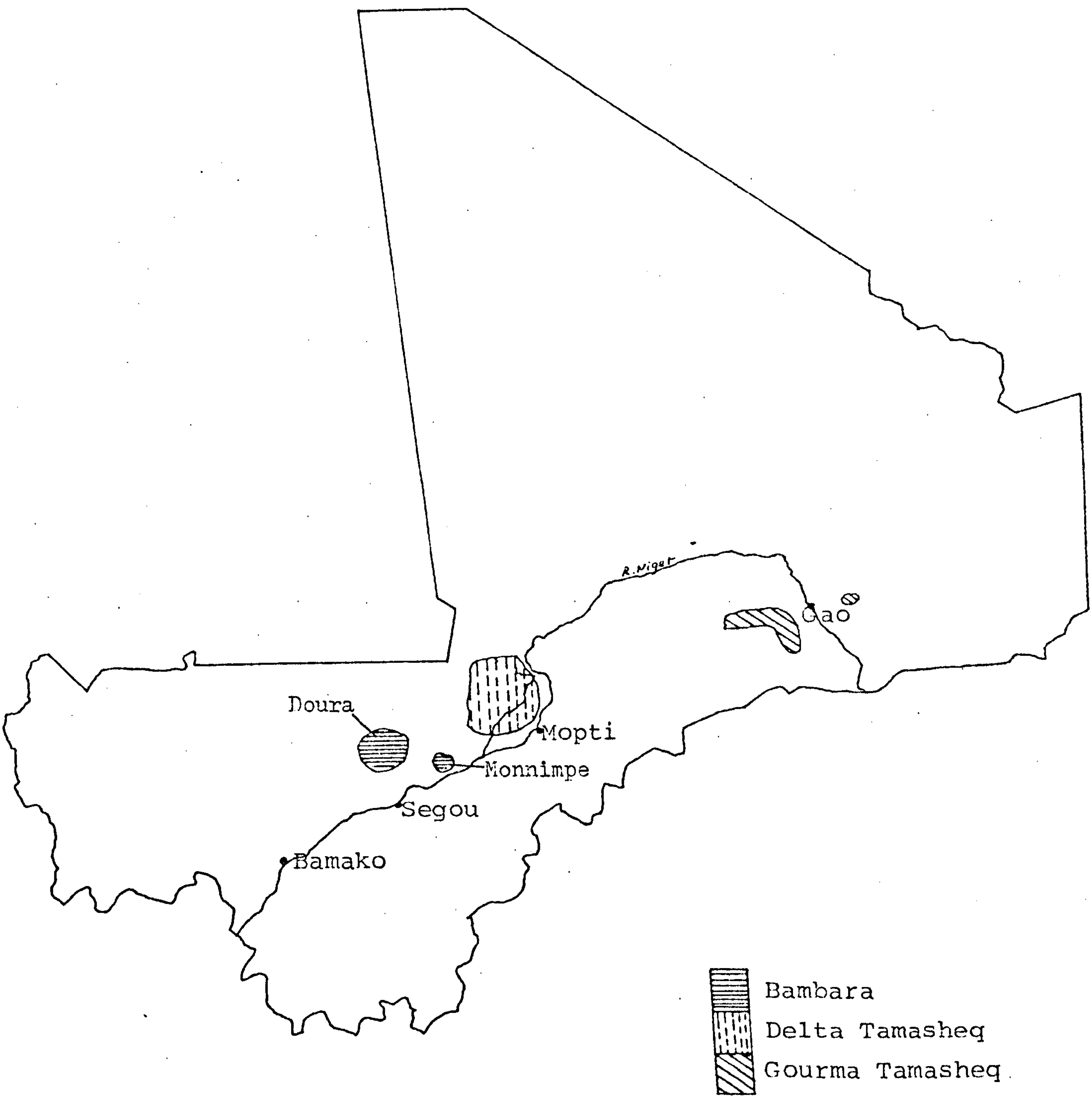
Some Bambara are Muslim and some villages have mosques, whereas others retain the traditional animist religion. In many cases Islam is only a very shallow veneer. Villages consist of members of one or more exogamous patrilineages with the basic unit of organisation being the _gwa_, a patrilineally related group of men (usually a man with his sons or a group of brothers) with their wives and children who cultivate, live and eat together. The senior man in each _gwa_, the _gwatigi_, was interviewed for the demographic survey. _Gwa_ range in size from two or three people up to about a hundred (survey average was 14) although very large units are rare as they usually break up into smaller _gwa_. The larger _gwa_ tend to be the more economically viable and successful (Fulton & Toulmin 1982) although there is much fluctuation even on an annual basis. Despite the existence of both rich and poor households, in general, Bambara society is very egalitarian with various strategies for diminishing economic differentials. There is no strong social differentiation although families of former slaves are still identified as such on certain occasions. Communal labour and loans do much to reduce variability and overall the impression is one of homogeneity. It was impossible to identify any simple socio-economic factors for differentiating households within the sample for which measures could be collected in a single round survey.

In order to be able to stratify the sample in some way, two different areas were enumerated. The first covered most of the villages in the arrondissement of Doura in the cercle of Niono, (see Figure 2.1), and included three villages under intensive socio-economic study (two of which were later the subjects of a nutrition and morbidity survey). Villages close to the Office du Niger irrigation scheme were omitted from the survey because we wanted to limit ourselves to areas predominantly dependent on dry-land millet farming with no daily labour in any of the Office du Niger fields or factories. Most of Doura is rather isolated, marginal in that it is at the edge of the rainfall zone where dryland millet farming is a viable proposition, and virtually untouched by any medical or educational services. A small primary school and almost defunct dispensary in one large village, Sagala-ba, were used by few people outside the village itself. In the dry season many young men and some women go off to the cities to work as migrant labourers for money to pay taxes and marriage expenses, and also to alleviate strains on limited food resources within the household (Martin 1983). Although this labour is purely seasonal with everybody returning by the beginning of the cultivation season, it has the effect of increasing contact with the modern world, and developing awareness of how to manipulate the services found there.

The second area enumerated included all the villages in the grid square 05°40'W, 14°10'N in Monnimpe arrondissement in the cercle of Ke Macina. These villages were selected because they are dry-land millet farmers but are closer to the whole Office du Niger scheme than Doura, although there are still no day labourers on the scheme. The area is apparently less marginal than Doura in terms of rainfall and the villagers said that they hardly suffered during the 1973-4 Sahel Drought. Their diet is more varied than that of the Doura villagers. Some rice is eaten; this is obtained through the exchanges of millet for rice with Office du Niger cultivators. They also eat meat more often than do Doura people.[1] There is more contact with outside services, and cars and bush

1. This observation was made by all the interviewers.

FIGURE 2.1 MAP OF MALI SHOWING LOCATION OF THE POPULATIONS SURVEYED



taxis operating between Niono and Ke Macina regularly pass through many of the villages. The arrondissement chef-lieu, Monnimpebougou, has a dispensary, a school and a water pump as well as several shops and a big weekly market. Although this village was not included in the survey, it is only about three kilometres from a large village, Markala, and several Markala children went to the school. Differences between the two areas should not be over emphasised however, as they are not important in terms of way of life, only in the details. Nevertheless, as will be seen from the demographic profiles presented below, there were quite significant demographic differences by area, which may be important in identifying the processes leading to change.

Kel Tamasheq

The Tamasheq surveys covered two areas in Mali: the inner Niger Delta where several thousand Kel Tamasheq spend the hot season, and the Gourma, which is the area south of the Niger bend (see figure 2.1). The Gourma survey concentrated on those people who live away from the river and to the east of Gossi. Although both samples were of Tamasheq speaking pastoral nomads, some important differences between them must be outlined.

Malian Kel Tamasheq form part of a larger ethnic group commonly called Twareg, who live across the northern Sahel from Mali to Niger, and to the north in the Hoggar in Algeria, with a few to the south in Upper Volta and Nigeria. I will refer to this whole ethnic group as Twareg, but the immense diversity in social customs and behaviour means that it is desirable to distinguish one sub-group from another. The particular dialect of their language spoken in Mali is called Tamasheq, and the people refer to themselves as Kel Tamasheq (the people of (who speak) Tamasheq) so the two samples will be referred to as Delta Tamasheq and Gourma Tamasheq.

One of the most notable features of Twareg society is its class system, which varies in detail from area to area. Everywhere, each class is basically endogamous, though it appears from the literature that the degree of endogamy varies quite substantially. In the two areas surveyed, class endogamy is a firmly adhered to principle.

Other important aspects of Twareg society and life are mobility and fluidity. Groups and individuals are physically mobile, which is essential in an environment where both pasture and water are both variable and impermanent. Actual camp composition changes frequently and there are few fixed units. Gallais says of the Gourma Tamasheq:

> "Mais si le schéma de l'organisation est assez stable, il est traversé par une grande mobilité personnelle. Fractions et tribus sont en fait des groupements contigents, sans cesse remis en question par des fissons ou des réunions d'opportunité".
> (1975, p.47)

Despite this fluidity the ideological perception of society with rigid class boundaries is maintained.

Most Twareg are, or were originally, pastoralists, and the Malian Kel Tamasheq herd cattle, goats, sheeps and camels, and they rarely cultivate. Their diet is mainly milk, grain and some meat. Grain is either gathered wild or purchased from markets or villages out of the proceeds from selling stock. Limitations of pasture, and more particularly, of water, mean that physical mobility is essential to effectively use pastoralism to exploit the environment; Kel Tamasheq live in tents made of leather or straw mats that can easily be packed up and moved. In the long, hot, dry season water is the principal problem, and mobility is reduced to the limited availability of water points which are frequently long distances (up to fifteen kilometres) from the camp. This is the season of hardship when animals produce little milk, and both watering them and finding pasture is very hard work.

Delta Tamasheq

The Delta Tamasheq spend the hot and cold season in the inner Niger delta, a plain with an annual flood, whose extent depends on rainfall towards the source of the Niger river, in the Fouta Djallon of Guinea. This flood retreats gradually leaving good animal pastures (the bourgoutières) and permitting rice cultivation. The area is densely populated, relative to the rest of Mali, principally by Fulani agro-paturalists and Bozo fishermen (see Gallais 1968). Many other groups bring their cattle into the Delta in the dry season to benefit from the pastures. The Kel Tamasheq first came into the zone around 1913, and now several thousand enter the Delta each year. Increasing pressure on pasture because of ever-increasing numbers of cattle entering the area, along with expansion of areas being cultivated, added to the traditional land tenure and rights system, mean that there are more and more conflicts between the Fulani and the Kel Tamasheq (and other newcomers).

Delta Tamasheq are unusual amongst Twareg, and other Sahelian pastoralists in general, in that they do not get their dry season water from wells, since standing water remaining from the previous year's flood is generally available throughout the dry season. This means that they are not subject to increased labour demands for watering animals during the hot season. However, as drinking water has often been standing for nine or ten months, there is an increased probability of water-borne disease and infection, particularly as both animals and humans drink water from the same pools and marshes, which are often the same pools used for bathing in. It is highly likely that this environmental factor will affect the demographic patterns in the community, particularly with regard to child mortality.

Five different social classes can be distinguished in the Delta, although only two are present in any great numbers:

Imushar are the traditional Twareg warriors and nobles par excellence. In the past they were the political chiefs and led raiding parties and fights against other groups and villages to capture slaves and booty. In Mali these raids had effectively ceased by the 1930s and nowadays the imushar are cattle owners and herders like everyone else, although they retain their high status and prestige.

The few _imushar_ in the Delta are from the Tengeregif confederation and originate from Tombouctou.

Inesleman are the religious practitioners. In Tamasheq, the word _inesleman_ means Muslim, so effectively all Twareg are _inesleman_, but it is also used to refer to the class who provide the maraboutic (religious) specialists including certain individuals learned in Arabic and the Quran (_alfaqi_ s.). Although _inesleman_ are all practising Muslims not everyone goes to Quranic school. _Inesleman_ and _imushar_ traditionally had complementary roles as the latter, with their vassals, used to go on raiding parties for which they needed religious protection in the form of charms or 'grigris' which were provided by the _inesleman_. In return the _inesleman_ received slaves and booty acquired from the raids.

Imghad were traditionally the vassals of the _imushar_, herded the _imushar_'s animals for them and provided man-power for the raids. Nowadays there are few differences between Delta _imghad_ and _inesleman_ as both herd cattle and goats, both still have access to an ex-slave labour force and frequently they live in the same camps. Some _imghad_ are obviously poorer than many _inesleman_ in terms of both cattles and slaves, but this is partially an accident of history resulting from the liberation of slaves about twenty-five years ago when some _imghad_ slaves left their camps taking many of the cattle with them. These cattle were later awarded to them by the courts. Other _imghad_ families are indistinguishable from _inesleman_ families in terms of wealth. However there are subtle differences in the behaviour of the two classes regarding bridewealth and marriage behaviour. In general the _imghad_ are more flexible and adaptable to changing physical and economic conditions than _inesleman_ and _imghad_ women are more active than _inesleman_ women. This may be largely due to the fact that a higher proportion of _imghad_ slaves quit the camps at Independence (1960), thus obliging the _imghad_ women to work.

Inhaden are the blacksmiths and artisans and both men and women are skilled craftspeople with wood and metal (men) and leather (women). Between them they make most of the items needed by the camp; bowls, beds, cushions, bags, mortars, pestles, mats, knives, swords, and saddles. Essentially blacksmith husbands and wives have the complementary skills necessary for a viable unit to provide for a camp's needs. Blacksmiths are traditionally linked to a family from one of the above three social classes with whom they camp for much of the year, for whom they make things (for which they are paid) and from whom they receive milk. Apart from baggage animals, blacksmiths do not generally own cattle themselves, although some do have herds of goats. Rather than being pastoralists themselves, they are craftsmen dependent on pastoralists, and they sell their crafts not only to those with whom they camp but also in the markets.

Iklan (Bella) are the slaves traditionally owned and kept by _imushar_, _inesleman_ and _imghad_. Today's Bella are descended from women and children captured from villages in raids. At Mali's independence (1960) slavery was officially abolished and in the colonial years prior to that date there had been a gradual liberation of slaves. Despite all this, there remains a large number of dependent Bella today, who live with their traditional owners and work for them for their keep and very little payment. Other Bella live independently with their own herds of goats and cows, and a third group live in separate camps but are still linked to their owners and herd their owners' cattle. Bella have very low status, nobles still refer to them as possessions (_taklitin_ = _my_ Bella girl) in a similar way to animals; the owner of a Bella woman also owns her children. Although the proportion of independent Bella in Tamasheq society is increasing, the demographic data are presented here for all Bella, dependent and independent together, although most of the qualitative data is for dependent Bella only.

Apart from this five-fold endogamous class system, other groupings and classifications are important for understanding the principles of Twareg society. Firstly there is a division into _illelan_ and _iklan_. _Illelan_ are "free" Twareg and include all of the first four classes outlined above, whereas _iklan_ are "unfree" or captives. Although blacksmiths are _illelan_, for the purposes of the demographic analysis they have been included with the _iklan_ for several reasons. Blacksmiths have much lower status than the other _illelan_ classes and do not own slaves. Behaviourally they resemble iklan more than the other illelan, blacksmith men and women work all the time, women prepare their own food, fetch their own water and look after their own children. Physically they are closer to iklan, being of negroid origin rather than fair-skinned Berbers. Ideally, a thorough demographic analysis should examine each of the five classes separately, but the numbers of imushar, imghad, and inhaden enumerated are too small. Thus the sample has been divided into two roughly homogenous and equal halves, of which the imushar, imghad and inesleman combined will be called 'nobles', and inhaden and iklan combined will be called Bella.

A second system of Kel Tamasheq social organisation, which is not appropriate for demographic analysis, is that of confederations and fractions. The Twareg world is split into confederations or 'drum-groups' which are primarily political groupings and can be summoned at time of war or crisis by a drum which is held by one sub-group of the confederation. Confederations are made up of several different fractions or lineages (towsit s.) of various social classes. In Mali these fractions are used as administrative units for the collection of taxes by the government and were also used as such by the French in colonial times. The chef de fraction is responsible each year for acquiring the total sum for which his fraction has been assessed. The main confederations represented in the Delta are the Kel Antassar and Sherifen and the majority of inesleman there belong to these groups. The imushar and imghad minorities are mainly from the Tengeregif confederation. Kel Antassar are rather unusual in that traditionally they were socially in-between the imushar warriors and the inesleman marabouts and are said to be descended from Arabs from Medina. Nowadays they are all cattle herders, although many Kel Antassar are involved in cattle trading, whilst there are also religious specialists. There are various Kel Antassar fractions in the Delta, all supposedly related to one another. Although most marriages are within fractions, there are no bars to inter-fraction marriages where individuals are of the same class.

Gourma Tamasheq

For the Gourma survey about 600 individuals were enumerated in the Haussa, the area east of Gao[2] on the left bank of the Niger river, but the people were from the same fractions and social classes as found in the Gourma (on the right bank). The camps in the Haussa tend to be smaller (mean 20 individuals) than the Gourma camps (mean 38) and more scattered, partly as a result of a very poor rainy season the year before the survey, but there is no evidence that in any other way they differ from the Gourma. In both areas dry season water is obtained from well systems, whereby many small wells are dug annually in dried up lake-beds, where the lakes actually appear in the wet season. During the survey we tried to cover all the camps around one well system before moving onto the next set of wells. Six major systems[3] were covered in this way and also some of the camps around Gossi lake.

Class

Some of the Gourma social classes are the same as in the Delta but in other aspects the populations differ. In the Gourma there is a very small minority of high status imushar but in general the high status (and rich) groups are imghad who have essentially taken over the traditional role of the imushar. Gourma inesleman tend to be far more learned in Islam that the Kel Antassar from the Delta, and many of them are Keles Souk marabouts, a group of very powerful religious fractions. Not many of this group were included in the survey, partly because of problems interviewing them, particularly their secluded women, but also because we wanted to interview a large proportion of imghad. Gourma imghad are unique amongst Twareg, in that they have built themselves into a rich and powerful position resembling the traditional role of the imushar. Also, certain imghad fractions have a matrilineal inheritance system which is totally different from the patrilineal Delta Tamasheq, and also from the other classes and fractions

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2. This was because a fuel crisis in Gao meant that we could not go as far as the Gourma for our first trip out!

3. Doro, Doghey, In Tillit, Mersi, Tin tahejeren and Adjura

in the Gourma. We aimed to include as many of these matrilineal imghad as possible in the survey to see if the different inheritance system was associated with different demographic patterns. In the analysis however, small numbers meant that imghad could not be treated separately from other Gourma nobles; nevertheless, in this category it is the matrilineal imghad who dominate.

There is a group of lower status illelan groups in the Gourma, not found in the Delta, who are the descendants of freed slaves and hybrid groups from several generations back. Generally these groups have few Bella of their own, and are rather poorer than the imghad and Kel es Souk, although they are not really a homogenous category. Included in this group, which, for the demographic analysis is called 'low-status illelan' are fractions such as Iboghellaten, Ibohannen, Dag Iklan, as well as the blacksmiths. Gourma Bella have a similar role to those in the Delta, although in the Gourma there is probably a higher proportion of independent Bella.

The Gourma is climatically very different from the Delta, being more typical of the dry Sahel where during the hot, dry season there is little pasture and much effort is expended in getting water. It is very isolated, with few villages in the area surveyed, and little access to any health or education services except around In Tillit and Gossi. A nomad school was set up in the 1950s which moved around several times from well system to well system, finally being established in In Tillit, but the classes are very small (10-15 pupils). The majority of the literates in the survey had been to this school. Some of the people interviewed had never seen a fixed permanent dwelling or a village. Long term out migration, especially of young Bella and low-status illelan men, is relatively frequent, according to local information, and it was particularly widespread during the 1973-4 drought. The young men go to Niger, Nigeria and Ghana, where, at least until recently they could earn far more money than was possible in Mali, return and establish themselves with a herd and family. Others go away after marriage leaving their wives with kin and they return when they have enough money to buy some animals.

Summary

This series of demographic surveys has covered two ethnic groups with totally different life styles and production systems. Sedentary, egalitarian Bambara live in villages, cultivate millet and use wells for their water supply, and contrast with the nomadic Kel Tamasheq who never cultivate, have a highly stratified social class system and a variety of water supplies. In each ethnic group, people consider that only individuals practising their own particular production system - millet farming for the Bambara, livestock herding for the Kel Tamasheq - are true human beings at their full potential, and anyone who subsists in a different way is considered inferior. As the populations were defined along ethnic and economic criteria, demographic variation between samples should provide some evidence of the effects of culture and economy on demographic parameters. Equally, within group variation, particularly for the Tamasheq samples, indicates some of the possible effects of wealth, status and some environmental factors.

CHAPTER 3 - METHODOLOGY

Survey methodology

The original aims of the demographic surveys amongst these three populations, were to measure and compare the levels of the demographic parameters of communities with different economic production systems ranging from agricultural to the pure pastoral. The surveys were not intended to produce demographic measures representative of a larger population, hence, samples were not selected from national or regional sampling frames. Instead, for each production system, areas were chosen for the surveys within which we tried to obtain total coverage of the ethnic group under consideration (see Figure 2.1). In each case, ethnicity largely determined the production system practised. Each area included villages and camps which were undergoing intensive anthropological and economic studies.

In order that the research could be done in the shortest possible time and within the budget available, single round retrospective surveys were planned, which would produce results for indirect estimates of fertility and mortality to be made using Brass type methods.

Questionnaire design (see questionnaires in Appendix 1)

A brief pilot survey indicated that it was not only possible, but desirable, to use two questionnaires, one for the household heads and one for women of childbearing age. There were three main purposes for having a women's questionnaire: to have an independent check on the retrospective fertility and child mortality data on the household questionnaire; to provide birth histories which could be analysed using life table techniques; to collect current status information on breastfeeding, menstruation and pregnancy for analysis of intermediate fertility variables.

The household questionnaire followed the lines of that used by the World Fertility Survey, which had been substantially tested under field conditions. As our principal differentiating variables were by ethnic group and production system, and were covered by the separate surveys, no specific questions on economic status were asked. Data on current fertility were obtained from a question on 'time since birth of last child', for all women of child bearing age. This was considered to be more accurate than asking about births in the twelve months preceding the survey. No questions were asked on deaths in the preceding year, because not only are the responses to these questions very inaccurate, but also, our samples were too small to produce valid age specific death rates.

For the birth histories, questions were asked on seasons of birth and death, both of which were well remembered. The pilot survey had included questions on education as well as on contraception and induced abortion, but the literacy rate was so low as to render educational details irrelevant. Contraception is virtually unknown, and even if induced abortion is practised, it was rapidly apparent that any data on the subject would have to be obtained qualitatively through intensive investigation rather than through an extensive survey of this kind. Thus the women's questionnaire was limited to a brief birth history, along with the current status questions.

Interviews

The interviewing teams consisted of secondary school leavers with between 8 and 12 years education. Different teams were used for each survey and their first language was that of the ethnic group being interviewed; where possible teams were recruited from the area of the survey. The Bambara and Delta Tamasheq teams consisted of three pairs of interviewers, each pair comprising one male and one female who worked together. Each team also had a supervisor, which for the Bambara was an older man seconded from the Bureau of Statistics. His age did much to increase our credibility with the villagers who respect age far more than education. It was impossible to get any female interviewers for the Gourma survey, but it transpired that men could effectively interview women of all social classes, except secluded inesleman women. Two men were thus trained to interview women, and they had few problems even in the more sensitive questions on menstruation and pregnancy. Many of the practical problems encountered in previous demographic surveys of nomadic pastoralists, such as the youth of interviewers, low status interviewers, educated women unwilling and unable to withstand the rigours of bush life (Niger Republic 1963) were also problems for these surveys.

The interviewing procedure was similar for all three surveys. On arrival in the village or camp, one of the principal investigators would go with the supervisor into the village, visit the chief and ask him to call together his advisors, or, in the case of Kel Tamasheq, a group of men, to whom we explained the aims of the survey, our interviewing procedures and the questions to be asked[1]. Having asked their permission to proceed (which was invariably given) a list of the household heads was made, who for the Bambara were gwatigi (see above). For the Kel Tamasheq, the units of enumeration were tents. Here, divorced or widowed women living alone but dependent on male relatives in other tents were enumerated as separate households, because only in this way could we ensure that everyone in the camp was included only once. After the household heads' names had been written and numbered on a village form the interviewers were sent out to interview them in their homes. At this point small presents were given to the village chief and elders (kola nuts and salt for the Bambara, tea and sugar for the Kel Tamasheq).

During the interview the male interviewer listed everyone who lived in that household, their relationship with the head of the household, sex, and for the Kel Tamasheq, social class. After the listing, ages were obtained for the whole household. Where ages were not known local eventcalendars (see Appendix 2) were used which developed as the surveys proceeded. Comparative ages were also used and any literate people were often referred to. The events on the calendars ranged from international and national

1. At this point we emphasised that we were nothing to do with tax collection although we were working with the administration's permission. We also pointed out that we wanted to enumerate all the people actually living there rather than just those who were registered for that village or fraction.

such as the Second World War and Malian Independence to natural events such as eclipses of the sun. Often the locally recruited interviewers had learnt about local events in school and could date them. After the age estimation the female interviewer left to interview separately all the women age 15-50 (15-54 for the Gourma Tamasheq) while the male interviewer continued with the household head. For the household forms, if the head were absent, someone else within the household would be interviewed in his place. For the women's questionnaire, however, if a woman were absent no interview took place, and no woman answered questions for another.

For the birth histories a list was first obtained of all a woman's children, with their names, if named, and whether they were alive or dead, then the interviewer returned to the beginning to obtain data on ages, seasons of birth and death and age at death. Thus age at death was obtained using retrospective questioning.[2] Interviewers were trained to check the seasons of birth and death with the age at death to ensure they were all consistent. If not, then they questioned the woman further.

After all the interviews had taken place in a village, the forms were checked for missing data or glaring inconsistencies, which, when they occurred, interviewers were sent back to re-interview and correct. Particular inconsistencies that were not accepted

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2. Age at death was recorded in days for the first month, months for the first two years, and thenceforth in completed years. It was coded into deaths; under 1 week, 1-3 weeks, in months up to one year, in 3 month intervals up to 2 years, in years up to 5 years and then 5-9, 10-14 and 15+ years for those over 5 years at death. There are obviously many errors inherent in this type of questioning, particularly heaping on 6 month and annual digits, and it is probable that many deaths at 11 or 23 months were pushed up to the completed year. This effect was much less in the Gourma survey where the seasons were recorded in much smaller units. If, for example, an interviewer was told that a child was born at the end of the hot season and died in the middle of the hot season aged one, he would ask supplementary questions to verify whether the child was 11 or 23 months old at death. The frequencies of age at death in this survey show much less heaping than in the other two surveys.

were: large age differences for women or children between the household and individual forms; variation in the numbers of live children reported; more than one child different for reported dead children.[3] Various inconsistencies within households were also checked and corrected on the spot before moving on the next village.

Most of the household forms were coded in the field and the women's forms shortly afterwards. Household forms were coded in red on top of the original pencil written data, whereas women's data were transcribed onto coding sheets. In London, the data were punched, verified, entered into the computer and 'cleaned' using a series of logical checks and valid value ranges. Usually the errors found were due to miscoding rather than mistakes in the data collection, but in the latter case it was often possible to correct the errors by examining the rest of the form.

All the preliminary tables were made using SPSS (Statistical Package for Social Scientists), from which the data were taken for estimating the demographic measures.

Indirect methods of estimation

In making estimates of fertility and mortality using indirect methods, data on parity, current fertility and surviving children were available both from the household forms and the birth histories. Each data set has its advantages and disadvantages. The household data cover the total population, but information on women's children was given by the household head who might be unaware of children who had died early, or of dead children from previous marriages. Also, in large households the head was less well acquainted with the circumstances of younger women married to nephews or grandsons. The birth history data overcomes these deficiencies, but, because some women were away visiting kin, working in the towns, or just

3. Because of the sensitivity of this subject, and the very high child mortality, especially for the Bambara, it was not always possible to check every single dead child, particularly as inconsistencies seemed often to be genuinely due to memory lapses rather than systematic evasion.

not in the village or camp that day, the measures obtained do not cover the whole population.

Fertility

Levels of fertility were estimated using the Brass P/F ratio method (Brass et al. 1968) which compares the reported parities and current fertilities in order to estimate total fertility rates. The method assumes that parities are accurately reported for younger women, and that the pattern of the age specific fertility rates is accurate. For each five year age group the ratio of the parity to the cumulated current fertility is calculated, and these P/F ratios are used to correct the current fertility cumulated over all ages. For these surveys the mean of the ratios P_2/F_2 and P_3/F_3 (derived from the data on women aged 20-24 and 25-29) was generally used to produce the final estimated total fertility rates. In every case, independent fertility estimates were made from both the household and the birth history data to cross check the results.

Infant and child mortality

Indirect estimates of infant and child mortality were made using the Brass method (Brass et al. 1968) where the proportions dead of children ever born are converted into ${}_xq_o$ values using the Brass weights and the General Standard model life table. The level of mortality is indicated by alpha; positive alphas imply higher (worse) mortality than in the General Standard ($\overset{o}{e}_o = 43.6$) and negative alphas show lower (better) mortality. The time locations of the estimates were also calculated. Extrapolated values of ${}_1q_o$ and ${}_5q_o$ were made from the q_x values estimated from the proportions of child dead for each age group of mothers. The estimates made from mothers 15-19 are always very unreliable because of the unrepresentativeness of these women. Mortality estimates were made both from the household and the birth history data, not only to provide independent checks on the quality of the data, but also for a comparison with direct measures of mortality calculated from the birth histories.

Problems have been identified in using these Brass techniques elsewhere in West Africa (Garenne 1981, Pison 1983). In two long itudinal Senegalese studies, comparisons of direct mortality measures with Brass indirect estimates for the same populations have shown that the estimates using models (Brass General Standard, Princeton Regional model life tables - see Coale and Demeny 1966) which are far from the actual pattern of child mortality, can lead to underestimates of child mortality ${}_4q_1$ of up to 30 per cent. The patterns of mortality in both the Senegal populations are very extreme and such high child mortality in relation to infant mortality is not found elsewhere. For these Malian populations, it has been shown elsewhere (Hill, Randall, van den Eerembeemt 1983) that the infant and child mortality patterns are much closer to the Brass General Standard than are the Senegal groups, and do not show the extreme forms of high second and third year mortality found further west in Africa. Thus we feel justified in accepting the mortality levels estimated using the Brass method.

Adult mortality

Levels of adult mortality were estimated using the Brass orphanhood method (Brass and Hill, 1973), which estimates the probability of survival from age 25 to age 25+N expressed in terms of alpha and $\overset{o}{e}_{15}$ from the General Standard model life table. Conditional survivorship was not used here, because the different levels of child mortality prevent comparison of the overall patterns of mortality. The time locations of the estimates were calculated using the method developed by Brass and Bamgboye (1981).

The estimates of adult mortality are less reliable than those for children, partly because the methods are less robust and more affected by the assumptions made. Problems arise particularly in the paternal orphanhood estimations. The main problem is that the mean age of fathers at the birth of their children is estimated by adding the mean age of mothers at the birth of their children to the difference in the singulate mean age at marriage (SMAM) between men and women. Yet, for the Bambara, men are polygamous and continue to take new wives until a late age and the average age difference between spouses is considerably greater than that between men and women at their first marriage. Tamasheq men continue to marry and reproduce up to an advanced age, whereas many women are widowed or divorced and do not even continue to bear children towards the end of their fecund years. Thus the difference between ages at first marriage is not a good approximation of the age difference of mean age at birth of children. In an attempt to overcome these problems, differences in the median ages of the currently married men and women were used instead of the SMAMS.

In some cases the different marriage patterns mean that for certain sub-groups in a population, lower mean ages of childbearing entail the use of different weights and ratios for the estimates. The situation may arise, as it does for the Delta Tamasheq, where all Delta Tamasheq have lower mortality ($\overset{o}{e}_{15}$) than their component sub-groups.

Data were also collected for estimates of adult mortality using information on survival of first spouse and the widowhood method. This method produced no coherent results for any of the three populations. This was possibly because of polygamy and the levirate for the Bambara, and high levels of marital mobility for the Kel Tamasheq.

Quality of the data

The quality of the data varied from survey to survey; each population had its own specific problems which are discussed in the chapters where their results are presented. Although it will be shown that the populations do have different patterns of fertility and mortality, it is possible that ethnically dependent reporting patterns, culturally specific taboos about demographic events, and chance elements have combined to produce a spurious impression of variation. Hence, at this point, a general evaluation of the data quality is required.

In all the groups except the Bambara[4] the age misreporting was quite severe, (worse for women than for men) and the patterns of errors are unsystematic. This precludes any conclusions on finer points and nuances obtained from any age dependent estimations. Some measures are more robust than others, however, and parities are particular are well reported in all three populations, at older ages as well as for the younger women. The P/F ratio estimates of total fertility are relatively reliable at the population level despite vagaries in the reported current age specific fertility rates, because the ratios used as correction factors were those for younger women for whom the fertility distributions are less erratic. For the sub-groups, especially for the Gourma Tamasheq, small numbers and age misreporting mean that no solid conclusions can really be drawn about class differentials for fertility. Attempts were made to smooth the current fertility distributions using the Gompertz model, but it was soon found that the number of uncertainties[5] meant that a whole variety of fertility levels and patterns could be obtained and plausibly justified, depending on the assumptions made; thus an examination of differentials obtained from these estimates would have been meaningless.

For child mortality the data suffer more from age misreporting of mothers than from the under-enumeration of dead children. In most cases the rising proportions of children dead with mothers' age indicate that the classic pattern of under-reporting for older women occurs rarely. It is very encouraging to see that for each population the results from the indirect estimates are coherent and

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4. Even at the data collection level, certain differences emerge between sedentary and nomadic pastoral groups. Ease of interviewing meant that, within a fixed time and budget, a larger sedentary sample could be interviewed. Also, because nomads tend to be excluded from mainstream politics and public life, as well as being physically isolated, the pastoral nomadic Kel Tamasheq know less about national and international events. Consequently ageing and dating are more difficult and age misreporting much worse than for the Bambara.

5. The problem was to decide which of the original values were accurate enough to determine the parameters for fitting the curve. Irregularities throughout the current fertility curve precluded its use. Equally, problems of parity specific age misreporting rendered the parities inaccurate too.

internally consistent, and at the sub-group level, the degree of variation by Tamasheq social class is similar for both household and birth history data sets, and also for the two different Tamasheq populations.

For adult mortality, reporting errors are harder to identify. Although the proportions of respondents with parents surviving should diminish with age, the factors leading to this are somewhat complex, since indirect data on adult mortality not only encompass many age groups of adults, but also cover both the recent and more distant past. Apart from age mis-reporting there are other problems specific to each of the ethnic groups.

Pison (1983 draft) has shown that in Senegal, a single round sruvey can miss about 5 per cent of children aged 5-9. These children may be highly selected according to the survivorship of their parents. In his surveys he estimates that although 5 per cent of all 5-9 year olds are motherless, 50 per cent of those who are omitted are motherless. In the large Bambara households where interviewers asked first for the names of men, then their wives, their children and then others in the household it is likely that this same pattern occurred, with motherless or fatherless children being systematically omitted. This means that, in reality, there is probably an increased proportion orphaned at early ages, and the rather improbable and apparently very rapid recent improvements in adult female mortality would be somewhat reduced.

Although adoption is practised by the Bambara, and Tamasheq children are very mobile, I think it is unlikely that this caused any systematic bias in the data. Interviewers were trained to ask for the biological parents, who were almost always known. Frequently, elaborate details were given about any adoptions, indicating that adopted children were recognised and identified as such.

All this considered, the levels of adult mortality differ so dramatically and consistently for each of the populations that it is highly unlikely that reporting errors alone could create the differentials.

The intensive study

Since the main aim of the whole study was to consider the demography of pastoral populations, a camp of the pastoral Delta Kel Tamasheq was selected for the intensive study. This particular camp was chosen because it was a large camp (about 150 people), with a mixed social class population of inesleman, imghad, blacksmiths and Bella, and it was also part of ILCA's socio-economic study sample. This meant that other data existed for many of the families, and also, the members of the camp were used to being the subjects of research, answering endless questions and having foreigners in their camp.

I spent three months in the camp where I worked principally with women, using a male interpreter. Much of the time was spent sitting with women, observing their behaviour and listening to conversations, which I would often follow up later with the interpreter. All the women in the camp were interviewed about their marriage history, bridewealth, husbands, divorces and residence, and also about children, childbearing and child health. These interviews did not follow a fixed format but were very open-ended. Sometimes they were done in the presence of other women and the emergent discussions were used to follow up new ideas. Men were also interviewed, particularly about marriage and divorce, both for their own individual cases and their general attitudes about such matters. The interviews with men tended to be more formal, but this was partly because many of the noble men in the camp were quite old and no longer given to chatting informally with a woman present.

Much of the information on which this thesis is based was derived from observation of different peoples' behaviour, and their reactions to events. In order to understand the different points of view about a certain event such as a divorce,Iwould talk to several people about the same subject. This was to get not only their description of the event, but also their reactions to the various participants' behaviour. These case studies were important in their elucidation of the values important to the different social classes, and the relationships between various social groups.

CHAPTER 4 - BAMBARA RESULTS

Population structure

The Bambara survey (March to May 1981) covered 50 villages ranging in size from 16 to 1678 inhabitants (see Appendix B). 10159 individuals were enumerated with 1815 women's interviews successfully completed out of 2191 women eligible for interview (table 4.1)

Table 4.1 Bambara population size and composition

	Doura	Monnimpe	Total
Total enumerated	6,900	3,259	10,159
Males	3,415	1,560	4,975
Females	3,485	1,699	5,184
Women 15-50 interviewed	1,249	566	1,815

The age sex structure of the population is shown in figures 4.1 (five year age groups) and 4.2 (single year age groups). Although the single year distribution indicates some age heaping, it is not particularly severe, and the smooth five year distribution shows little systematic bias in the age reporting. It is possible nevertheless to see the effects of using event calendars with a certain amount of age heaping on 7 years (1974 the year of the Sahelian drought), no particular deficit for 13 years (1968 the coup d'état) and likewise for 21 years (1960 Malian Independence). However, the absence of substantial heaping on these ages leads to the conclusion that the use of calendars improved rather than distorted the age reporting. The principal questionable features of the distribution are the deficits of 1 and 2 year olds and the excess of 3 year olds (these also occur for the independently recorded ages on the birth histories) and whether these are due to genuine annual fluctuations in fertility and mortality, or age misreporting. A certain amount of annual fluctuation is to be expected in such a small population, but age-misreporting could arise from the fact that the normative birth interval is two years, so any child with a younger sibling may be reported as three years old irrespective of the actual interval.

FIGURE 4.1 BAMBARA: AGE-SEX DISTRIBUTION - FIVE YEAR AGE GROUPS

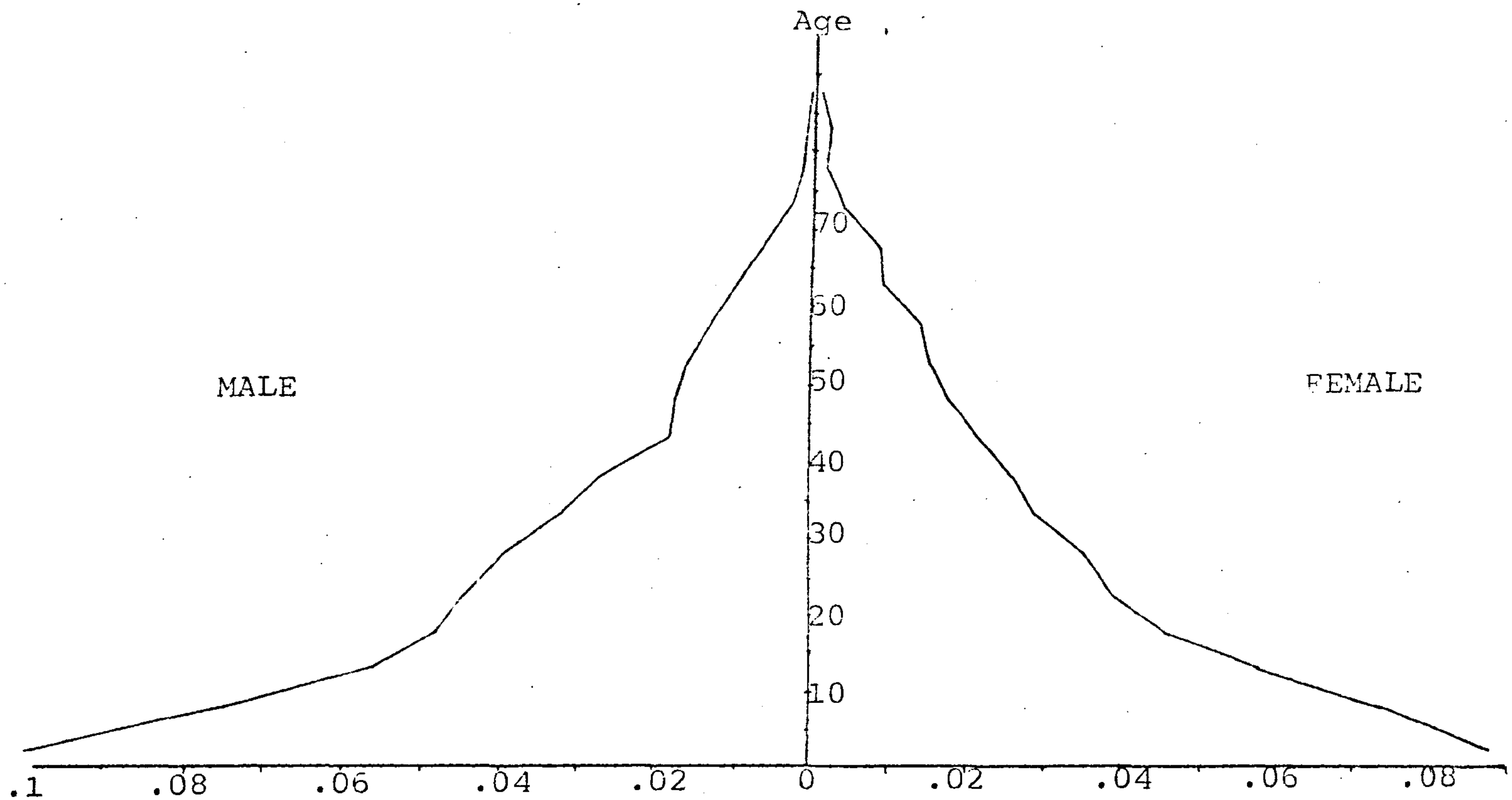
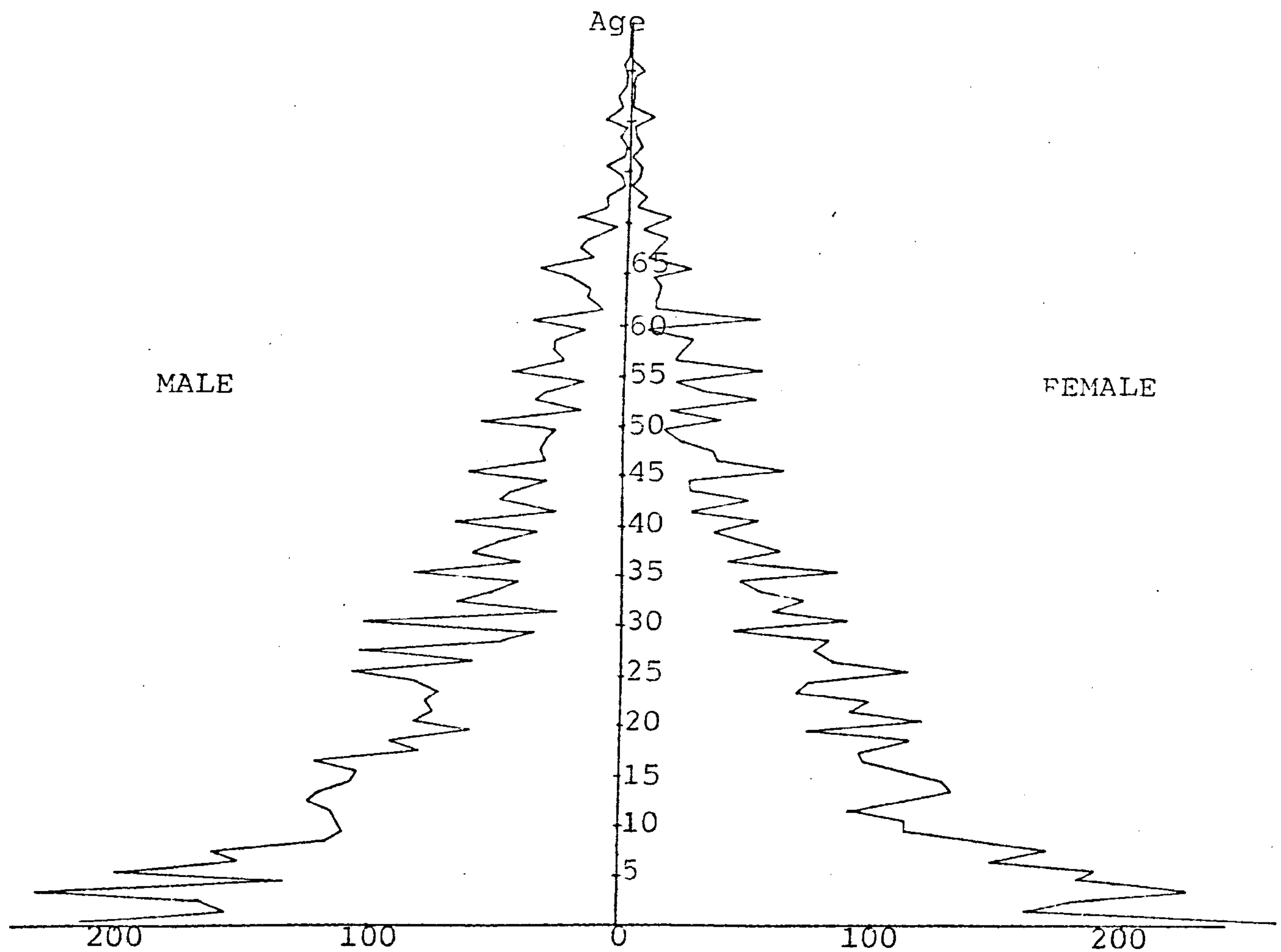


FIGURE 4.2 BAMBARA: AGE-SEX DISTRIBUTION - SINGLE YEAR AGE GROUPS



In general the distribution shows a young population with a heavy base to the pyramid, typical of a high fertility, high mortality regime. The overall sex-ratio is .96 with some evidence of small-scale, long-term, out-migration of young men, with all the five year age group sex ratios from 15 to 39 being under unity (.94, .87, .89, .90, .97), but unlike short-term seasonal migration, long-term out-migration is not really an important feature of the area. Questions posed to the village chiefs confirmed this finding, as in all cases they said that few young men left the villages permanently. Short-term seasonal migration was not picked up in the age distribution, because absentees away for less than six months and expected to return were included on the household forms.

The age distribution for the separate arrondissments have the same overall pattern. The proportion of the population under age 15 is .504 for Monnimpe and only .424 for Doura.

Literacy

9.3% of the total population were reported literate, but this includes both Quranic and Government schooling, and it is my impression that over half of those literates could only read the Quran. Not one woman had sufficient schooling to enable her to be interviewed in French and the majority of literate men had only done primary school. Certainly it would have been impossible to do any demographic analysis by educational levels.

Marriage

Figure 4.3 shows the proportions currently married by age and sex, from which it can be seen that women marry young and quickly, and that 99 per cent of women are married for the central childbearing years. AFter age 50 the proportion currently married falls with a paralleled increase in proportion widowed. Men marry later, but from age 37 over 90% are currently married. Polygyny and the levirate both serve to maintain this pattern of continuous marriage. Lifetime celibacy is unknown, with no unmarried men over age 49 and no spinsters over age 24.

Fertility

From the household data it is possible to examine the characteristics of those women interviewed with the birth history questionnaire and those not interviewed (see table 4.2). In the younger age groups a larger proportion of women was absent, probably due to dry season out migration by younger people. Both parities and age specific fertility rates are lower for the women who were not interviewed. This may be due either to reporting errors - because cross checking was impossible - or genuine differences. Certainly, sterile women or women with no surviving children tend to be able to travel more during this season. For the fertility rates it is possible that some women had given birth away from home without their families' knowledge. Selective omission of dead children for absent women is not apparent, with no systematic differences in proportions dead of children ever born, for the two groups of women.

Levels and patterns

Figure 4.4 shows the reported parities and current fertility for both data sets, for all Bambara and broken down by arrondissement. The parities are very consistent with no evidence of underreporting

FIGURE 4.3 BAMBARA: PROPORTIONS CURRENTLY MARRIED BY AGE AND SEX

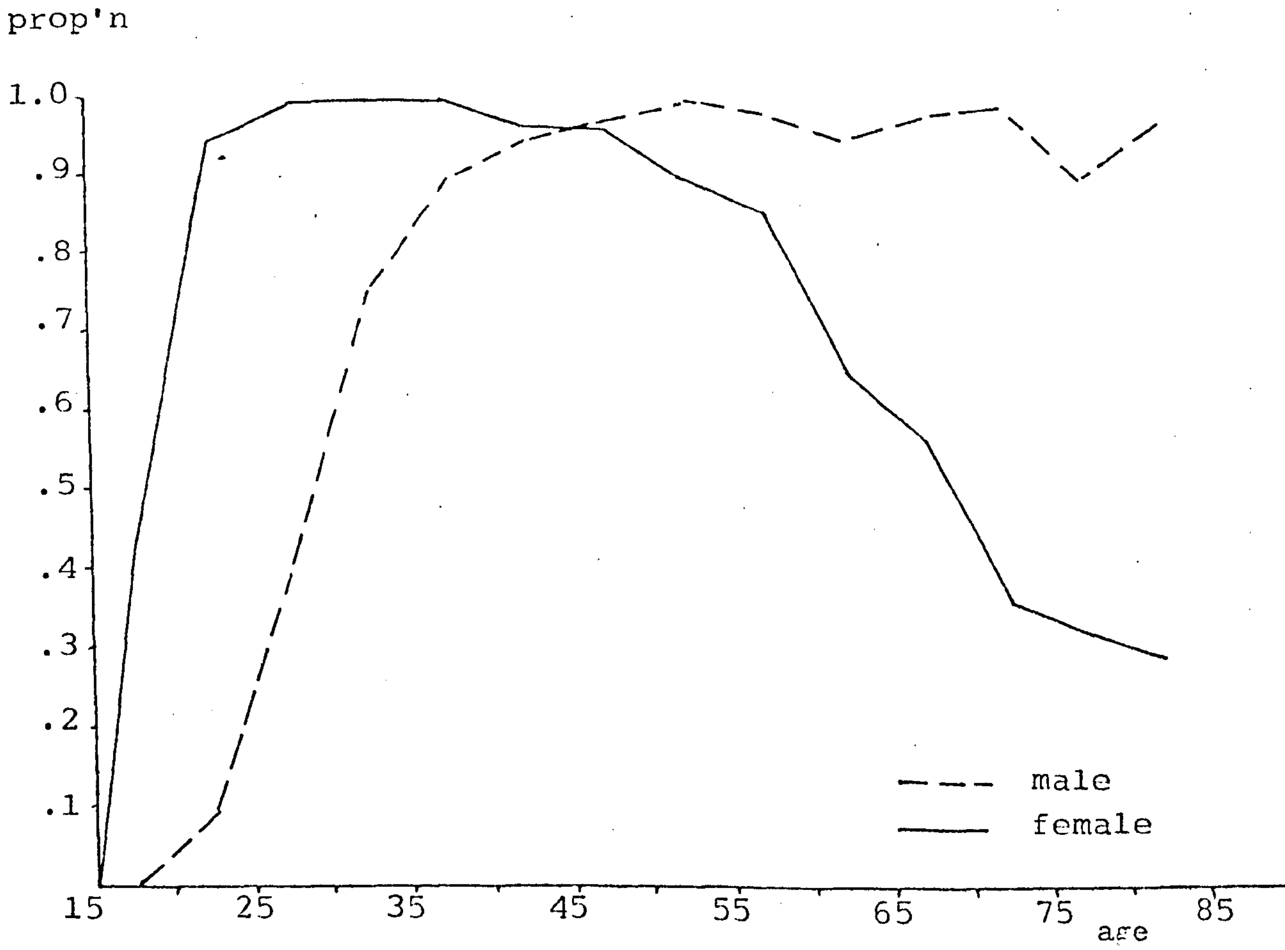


Table 4.2

CHARACTERISTICS OF BAMBARA WOMEN INTERVIEWED AND NOT INTERVIEWED

	Total Women		Proportions Not Interviewed		
Age	Interviewed	Not Interviewed	All	Doura	Monnimpe
15-19	304	186	.38	.42	.29
20-24	346	104	.23	.24	.21
25-29	315	84	.21	.21	.22
30-34	270	51	.16	.15	.17
35-39	230	42	.15	.15	.17
40-44	160	21	.12	.13	.10
45-49	151	24	.14	.14	.12

Parity		a.s.f.r.		Proportion dead of Children ever born	
Int.	Not Int.	Int.	Not Int.	Int.	Not Int.
.32	.30	.168	.118	.175	.161
1.99	1.58	.344	.286	.287	.341
3.33	3.40	.327	.262	.386	.325
5.34	5.16	.274	.176	.372	.403
6.41	5.10	.323	.159	.400	.411
7.22	5.81	.145	.091	.409	.418
7.75	6.38	.079	0.	.430	.464

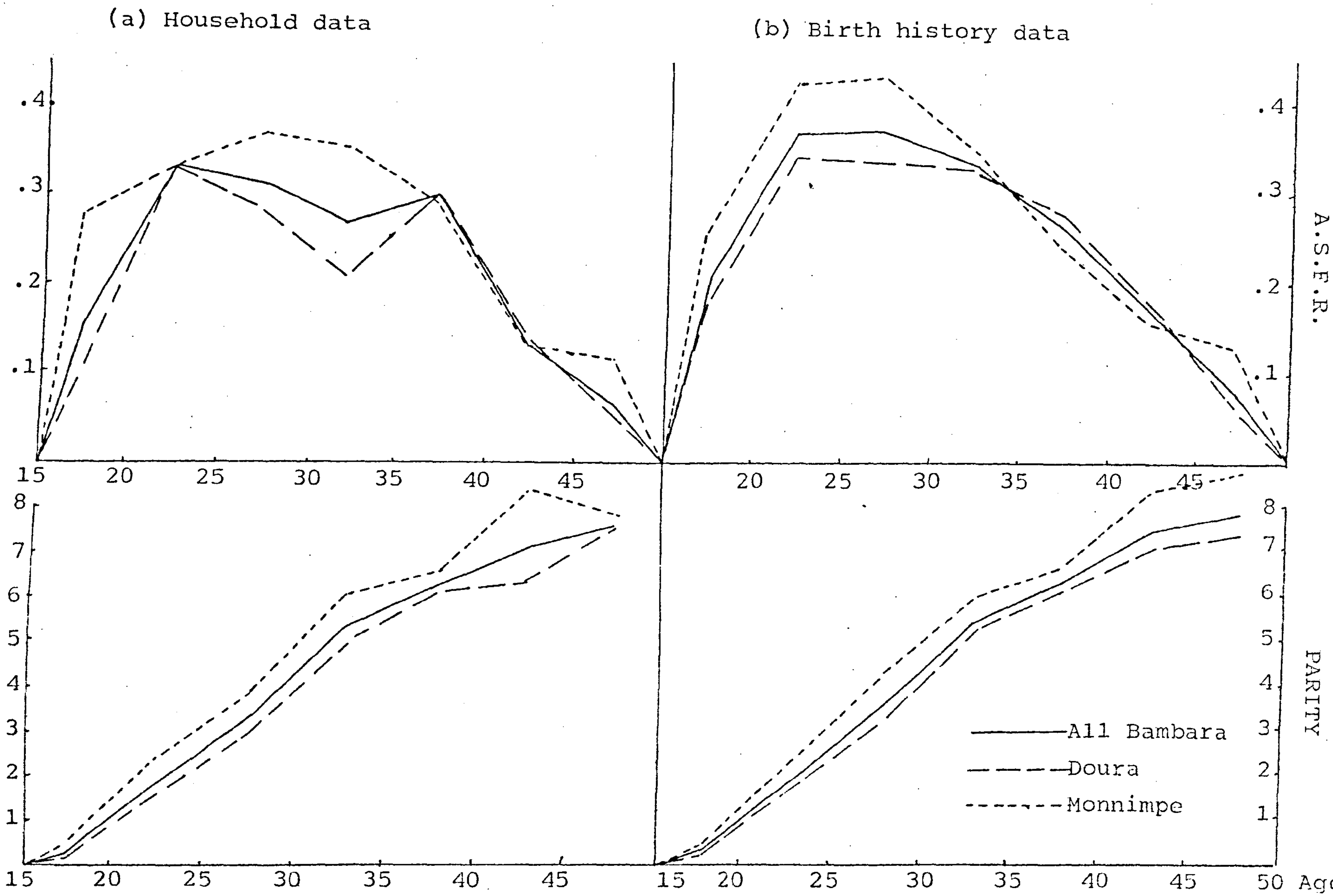


FIGURE 4.4 BAMBARA REPORTED CURRENT FERTILITY AND PARITY

at older ages, except in the Monnimpe household data. For both data sets, Monnimpe parities are higher than Doura at all ages; the differences between the two are fairly constant for the central childbearing ages, but increase at the extremes indicating that higher Monnimpe fertility may be due to a longer child bearing period rather than shorter birth intervals. Certainly higher earlier child bearing is borne out by the age specific fertility rates (calculated from births reported for the last 12 months) where higher current fertility for Monnimpe prevails until age 35. The curious bimodal distribution of the household data is probably caused by age misreporting. The same distribution was reported for Bambara women in the 1956-58 "Enquête Démographique dans le Delta Central Nigérien", and the 1960-61 "Enquête Démographique Au Mali".

The P/F ratios (tables 4.3 and 4.4) are quite even and do not tail off at older ages. The household heads' reference period is close to one year with all the ratios around 1, whereas the women used a longer reference period. For the women's data the 15-19 ratio is way out of line.[1] Otherwise the reasonable regularity of the P/F ratios is an encouraging sign of the quality of the data. Some of the irregularities are undoubtedly due to age misreporting, but we cannot really correct for this as the pattern of misreporting is unknown. The estimated total fertility rates are shown in table 4.5.

---

1. Although this ratio is generally considered to be unreliable because of selectivity, here it is possible to explain partly the large divergence. Premarital illegitimate children are quite common but rather shameful, and were only generally reported when the interviewers met the woman and saw her carrying or feeding the child. This biases the reporting towards those children born in the 12 months preceding the survey from which the age specific fertility rates (F) were calculated. The P (parity) data should include all births, both legitimate and illegitimate, recent and more distant, but if weaned illegitimate children are systematically underrreported the P/F ratio will be low, as it is for the 15-19s. At the household level there was a tendency to omit even those illegitimate children born in the year before the survey as the male interviewers did not see the children.

Table 4.3

BAMBARA PARITY, CURRENT FERTILITY AND
P/F RATIOS (HOUSEHOLD DATA)

a) All Bambara

Age	Total Women	CEB*	BLYR+	Reported Parity	Reported asfr.	P/F
15-19	490	153	73	.312	.149	.937
20-24	450	853	149	1.896	.331	1.093
25-29	399	1136	125	3.348	.313	.992
30-34	321	1705	83	5,311	.259	1.127
35-39	272	1688	81	6.206	.298	1.000
40-44	181	1277	25	7.055	.138	.992
45-49	175	1323	12	7.560	.069	.982

5. = 7.78

b) Doura

Age	Total Women	CEB	BLYR	Reported Parity	Reported asfr.	P/F
15-19	347	75	34	.216	.098	1.066
20-24	303	500	100	1.650	.330	1.112
25-29	269	829	77	3.082	.286	1.012
30-34	214	1063	45	4.967	.210	1.198
35-39	203	1239	61	6.103	.300	1.095
40-44	120	766	17	6.383	.142	.976
45-49	132	987	7	7.477	.053	1.063

5. = 7.10

c) Monnimpe

Age	Total Women	CEB	BLYR	Reported Parity	Reported asfr.	P/F
15-19	143	78	39	.545	.273	.840
20-24	147	353	49	2.401	.333	1.025
25-29	130	507	48	3.900	.369	.940
30-34	107	642	38	6.000	.355	1.006
35-39	69	449	20	6.507	.290	.859
40-44	61	511	8	8.377	.131	1.007
45-49	43	336	5	7.814	.116	.849

5. = 9.34

* CEB = Children ever born

\+ BLYR = Births in the last year

Asfr = Age Specific fertility
from BLYR

Table 4.4

BAMBARA PARITY, CURRENT FERTILITY AND
P/F RATIOS (BIRTH HISTORY DATA)

a) All Bambara

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	292	87	58	.298	.199	.655
20-24	383	711	141	1.856	.363	.893
25-29	333	1193	124	3.583	.372	.902
30-34	243	1312	81	5.399	.333	.944
35-39	194	1227	52	6.325	.268	.881
40-44	199	1482	34	7.447	.171	.912
45-49	138	1077	11	7.804	.080	.881

5. = 8.96

b) Doura

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	203	55	35	.271	.172	.691
20-24	260	440	89	1.692	.342	.899
25-29	208	665	70	3.197	.337	.890
30-34	175	910	57	5.200	.326	.992
35-39	136	839	38	6.169	.279	.916
40-44	142	1005	25	7.078	.176	.906
45-49	98	725	6	7.398	.061	.881

5. = 8.47

c) Monnimpe

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	89	32	23	.360	.258	.601
20-24	123	271	52	2.203	.423	.871
25-29	125	528	54	4.224	.432	.891
30-34	68	402	24	5.912	.353	.886
35-39	58	388	14	6.690	.241	.829
40-44	57	477	9	8.368	.158	.947
45-49	40	352	5	8.800	.125	.897

5. = 9.95

Table 4.5

BAMBARA TOTAL FERTILITY RATES ESTIMATED
USING THE P/F RATIO METHOD

	ALL	DOURA	MONNIMPE
Household File	8.12	7.54	9.18
Birth History File	8.04	7.58	8.77

Note: Derived using the mean of P_2/F_2 and P_3/F_3 to correct the level of reported age specific fertility.

Both data sets provide similar results with Monnimpe total fertility higher than that of Doura, and a very high overall total fertility of about 8. These estimates of total fertility are very close to the reported parities for women 45-50. As there is little under-reporting of parity at older ages this indicates a lack of recent change in fertility confirmed by the evenness of the P/F ratios. This stability is hardly surprising in areas where there have been few recent social changes in terms of medical and educational services, or in the economy and production system.

Marital fertility

Age specific marital fertility rates and total marital fertility rates were calculated using age specific rates (corrected for level using P/F ratios) and the proportions currently married. Because of the high premarital illegitimate fertility, the age specific marital fertility rate for the 15-19 year olds was calculated directly using the births in the last 12 months to currently married women. This was corrected for reference period errors with the same P/F ratios as used in the original estimations. The age specific marital fertility rates and total marital fertility in table 4.6 show that

Table 4.6

BAMBARA MARITAL FERTILITY (HOUSEHOLD DATA)

a) All Bambara

Age	asfr (from P/F)	Proportion currently married	marital asfr	cumulated total marital fertility
15-19	(.1829	.407)	.3092*	1.546
20-24	.3509	.942	.3725	3.409
25-29	.3235	.990	.3268	5.042
30-34	.2707	.994	.2723	6.404
35-39	.3035	.996	.3047	7.928
40-44	.1305	.957	.1364	8.609
45-49	.0614	.955	.0643	8.931 Total marital fertility rate

*Calculated directly from 59 births to 199 currently married women aged 15-19 = .2965 corrected using P/F correction (1.043)

b) Doura

Age	asfr (from P/F)	Proportion currently married	marital asfr	cumulated total marital fertility
15-19	(.1278	.266)	.2424*	1.212
20-24	.3585	.918	.3905	3.165
25-29	.2975	.989	.3008	4.669
30-34	.2261	.991	.2282	5.809
35-39	.3153	.995	.3169	7.394
40-44	.1358	.959	.1416	8.102
45-49	.0463	.948	.0493	8.348 TMFR

*21 births to 92 currently married women aged 15-19 = .2383 (P/F corr. = 1.062)

c) Monnimpe

Age	asfr (from P/F)	Proportion currently married	marital asfr	cumulated total marital fertility
15-19	(.3038	.748)	.3517*	1.759
20-24	.3311	.993	.3334	3.426
25-29	.3681	.992	.3711	5.281
30-34	.3480	1.000	.3480	7.021
35-39	.2758	1.000	.2753	8.398
40-44	.1142	.951	.1201	8.998
45-49	.1093	.977	.1119	9.557 TMFR

*38 births to 107 currently married women aged 15-19 = .3551 (P/F corr. = .991) fertility differentials between Monnimpe and Doura are maintained, and are thus not due to different marriage patterns. However nearly 50% of the difference in total marital fertility for the two areas is in the 15-19 age group, due possibly to different patterns of premarital conception rates and teenage subfecundity.

Mortality

Infant and child mortality

Table 4.7 shows the infant and child mortality estimates, and alphas for all Bambara and for the two arrondissements separately. In all cases the estimates for the 15-19 age groups are out of line, but this is to be expected because not only are they a selected group, but in this particular case, the high levels of premarital illegitimacy and failure to report dead illegitimate children increase the unreliability of estimates from this age group [2]. However, estimates from the other age groups are very even with no evidence at all of improving mortality. Indeed, for Monnimpe, the upward trend of ${}_5q_0$ seen in figure 4.5 indicates an apparently recent deterioration in mortality levels, but this is most probably due to underreporting of dead children at older ages. Indirect estimates of mortality from the birth history data produce similar results in terms of both level and pattern with high unchanging mortality. (see figure 4.5). Estimates made for the sexes separately showed no differences in mortality.

Adult mortality

For each respondents' age group the proportions not orphaned, the estimated alphas and $\overset{o}{e}_{15}$ are shown in table 4.8 and 4.9.

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2. Anthropologists who lived in one of the sample villages said that frequently they were not told of illegitimate births and they only found out about them when they saw the mother and child. Their impression was one of high mortality for these children.

Table 4.7

BAMBARA: ESTIMATES OF INFANT AND CHILD MORTALITY

USING BRASS MULTIPLIERS

(Household data)

(i) All

AGE GROUP	CHILDREN EVER BORN	CHILDREN SURVIVING	AGE X	Q(X)	ALPHA	DATE	$_1q_0$	$_5q_0$
1	153	127	1	0.1529	0.0110	80.14	0.1529	0.2349
2	853	599	2	0.2874	0.2612	78.08	0.2294	0.3361
3	1336	877	3	0.3319	0.3055	76.08	0.2454	0.3562
4	1705	1062	5	0.3690	0.3332	73.80	0.2559	0.3690
5	1688	1010	10	0.3959	0.3385	71.32	0.2579	0.3714
6	1277	754	15	0.3928	0.2954	68.45	0.2417	0.3515
7	1323	749	20	0.4153	0.2840	64.97	0.2376	0.3464

(ii) Doura

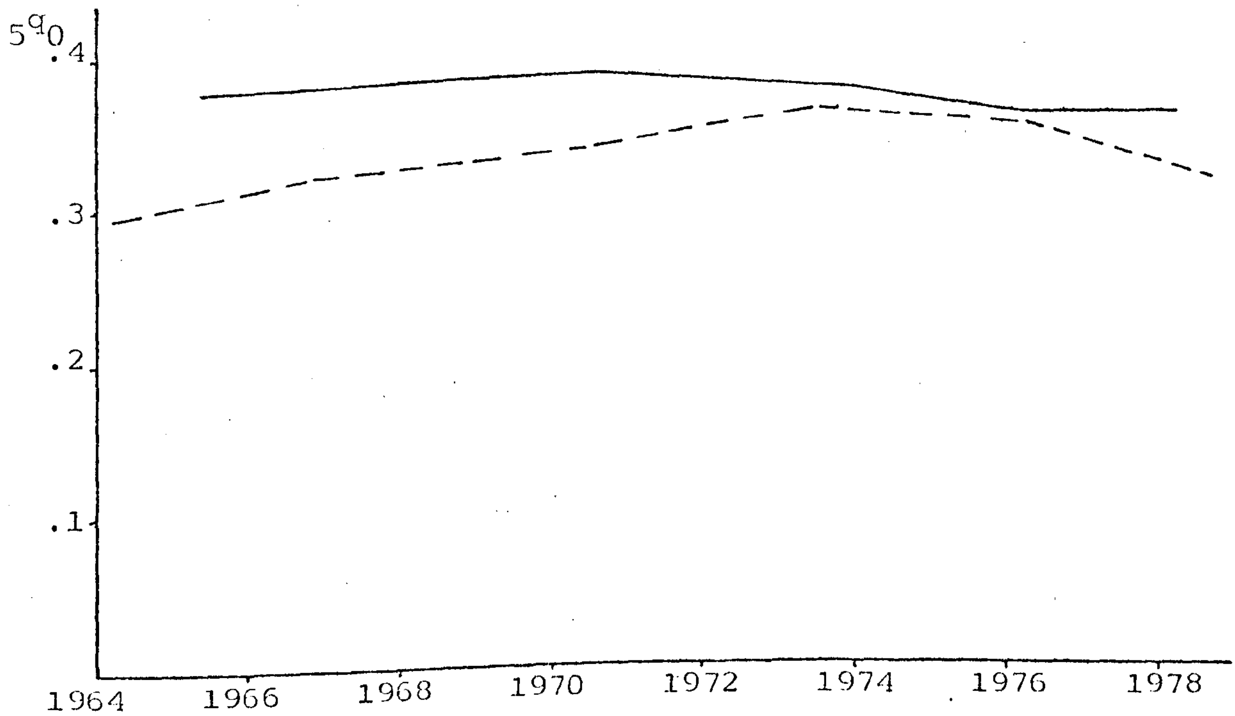
AGE GROUP	CHILDREN EVER BORN	CHILDREN SURVIVING	AGE X	Q(X)	ALPHA	DATE	$_1q_0$	$_5q_0$
1	75	64	1	0.1360	-0.0573	80.23	0.1360	0.2112
2	500	341	2	0.3125	0.3210	78.29	0.2512	0.3633
3	829	542	3	0.3385	0.3203	76.32	0.2510	0.3630
4	1063	658	5	0.3764	0.3490	74.06	0.2619	0.3764
5	1239	725	10	0.4131	0.2743	71.61	0.2718	0.3883
6	766	430	15	0.4258	0.3637	68.80	0.2676	0.3833
7	987	533	20	0.4456	0.3459	65.37	0.2607	0.3749

(iii) Monnimpe

AGE GROUP	CHILDREN EVER BORN	CHILDREN SURVIVING	AGE X	Q(X)	ALPHA	DATE	$_1q_0$	$_5q_0$
1	78	63	1	0.1652	0.0571	79.95	0.1652	0.2518
2	353	258	2	0.2525	0.1725	77.71	0.1996	0.2977
3	507	335	3	0.3216	0.2821	75.65	0.2369	0.3455
4	642	404	5	0.3563	0.3058	73.33	0.2456	0.3563
5	449	285	10	0.3529	0.2466	70.80	0.2243	0.3296
6	511	324	15	0.3433	0.1888	67.81	0.2048	0.3046
7	336	216	20	0.3347	0.1116	62.87	0.1808	0.2729

FIGURE 4.5 BAMBARA: TIME LOCATION OF $_5q_0$ ESTIMATED USING BRASS MULTIPLIERS

(a) Household data



(b) Birth history data

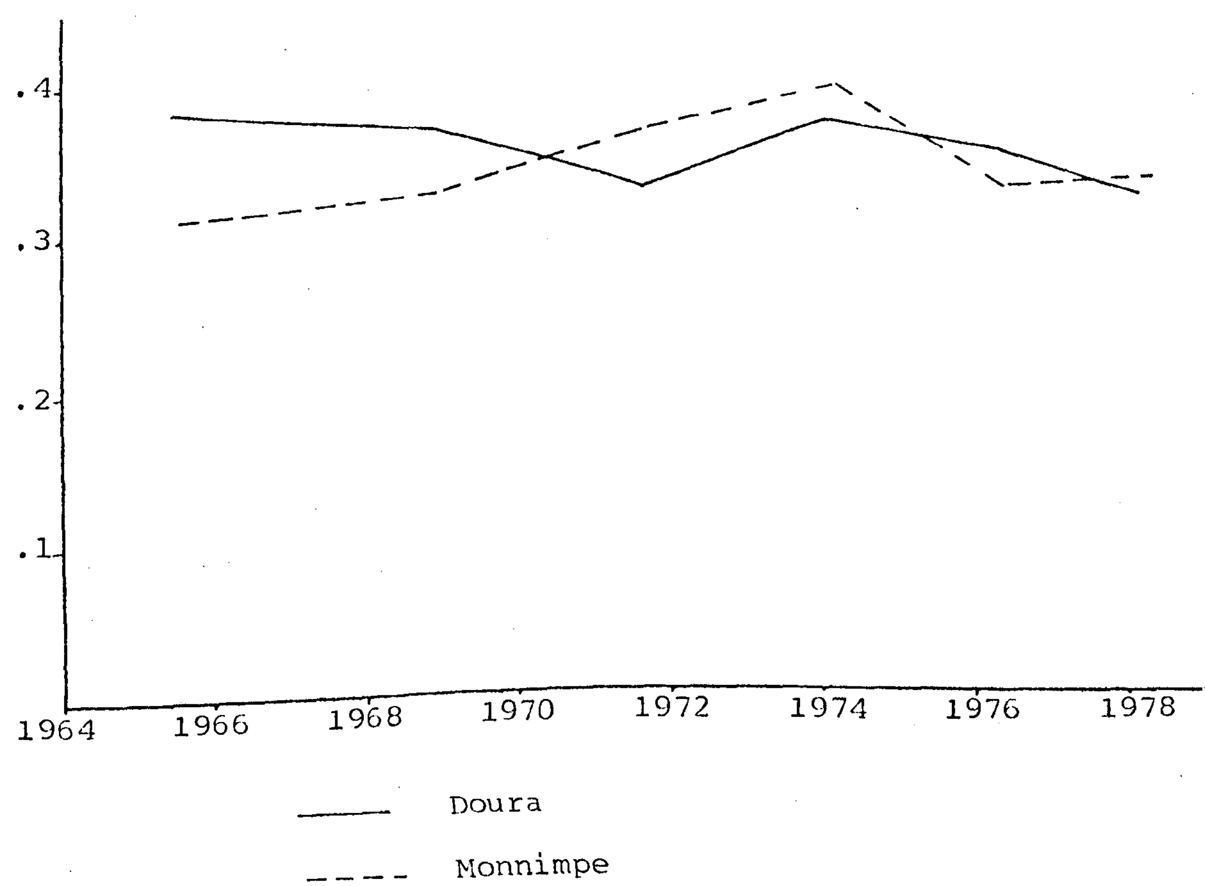


Table 4.8

BAMBARA: ESTIMATES OF FEMALE ADULT MORTALITY
USING ORPHANHOD DATA

a) All

Respondents' age group	Proportion not orphaned	$\frac{l_{25+N}}{l_{25}}$	α	$\mathring{e}_{15}$	Mean age of women at the birth of their children
5-9	.959	.943	-.3127	48.35	
10-14	.910	.897	-.2155	46.74	
15-19	.851	.844	-.1645	45.90	
20-24	.793	.791	-.1710	46.01	
25-29	.727	.732	-.2004	46.49	
30-34	.597	.603	-.0661	44.31	
35-39	.518	.526	-.1552	45.75	
40-44	.376	.376	-.0844	44.60	
45-49	.258	.247	-.2872	44.86	27.67

b) Doura

Respondents' age group	Proportion not orphaned	$\frac{l_{25+N}}{l_{25}}$	α	$\mathring{e}_{15}$	Mean age of women at the birth of their children
5-9	.947	.930	-.1741	46.06	
10-14	.894	.882	-.1117	45.04	
15-19	.830	.825	-.0690	44.35	
20-24	.761	.763	-.0599	44.21	
25-29	.692	.705	-.1111	45.03	
30-34	.558	.571	.0370	42.78	
35-39	.469	.483	-.0370	43.84	
40-44	.367	.381	-.0978	44.82	
45-49	.215	.214	.0341	42.72	28.14

c) Monnimpe

Respondents' age group	Proportion not orphaned	$\frac{l_{25+N}}{l_{25}}$	α	$\mathring{e}_{15}$	Mean age of women at the birth of their children
5-9	.982	.969	-.6829	54.35	
10-14	.946	.935	-.5262	51.85	
15-19	.905	.899	-.4724	50.98	
20-24	.869	.862	-.4835	51.16	
25-29	.800	.793	-.4128	50.00	
30-34	.684	.683	-.2970	48.09	
35-39	.642	.625	-.4140	50.02	
40-44	.395	.391	-.1286	45.32	
45-49	.366	.310	-.3052	48.22	26.88

Table 4.9

BAMBARA: ESTIMATES OF MALE ADULT MORTALITY USING ORPHANHOOD DATA

a) All

Respondents' age group	Proportion not orphaned	$\frac{l_{40+N}}{l_{40}}$	α	$\mathring{e}_{15}$	Mean age of fathers at the birth of their children
5-9	.921	.879	-.2335	47.04	
10-14	.817	.783	-.1190	45.16	
15-19	.716	.669	-.0562	44.15	
20-24	.575	.533	-.0115	43.44	
25-29	.477	.404	-.0373	43.85	
30-34	.354	.225	.1212	41.39	
35-39	.210	.179	-.3012	48.16	
40-44	.184	.042	.0807	42.01	38.7

b) Doura

Respondents' age group	Proportion not orphaned	$\frac{l_{40+N}}{l_{40}}$	α	$\mathring{e}_{15}$	Mean age of fathers at the birth of their children
5-9	.912	.873	-.1981	46.45	
10-14	.797	.768	-.0521	44.08	
15-19	.677	.652	.0082	43.13	
20-24	.554	.525	.0149	43.02	
25-29	.453	.406	-.0467	44.00	
30-34	.346	.239	.0515	42.45	
35-39	.199	.202	-.3991	49.77	
40-44	.201	.057	-.1843	46.23	39.7

c) Monnimpe

Respondents' age group	Proportion not orphaned	$\frac{l_{40+N}}{l_{40}}$	α	$\mathring{e}_{15}$	Mean age of fathers at the birth of their children
5-9	.938	.901	-.3857	49.55	
10-14	.865	.843	-.3942	49.69	
15-19	.817	.726	-.2530	47.36	
20-24	.629	.566	-.1159	45.11	
25-29	.527	.404	-.0385	43.87	
30-34	.374	.224	.1242	41.35	
35-39	.238	.108	.1610	40.80	
40-44	.145	.026	.6532	34.73	37.5

The mean ages of mothers/fathers at the birth of their children (M) are also shown and reflect the different fertility schedules for the two arrondissments, with Doura having later fertility than Monnimpe.

Three main points emerge:

1. The alphas are generally positive, unlike those for child mortality, indicating that adult mortality is better then that of the General Standard ($\overset{o}{e}_o$ = 43.6 Brass et al., 1968, p.128)

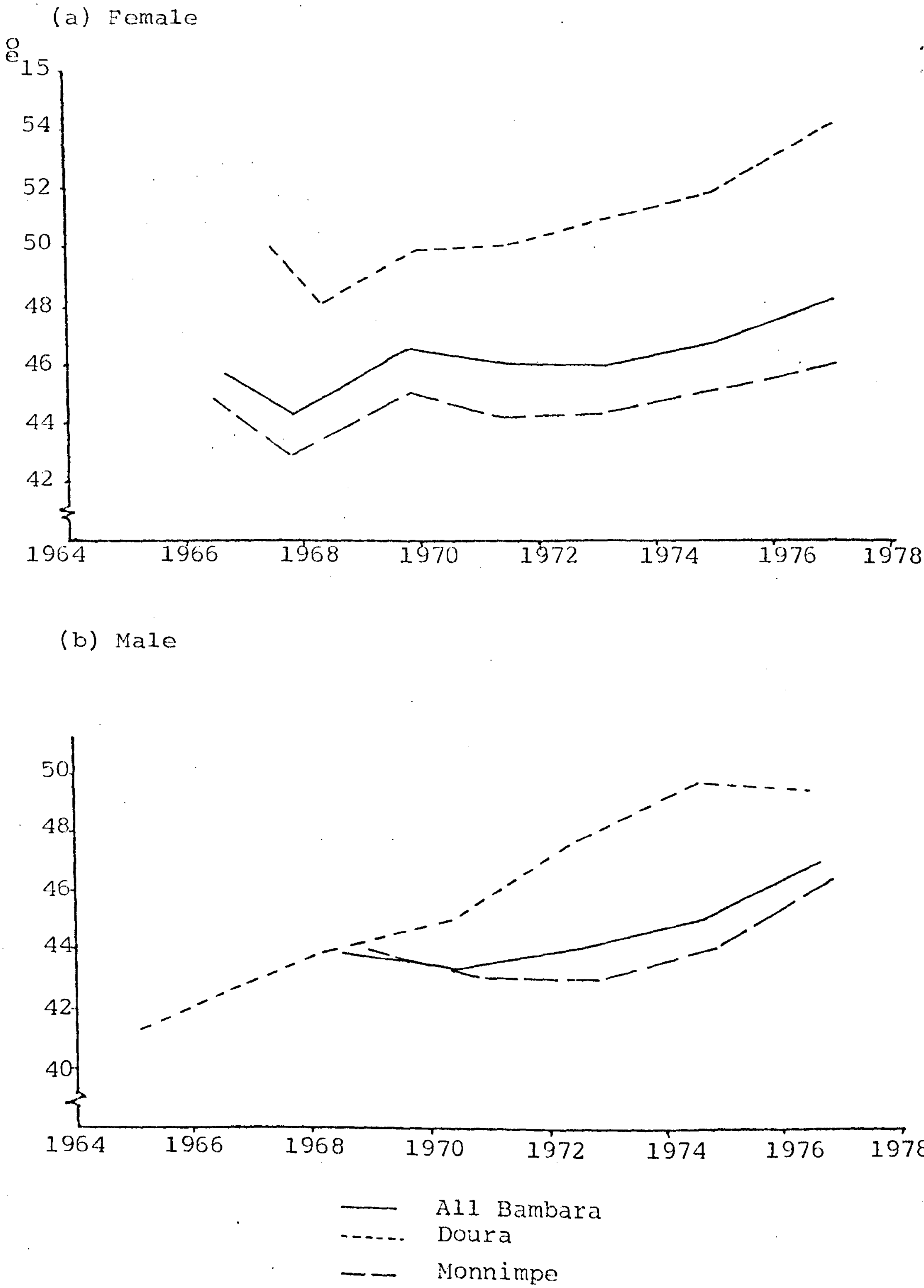
2. The relatively smooth series of alphas indicates a gradual improvement in adult mortality over recent years (figure 4.6) although the time locations are only a very approximate guide to the time reference of the mortality estimates.

3. For both sexes there are very clear differences between the arrondissements with Monnimpe having much lower mortality than Doura, particularly for women.

Discussion

The Bambara show a curious pattern of improving adult mortality, with a steady and high level of infant and child mortality. This is compounded by the fact that although there are substantial differences in adult mortality between the two arrondissements of Doura and the more modern Monnimpe, child mortality is about the same in both areas. It is possible that adult mortality has improved through the increased contact of younger adults with the towns and further afield during the dry season. In this slack period many young adults go to Segou, Bamako or even to Ivory Coast to earn money both for the families' taxes, and for personal cash. In any community, much of the reluctance to use medical and other facilities stems from distance, fear of the unknown and lack of money. For young migrating adults, all these three factors are overcome, and as

FIGURE 4.6 BAMBARA ADULT MORTALITY: $\overset{o}{e}_{15}$ FROM ORPHANHOOD ESTIMATES USING BRASS WEIGHTS



people do not stop migrating on marriage, young adults may well have improving mortality which emerges in these estimates. Those who do not migrate are still far more likely to use medical services themselves or for other adults, than for chidren, and it is rare that a child would be taken to the hospital for treatment. The fact that Monnimpe villages have better access to services and more possibility of using them confirms the notion that it is modern facilities that are helping generate mortality improvements for adults.

This is not to say that high mortality in these villages could be rapidly reduced by medical input in terms of dispensaries and nurses. It is quite probable that the high levels of child mortality are due to ignorance and poor practices in the care of the new-born, for example, or the use of pond water for wet season washing and drinking. One possible reason for continuing high child mortality in Monnimpe may be that of maternal care. Monnimpe women work as hard as Doura women, they have to pull water from equally deep wells, and cooking and agriculture are equally time-consuming. Constraints on mothers, inhibiting them from full attention to young children are probably equivalent in both areas, and may be even higher in the more land-scarce Monnimpe arrondissment where much of the cultivation season is spent in hamlets far from the village. The importance of both environmental factors and child care will be considered in more detail later, when the intermediate determinents of fertility and mortality are examined.

CHAPTER 5 - DELTA TAMASHEQ RESULTS

Population structure

The Delta Tamasheq survey covered 96 camps which in May-July 1981 were spread throughout the northern part of the inner Niger Delta, from west of the river Bani at Mopti to well outside the Delta itself in the dry zone to the north of Lere and Soumpi. 6128 individuals were enumerated and 1289 women's interviews completed. (table 5.1)

Table 5.1 Delta Tamsheq - Population Size and Composition

	Nobles			Bella		
	Imushar	Ineselman	Imghad	Inhaden	Iklan	Ns
Total	145	2772	334	254	2620	3
Male		1680			1347	
Female		1571			1527	
Total		2251			2874	

Figure 5.1 shows the 5 year age-sex distribution and figure 5.2 the single year age-sex distribution. This latter indicates some of the principal age reporting problems, which include substantial heaping on digits terminating in 5 and 0 with one exception: the lack of women aged 50, probably because these women had to have a birth history interview whereas those aged 51 did not! Age misreporting however, is obviously not just limited to digit preferences, but there is a general pushing up of women in their forties to ages 51 and higher. The age distribution was smoothed using a logit transformation and a Carrier Hobcraft (1971) stable population selected for proportion under 15, proportion over 45 and l_2. The line of the smoothed population distribution can be seen in figure 5.1. From this it is clear that not only is there severe female age misreporting, but that it is also not very systematic. The dearth of teenage girls is probably a sign of age-raising, possibly selective for marital status or number of children. There is little

FIGURE 5.1 DELTA TAMASHEQ: AGE-SEX DISTRIBUTION - FIVE YEAR AGE GROUPS

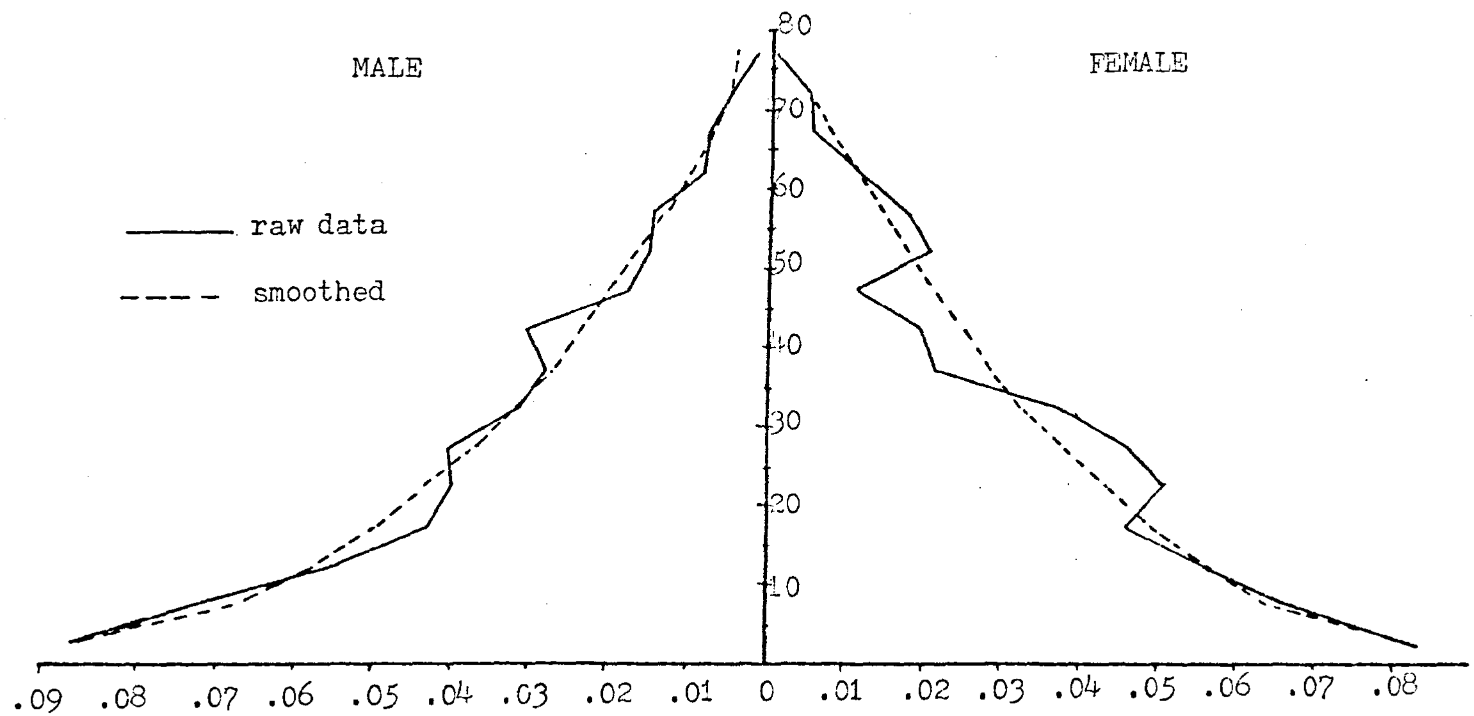
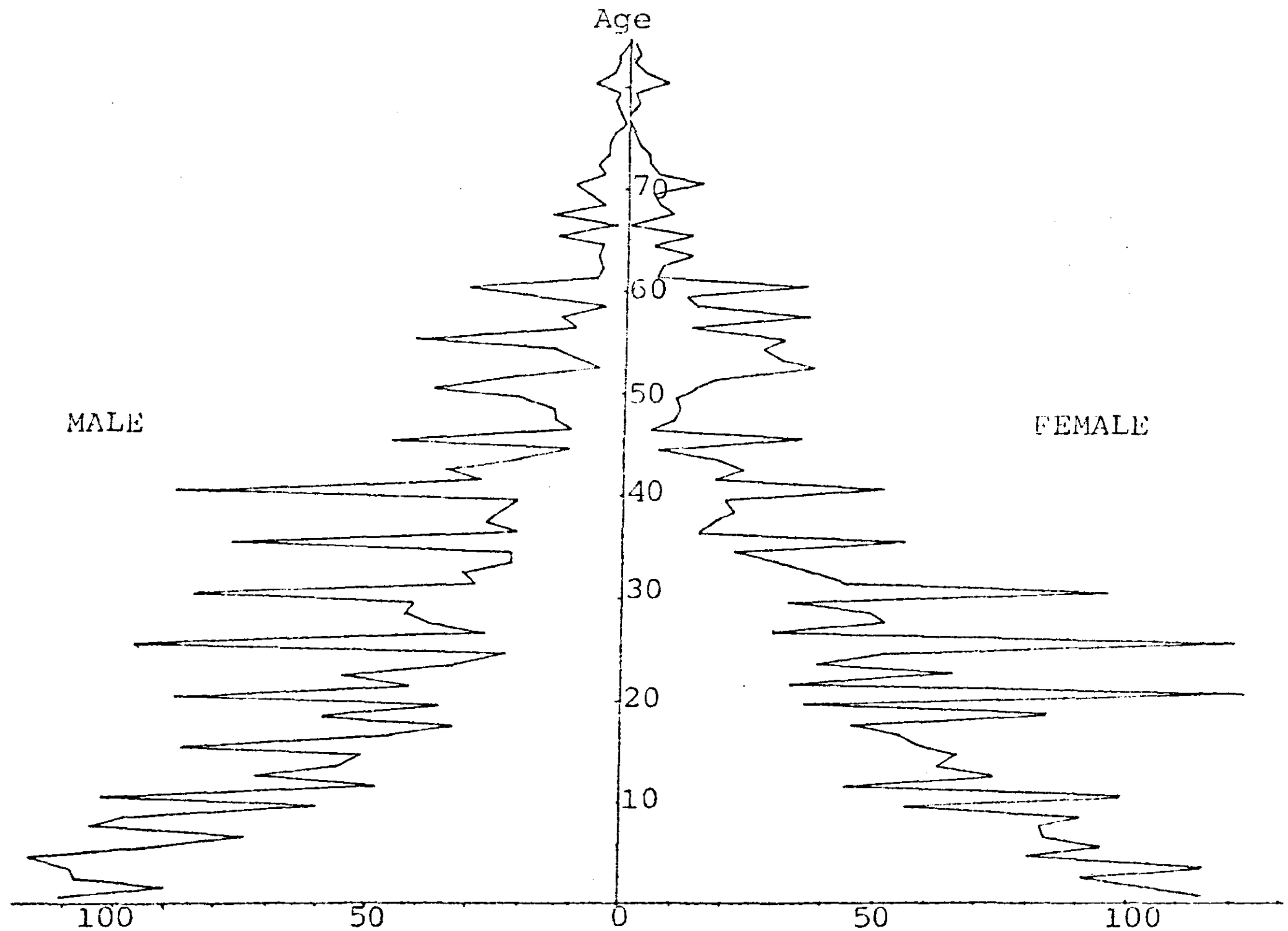


FIGURE 5.2   DELTA TAMASHEQ: AGE-SEX DISTRIBUTION - SINGLE YEAR AGE GROUPS



evidence of large scale out migration of young men, where the reported population is very similar to the smoothed population. Sex ratios (ages 15-59) for the different social classes are 1.05 for nobles and .81 for Bella, indicating class-dependent out migration.

Much of the age misreporting is due to Delta Tamasheq ignorance of national and international events, making it impossible to use event calendars to the same extent as in the other surveys. Also, for this survey, the enumerators were not from the zone, and were not aware of local events and their dates.

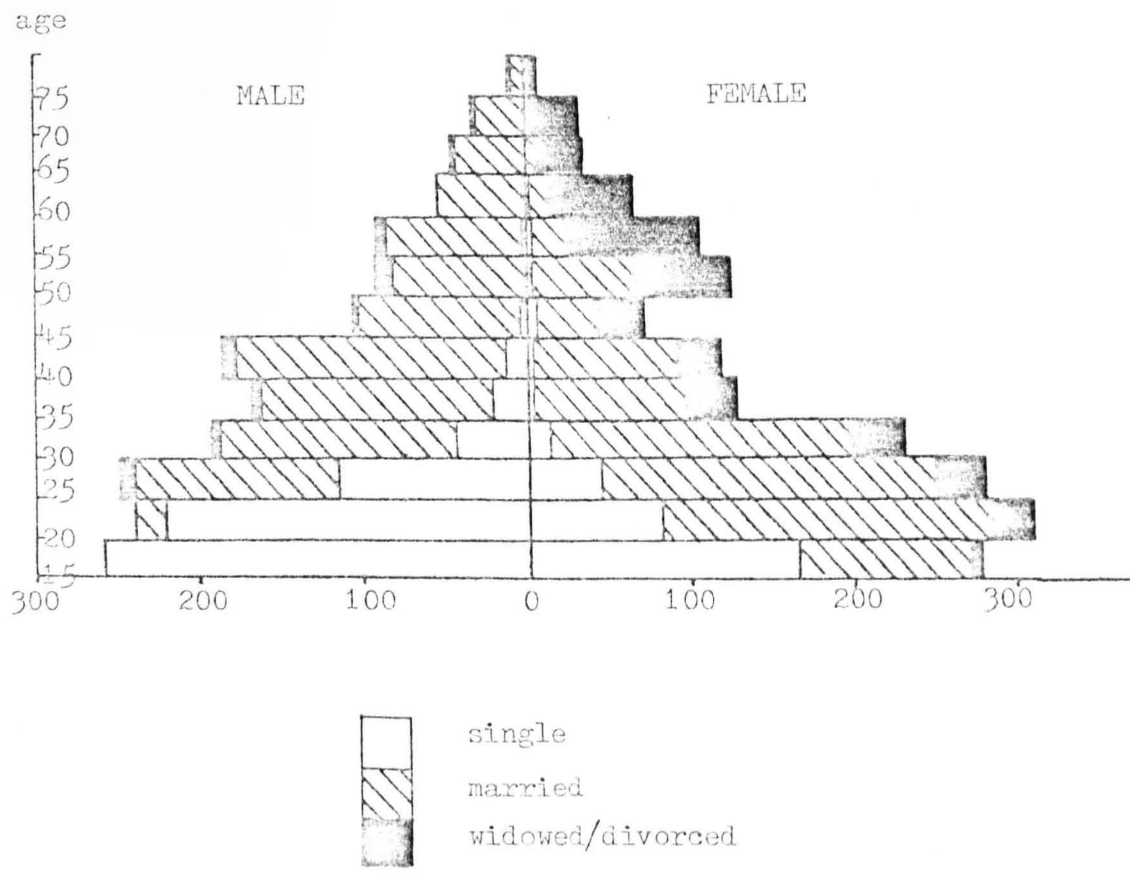
Literacy

The literacy rate was very low with 0.5 per cent of the population having been to government schools. A higher percentage (10.8%) were literate in Arabic from Quranic schools, but this is limited entirely to religious education. Delta Tamasheq Quranic schooling consists of marabouts (religious men) who take on one or two students just to learn the Quran. Quranic literacy has not changed any social relationships or access to the modern world.

Marriage

Figure 5.3 shows the age-sex distribution by marital status, and a population where at every age there is a sizeable proportion of women who are not currently married, although almost everyone marries at least once. Kel Tamasheq are monogamous and do not practise the levirate. They are also class-endogamous with the majority of marriages between close kin. For nobles all child-bearing is within marriage, and although Bella women do occasionally have illegitimate children this occurs infrequently in the Delta. Nobles also occasionally practise precocious marriages whereby young girls are married well before puberty (aged 9 or 10) and move in with their husbands, although sexual relations should not start before the girl has developed breasts. Nowadays these marriages are less common than in the past.

FIGURE 5.3 DELTA TAMASHEQ: AGE-SEX DISTRIBUTION BY MARITAL STATUS



Women interviewed

Table 5.2 shows some of the characteristics of those women who were interviewed and those who were not. At every age a higher proportion of those not interviewed were reported single. Although this may represent a reluctance to allow unmarried girls to be interviewed, it also reflects the greater amount of mobility allowed to older unmarried women who may travel and visit relatives and were therefore absent for the survey. The higher proportion of single women who were not interviewed is reflected in their lower parities and throughout, uninterviewed women have much lower reported current fertility. Unlike the Bambara, Tamasheq women do not go on hot season labour migration, and thus a higher proportion of women of all ages were interviewed, and a relatively constant proportion omitted by age and only about eleven per cent are missing in each age group.

Fertility

Figure 5.4 shows the reported parities and current fertility for both data sets broken down by social class. As we know already that there is major age misreporting, few concrete conclusions can be drawn from reported patterns of fertility. For the household data the current fertility of the two oldest age groups is most probably an overestimate; it is likely that those women whose ages were boosted beyond 50 were those who had finished child-bearing leaving a small selected age-group of child-bearing women. In both data sets noble women have later child-bearing than Bella, whose current fertility peaks at a younger age. This is inconsistent with precocious noble marriages, but prepubertal sexual relations may actually reduce girls' fecundity, besides which, these marriages which tend to be with much older men, frequently break down before the girl has even started to menstruate.

Parities are similar for both data sets and reflect the patterns of current fertility with Bella women having higher parities at younger ages. In all cases except noble household data, there

Table 5.2

DELTA TAMASHEQ: CHARACTERISTICS OF WOMEN

INTERVIEWED AND NOT INTERVIEWED

	Total Women		Proportion not interviewed			Proportion Single	
Age	Int.	Not Int.	All	Nobles	Bella	Int.	Not Int.
15-19	238	41	.15	.15	.15	.56	.78
20-24	276	36	.11	.10	.13	.23	.50
25-29	260	25	.09	.09	.09	.14	.40
30-34	206	26	.11	.07	.15	.07	.12
35-39	116	15	.11	.11	.12	.03	.07
40-44	109	11	.09	.08	.10	.04	.18
45-49	63	8	.11	.13	.10	.11	.13
			.125				

Parity		a.s.f.r.		Proportion dead of Children ever born	
Int.	Not Int.	Int.	Not Int.	Int.	Not Int.
.26	.15	.110	0	.206	.500
1.37	.63	.196	.056	.223	.091
2.55	1.60	.231	.160	.254	.250
4.00	3.80	.220	.125	.328	.368
4.63	4.67	.190	.077	.343	.286
5.30	4.36	.101	0	.400	.313
5.08	6.13	.048	.125	.381	.429

FIGURE 5.4 DELTA TAMASHEQ: REPORTED CURRENT FERTILITY AND PARITY

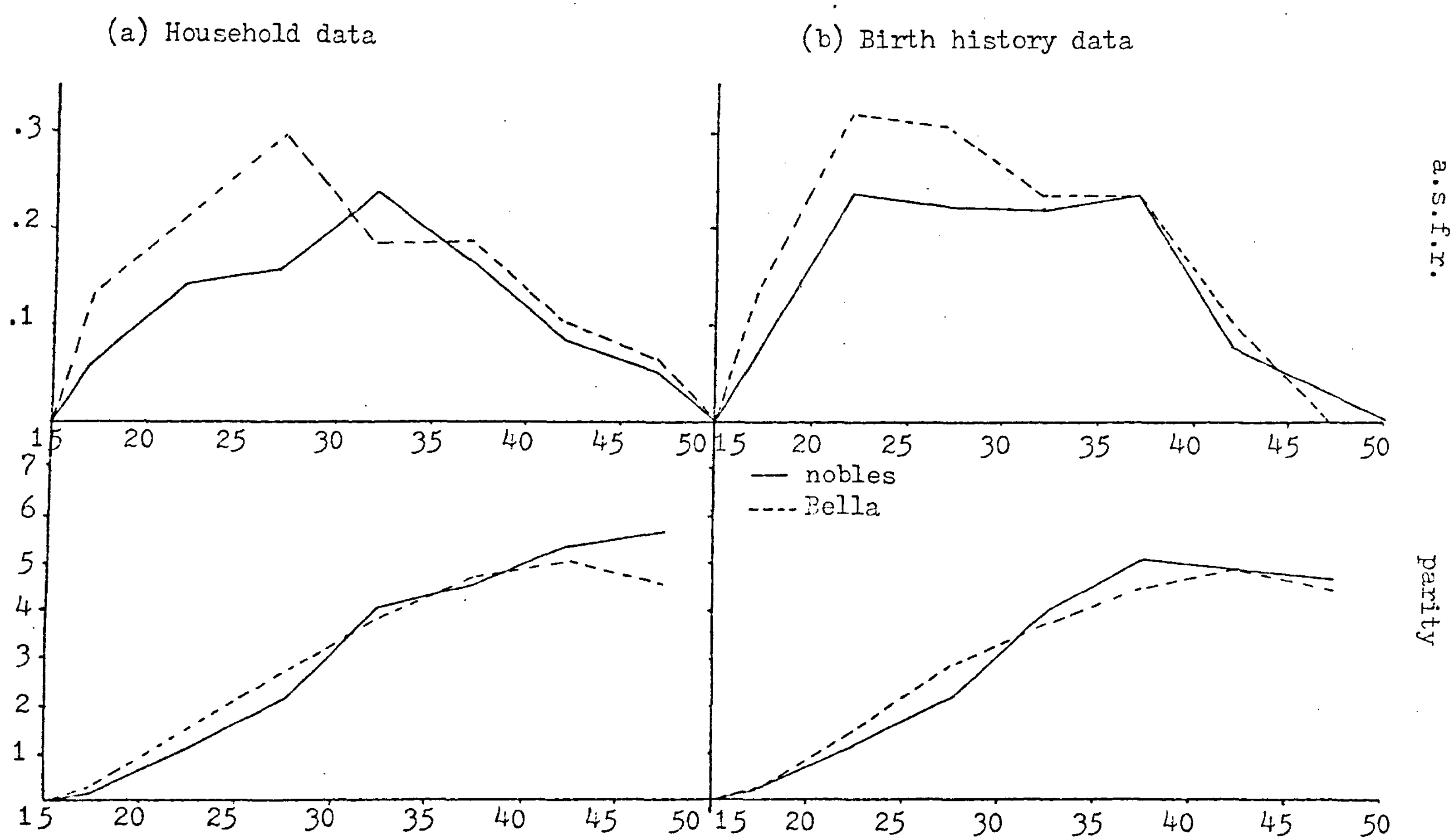


Table 5.3

DELTA TAMASHEQ PARITY, CURRENT FERTILITY AND P/F RATIOS - Household data

(i) All

	TOTAL WOMEN	CEB	BLYR	REPORTED PARITY	REPORTED a.s.f.r.	P/F
15-19	279	69	26	0.2473	0.0932	1.1510
20-24	311	399	55	1.2830	0.1768	1.3268
25-29	285	703	64	2.4667	0.2246	1.2181
30-34	231	918	49	3.9740	0.2121	1.2740
35-39	131	607	23	4.6336	0.1756	1.1345
40-44	120	626	11	5.2167	0.0917	1.1279
45-49	71	369	4	5.1972	0.0563	1.0219

(ii) Nobles

	TOTAL WOMEN	CEB	BLYR	REPORTED PARITY	REPORTED a.s.f.r.	P/F
15-19	151	29	9	0.1921	0.0596	1.4260
20-24	161	172	23	1.0683	0.1429	1.4716
25-29	146	321	23	2.1986	0.1575	1.5231
30-34	127	517	30	4.0709	0.2362	1.6076
35-39	72	328	12	4.5556	0.1667	1.2995
40-44	71	378	6	5.3239	0.0845	1.3256
45-49	40	227	2	5.6750	0.0500	1.2814

(iii) Bella and Blacksmiths

	TOTAL WOMEN	CEB	BLYR	REPORTED PARITY	REPORTED a.s.f.r.	P/F
15-19	128	40	17	0.3125	0.1328	1.0080
20-24	150	227	32	1.5133	0.2133	1.2155
25-29	139	382	41	2.7482	0.2950	1.0314
30-34	104	401	19	3.8558	0.1827	1.0292
35-39	59	279	11	4.7288	0.1864	1.0060
40-44	49	248	5	5.0612	0.1020	0.9577
45-49	31	142	2	4.5806	0.0645	0.7886

Table 5.4

DELTA TAMASHEQ PARITY, CURRENT FERTILITY AND P/F RATIOS (BIRTH HISTORY DATA)

a) All

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	238	53	22	0.2227	0.0924	1.1319
20-24	302	398	82	0.3179	0.2715	1.0440
25-29	243	620	63	2.5514	0.2593	0.9767
30-34	195	751	43	3.8513	0.2205	1.0216
35-39	129	621	28	4.8140	0.2171	0.9785
40-44	104	507	9	4.8750	0.0865	0.8718
45-49	54	247	1	4.5741	0.0185	0.7876

b) Nobles

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	139	29	9	0.2085	0.0647	1.5736
20-24	166	197	39	1.1867	0.2349	1.1593
25-29	117	258	26	2.2051	0.2222	1.0185
30-34	105	417	23	3.9714	0.2190	1.2227
35-39	73	371	17	5.0822	0.2329	1.1375
40-44	64	312	5	4.8750	0.0781	0.9572
45-49	32	149	1	4.6563	0.0313	0.8655

c) Bella

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	99	24	13	0.2424	0.1313	0.8403
20-24	136	201	43	1.4779	0.3162	0.9324
25-29	126	362	38	2.8730	0.3016	0.9060
30-34	90	334	21	3.7111	0.2332	0.8364
35-39	56	250	13	4.4643	0.2321	0.7892
40-44	40	195	4	4.8759	0.1000	0.7548
45-49	22	98	0	4.4545	0.0	0.6777

is underreporting of parity at older ages, which may be just underreporting of dead children [1]. Although actual adoption is infrequent, children are very mobile and may be brought up by a grandmother or mother's sister. Many Bella children leave their parents at an early age (6 or 7) to go and work for their owners. Thus living children may also be underreported.

Estimates of total fertility were made using the P/F ratio method (tables 5.3 and 5.4). All the ratios tail off at older ages because of the parity underreporting. For the population as a whole the series is quite even, but for some of the sub-groups, particularly the noble women, the ratios are somewhat erratic. Total fertility rates (table 3.5) were estimated using the means of P_2/F_2 and P_3/F_3 except for the Bella household data where P_4/F_4 was included because it was more in line with the earlier ratios.

Table 5.5 - Delta Tamasheq Total Fertility Rates Estimated Using P/F Ratio Methods

	All	Nobles	Bella
Household data	6.56	6.72	6.43 *
Birth History data	5.89	5.90	5.90

<u>Note</u>: Total fertility estimated using the average of P_2/F_2 and P_3/F_3 to adjust reported age specific fertility (births in the preceding 12 month) except for the values starred where the mean of P_2/F_2, P_3/F_3, P_4/F_4 was used.

It is curious that in every case the total fertility estimates from the household data are higher than those from the birth histories. This may be due to a problem which emerged during the survey, whereby

1. Cross checking of women in subsequent intensive fieldwork showed that daughters who had married and left home were also quite often omitted.

a man tended to report for his current wife all the chidren that he had had, including those from previous marriages. We attempted to rectify this during the fieldwork but it is possible that some cases were omitted. The estimated total fertilities show that in terms of final achievement there are no differences between noble and Bella fertility despite all the social and economic status variations.

Marital fertility

Estimates of marital fertility were made using the proportions currently married and the corrected current fertility rates from the P/F ratio calculations (table 5.6). The total marital fertilities do not differ by social class, although the patterns of fertility are very different. The very high estimate of marital fertility of the 15-19 year old Bella reflects the higher incidence of premarital conceptions in this group compared with the nobles whose social sanctions against premarital sexual relations are strong enough to prevent any premarital illegitimate children. For all Delta Tamasheq the marriage pattern obviously has a very pronounced effect on fertility, with periods outside marriage alone reducing the total fertility by about 35%.

Mortality

Infant and child mortality

The estimated q_x's, alphas and inferred ${}_1q_0$ and ${}_5q_0$ are presented for the household data in table 5.7. Ignoring the estimates from 15-19 year olds because of errors and their unrepresentativeness, for all groups the alphas increase with the age of mothers, indicating some slight improvements in child mortality recently. Brass's General Standard life table was used to infer each ${}_1q_0$ and ${}_5q_0$

Table 5.6

DELTA TAMASHEQ MARITAL FERTILITY

(HOUSEHOLD DATA)

a) All

age	asfr (from P/F)	proportion currently married	marital asfr	cumulated marital parity	
15-19	.1357	.382	.3552	1.776	
20-24	.2342	.660	.3548	3.550	
25-29	.2883	.719	.4010	5.555	
30-34	.2667	.793	.3363	7.237	
35-39	.2161	.702	.3078	8.776	
40-44	.1052	.717	.1467	9.510	
45-49	.0648	.535	.1211	10.115	TMFR

b) Nobles

age	asfr (from P/F)	proportion currently married	marital asfr	cumulated marital parity	
15-19	.1032	.395	.2613	1.306	
20-24	.2216	.642	.3452	3.032	
25-29	.2445	.726	.3368	4.716	
30-34	.3542	.836	.4237	6.834	
35-39	.2390	.681	.3510	8.589	
40-44	.1136	.690	.1646	9.412	
45-49	.0677	.575	.1177	10.001	TMFR

c) Bella

age	asfr (from P/F)	proportion currently married	marital asfr	cumulated marital parity	
15-19	.1652	.367	.4501 (.3253)*	2.251 (1.627)	
20-24	.2426	.680	.3568	4.035	
25-29	.3172	.712	.4455	6.262	
30-34	.1964	.760	.2584	7.554	
35-39	.1991	.729	.2731	8.920	
40-44	.1008	.755	.1335	9.587	
45-49	.0638	.484	.1318	10.246 (9.622)	TMF

*The figures in brackets are the estimatations using births born to currently married Bella Women for estimating marital fertility. Correction was made for reference period error.

Table 5.7

ESTIMATES OF INFANT AND CHILD MORTALITY

USING BRASS MULTIPLIERS

DELTA TAMASHEQ - (Household file)

(i) All

AGE GROUP	CHILDREN EVER BORN	CHILDREN SURVIVING	AGE X	Q(X)	ALPHA	DATE	$_1q_0$	$_5q_0$
1	69	53	1	0.2189	0.2311	80.20	0.2189	0.3228
2	399	313	2	0.2138	0.0641	78.52	0.1672	0.2545
3	703	524	3	0.2504	0.1069	76.57	0.1794	0.2711
4	918	613	5	0.3298	0.2469	74.33	0.2244	0.3298
5	607	403	10	0.3364	0.2101	71.89	0.2119	0.3137
6	626	380	15	0.3838	0.2763	69.11	0.2348	0.3429
7	369	226	20	0.3777	0.2054	65.71	0.2013	0.3117

(ii) Nobles

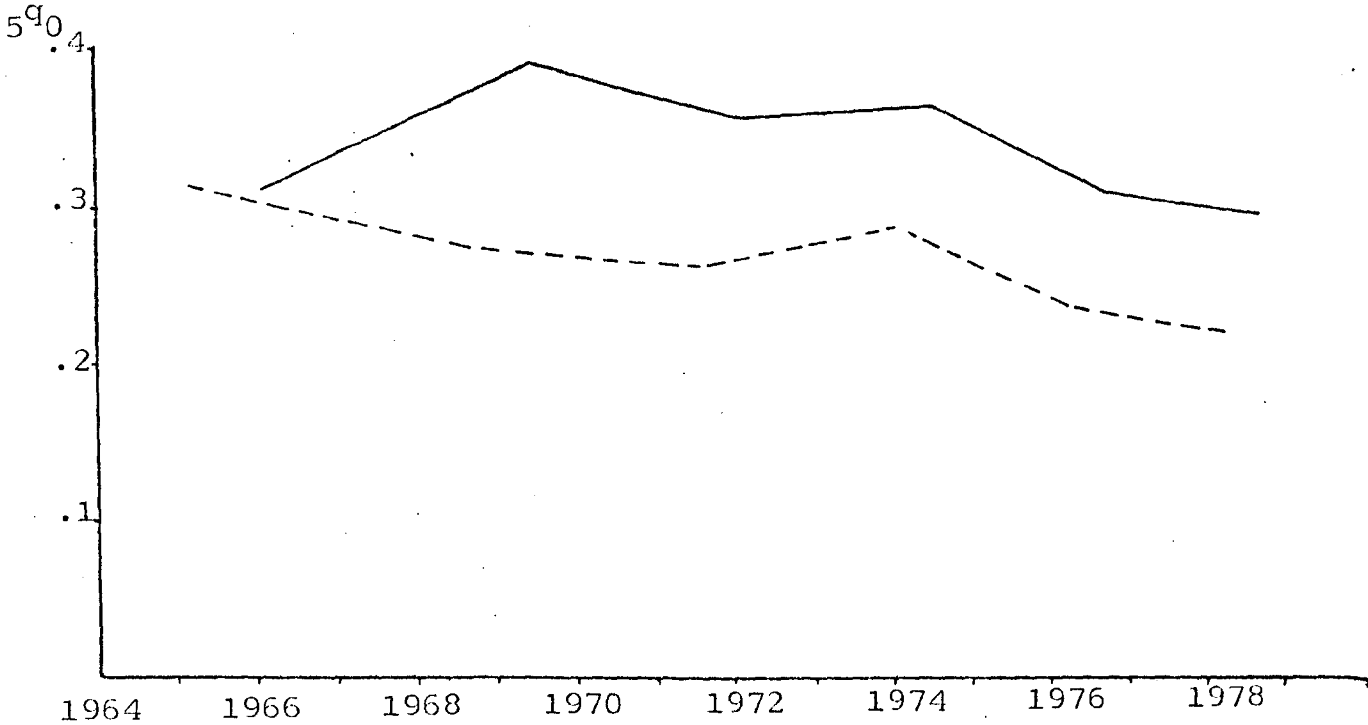
AGE GROUP	CHILDREN EVER BORN	CHILDREN SURVIVING	AGE X	Q(X)	ALPHA	DATE	$_1q_0$	$_5q_0$
1	29	21	1	0.2710	0.3722	80.24	0.2710	0.3873
2	172	129	2	0.2532	0.1744	78.74	0.2002	0.2985
3	321	228	3	0.2884	0.2037	76.83	0.2097	0.3109
4	517	329	5	0.3648	0.3242	74.61	0.2524	0.3648
5	328	204	10	0.3827	0.3107	72.20	0.2474	0.3586
6	378	212	15	0.4345	0.3813	69.48	0.2746	0.3916
7	227	140	20	0.3784	0.2070	66.16	0.2108	0.3124

(iii) Blacksmiths and Bella

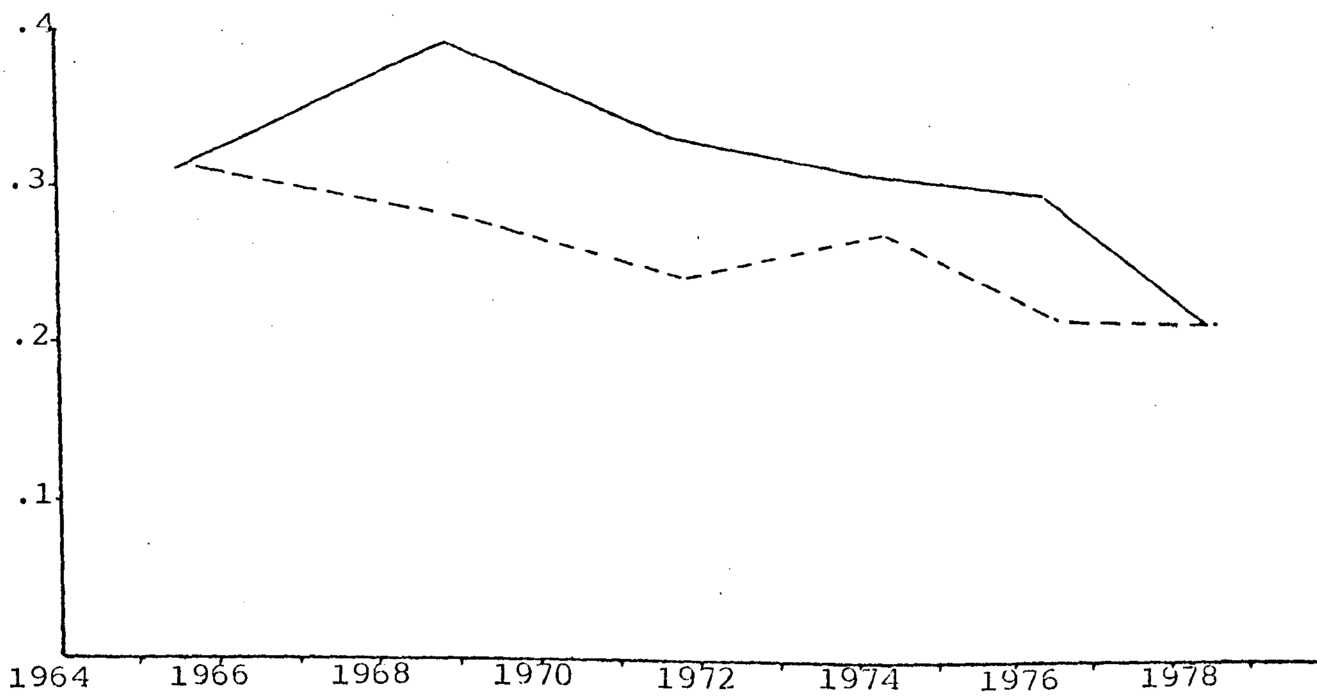
AGE GROUP	CHILDREN EVER BORN	CHILDREN SURVIVING	AGE X	Q(X)	ALPHA	DATE	$_1q_0$	$_5q_0$
1	40	32	1	0.1828	0.1181	80.16	0.1828	0.2755
2	227	184	2	0.1845	-0.0278	78.33	0.1431	0.2212
3	382	296	3	0.2188	0.0190	76.35	0.1550	0.2377
4	401	284	5	0.2869	0.1461	74.07	0.1913	0.2869
5	279	199	10	0.2841	0.0877	71.61	0.1738	0.2635
6	248	168	15	0.3113	0.1161	68.77	0.1822	0.2747
7	142	86	20	0.3798	0.2099	65.32	0.2118	0.3136

FIGURE 5.5 DELTA TAMASHEQ: TIME LOCATION OF $_5q_0$ ESTIMATED USING BRASS MULTIPLIERS

(a) Household data



(b) Birth history data



——— nobles

- - - Bella

because it represents an average experience, rather than due to a belief that it was the model which bore the closest resemblance to Tamasheq mortality patterns. Anyhow, at this stage of the analysis we are more interested in the time trends of the estimates and the pattern of differentials between the social clases. Figure 5.5 shows the time location of the estimates made from the household data and also from the birth histories. The pattern of both is much the same with:

(a) a slight improvement for both classes over the last few years;

(b) severe under-reporting of dead children for noble women in the oldest age group;

(c) nobles having consistently higher mortality than Bella.

The mean childhood mortality for nobles (${}_5q_0$) is .339 and for Bella, .266 from the household data, and .306 and .254 respectively from the birth history data.[2] This difference of over 50 per thousand is substantial, considering that both groups live in exactly the same physical environment and the same camps.

Adult mortality

For each respondents' age group, the proportions not orphaned, alphas and estimated $\overset{o}{e}_{15}$ are presented in tables 5.8 and 5.9, and figure 5.6 shows the time location of the estimates. For all women, and by social class, a gradual steady improvement in adult female mortality is indicated, with Bella mortality substantially lower than that of noble women. This difference is maintained at every age. At older ages the large oscillations in alpha for the noble women are due to small numbers rather than any significant variation. The mean age of noble women at the birth of their children is calculated to be two years higher than that of Bella. The age misreporting errors that could affect this were commented on in the fertility section, where it was noted that errors are likely to be such that in reality there is a smaller difference between classes and thus class adult mortality diferentials would be even greater.

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2. Calculated using the mean of the estimated ${}_5q_0$ for women aged 20-49.

Table 5.8

DELTA TAMASHEQ: ESTIMATES OF FEMALE ADULT MORTALITY USING ORPHANHOOD DATA

a) All

Respondents' age group	Proportion not orphaned	$\frac{l_{25+N}}{l_{25}}$	α	$\mathring{e}_{15}$	Mean age of mothers at the birth of their children
5-9	.928	.918	-.0548	44.13	
10-14	.896	.882	-.1146	45.09	
15-19	.829	.821	-.0468	44.00	
20-24	.738	.737	.0419	42.60	
25-29	.621	.629	.1431	41.07	
30-34	.477	.487	.3104	38.70	
35-39	.383	.393	.2525	39.49	
40-44	.260	.260	.3485	38.20	
45-49	.243	.222	.0011	43.24	M = 27.8

b) Nobles

Respondents' age group	Proportion not orphaned	$\frac{l_{25+N}}{l_{25}}$	α	$\mathring{e}_{15}$	Mean age of mothers at the birth of their children
5-9	.907	.897	.1321	41.23	
10-14	.871	.864	-.0021	43.29	
15-19	.825	.824	-.0629	44.26	
20-24	.699	.710	.1487	40.98	
25-29	.590	.620	.1754	40.59	
30-34	.428	.451	.4534	36.89	
35-39	.335	.365	.3636	38.00	
40-44	.216	.215	.6289	34.97	
45-49	.223	.234	-.0480	44.02	M = 28.86

c) Bella

Respondents' age group	Proportion not orphaned	$\frac{l_{25+N}}{l_{25}}$	α	$\mathring{e}_{15}$	Mean age of mothers at the birth of their children
5-9	.947	.938	-.2567	47.42	
10-14	.921	.898	-.2238	46.88	
15-19	.836	.827	-.0783	44.50	
20-24	.785	.773	-.0959	44.79	
25-29	.656	.650	.0728	42.13	
30-34	.543	.541	.1227	41.37	
35-39	.458	.450	.0608	42.31	
40-44	.336	.327	.0724	42.13	
45-49	.265	.233	-.0437	43.95	M = 26.92

Table 5.9

DELTA TAMASHEQ: ESTIMATES OF MALE ADULT MORTALITY USING ORPHANHOOD DATA

a) All

Respondents' age group	Proportion not orphaned	$\frac{l_{40+N}}{l_{40}}$	α	$\mathring{e}_{15}$	Mean age of fathers at the birth of their children
5-9	.869	.802	.2494	39.54	
10-14	.756	.695	.2855	39.04	
15-19	.652	.589	.2550	39.46	
20-24	.551	.437	.3569	38.09	
25-29	.405	.211	1.6768	29.45	
30-34	.207	.160	.6050	35.21	M = 36.39

b) Nobles

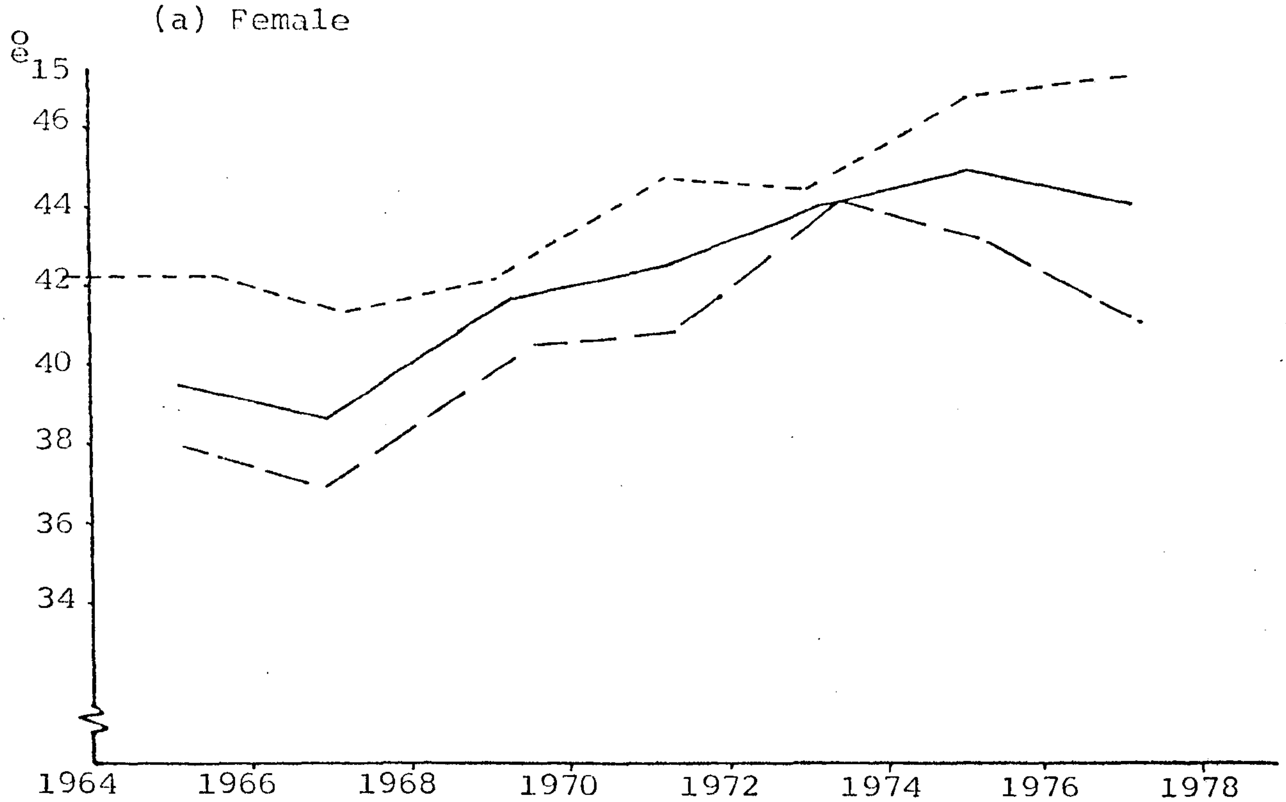
Respondents' age group	Proportion not orphaned	$\frac{l_{40+N}}{l_{40}}$	α	$\mathring{e}_{15}$	Mean age of fathers at the birth of their children
5-9	.887	.829	.0782	42.04	
10-14	.740	.718	.1732	40.62	
15-19	.672	.624	.1127	41.52	
20-24	.510	.464	.2404	39.66	
25-29	.392	.279	.5876	35.39	
30-34	.178	.139	.9459	32.34	M = 38.96

c) Bella

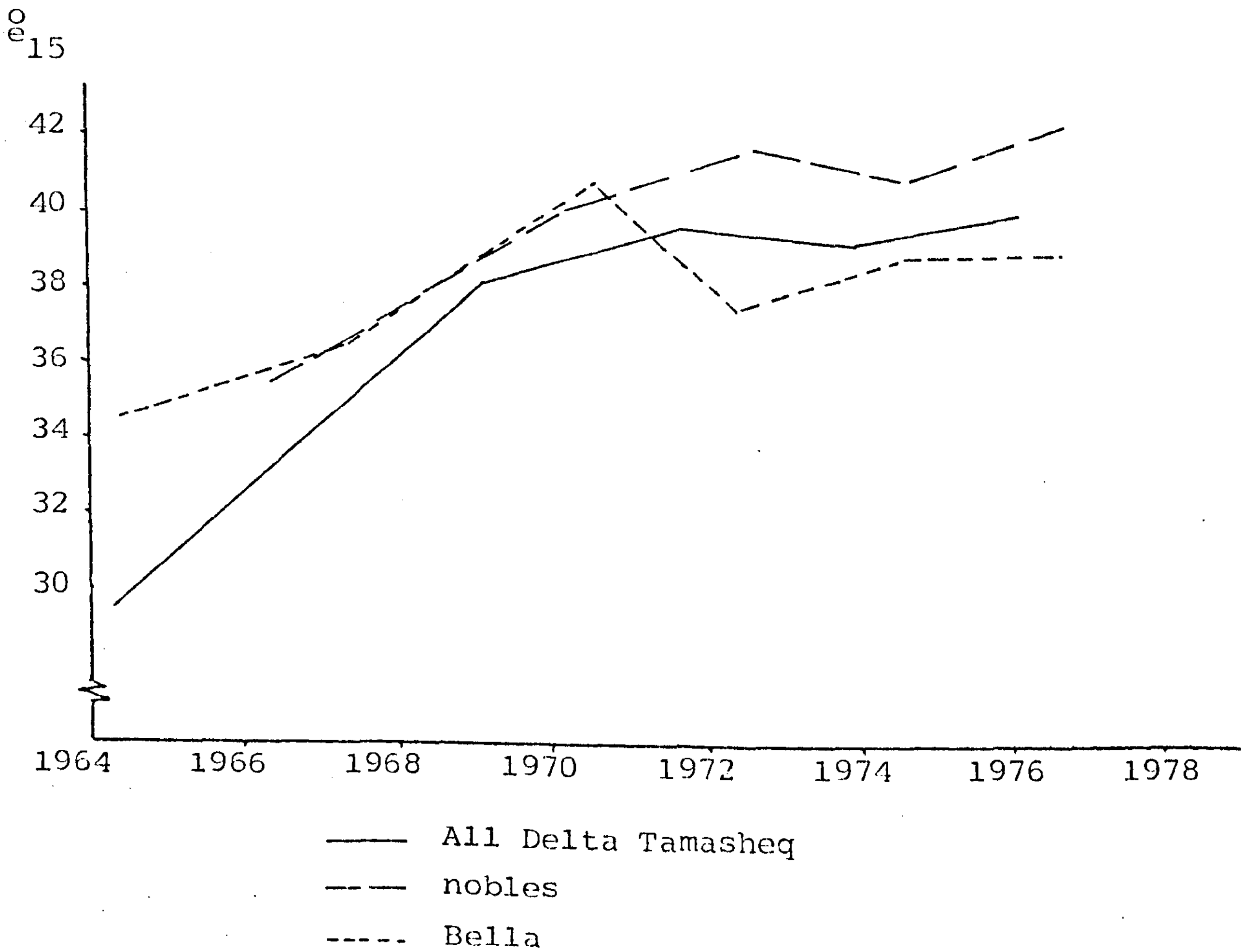
Respondents' age group	Proportion not orphaned	$\frac{l_{40+N}}{l_{40}}$	α	$\mathring{e}_{15}$	Mean age of fathers at the birth of their children
5-9	.852	.823	.3082	38.73	
10-14	.772	.738	.3156	38.63	
15-19	.623	.620	.4218	37.27	
20-24	.601	.574	.1655	40.74	
25-29	.420	.377	.4997	36.35	
30-34	.246	.240	.6716	34.55	
35-39	.231	.122	1.0083	31.94	
40-44	.082	.110	.0845	41.95	M = 34.82

FIGURE 5.6 DELTA TAMASHEQ ADULT MORTALITY: $\overset{o}{e}_{15}$ FROM ORPHANHOOD ESTIMATES USING BRASS WEIGHTS

(a) Female



(b) Male



For men, the social class variations in mean age at childbearing has a powerful effect on the estimates because different weights and ratios are used for the Bella. Given that this mean age of childbearing is only a rough approximation, whether differences in mean ages at first marriage or median ages of the currently married are used for calculating them, few conclusions can be drawn about social class patterns of adult male mortality. It seems that male mortality is rather heavier than that of females, but all the approximations used in calculating the former make even this conclusion hard to substantiate.

Discussion

It is hard to ignore the fact that the mortality estimates show both Bella women and children to have substantially lower mortality than nobles, with possibly the reverse effect for men, and not to link this phenomenon to maternal health and child care. This concept will be expanded in more detail elsewhere, but it must be stated here that noble women tend to be obese, immobile, and do little or no work, a way of life that is certainly considered to be unhealthy from the popular viewpoint of western medicine. Bella women however, are fitter and more active, although their work is not so strenuous nor their diet so restricted as that of many other African women. Physical well-being may be linked not only to lower levels or mortality for themselves but also to greater physical ability to care for their children. Those very factors that probably lead to noble women's higher mortality, obesity and immobility, may inhibit their ability to care for and supervise their children and thus, indirectly increase child morbidity and mortality.

It is perhaps surprising that such a highly stratified society, with substantial class associated mortality differentials should be so homogenous regarding total fertility, despite apparently different patterns of child-bearing. The combination of fertility and mortality rates confirms the indigenous perception of their demography. Nobles are frequently heard to say that the numbers of Bella are increasing in relation to themselves, and that Bella women always have lots of children around them. They explain this by saying that Bella children die less frequently because they are more adapted to the Delta climate because they originate from further south. It is possible that Bella children do have some genetic adaptation to the area which differs from that of the nobles of Berber origin - sickle cell trait is a factor that springs to mind - but the similarity of mortality variation between both women and children and not men, leads one to consider much more closely the mother-child relationship in mortality.

CHAPTER 6 - GOURMA TAMASHEQ RESULTS

Population structure

During the Gourma Tamasheq survey (March to May 1982) 6523 individuals were enumerated of whom 1751 were women aged 15-54. 1505 of these women were successfully interviewed with the birth history questionnaire. Table 6.1 shows the class distribution of those interviewed.

Table 6.1 Gourma Tamasheq: Population size and composition

	Imushar	Inesleman	Imghad	Low status illelan	Inhaden	Bella	non Tamasheq	Total
	57	400	1050	1903	238	2872	3	6523
Total		1507		2141		2872	3	6523
Women 15-54 eligible for interview		381		602		771	1	1754
Women interviewed		341		538		625	1	1505

The reported five year age-sex distribution and a smoothed five year distribution are shown in figure 6.1 and the reported single year age-sex distribution in figure 6.2. The reported distributions are somewhat irregular reflecting major age-misreporting particularly for women. The excess of women aged 55-59 over those aged 50-54 probably reflects the fact that the elder of these two groups did not have to have the birth history interviews. It is likely that the other large age groups (20-24 and 35-39) are manifestations of selective age misreporting partially dependent on marital status and fertility. The smoothed distribution indicates no particular deficit of teenage girls, but the bulge of 20-29 year olds and deficit

FIGURE 6.1 GOURMA TAMASHEQ: AGE-SEX DISTRIBUTION - FIVE YEAR AGE GROUPS (REPORTED AND SMOOTHED)

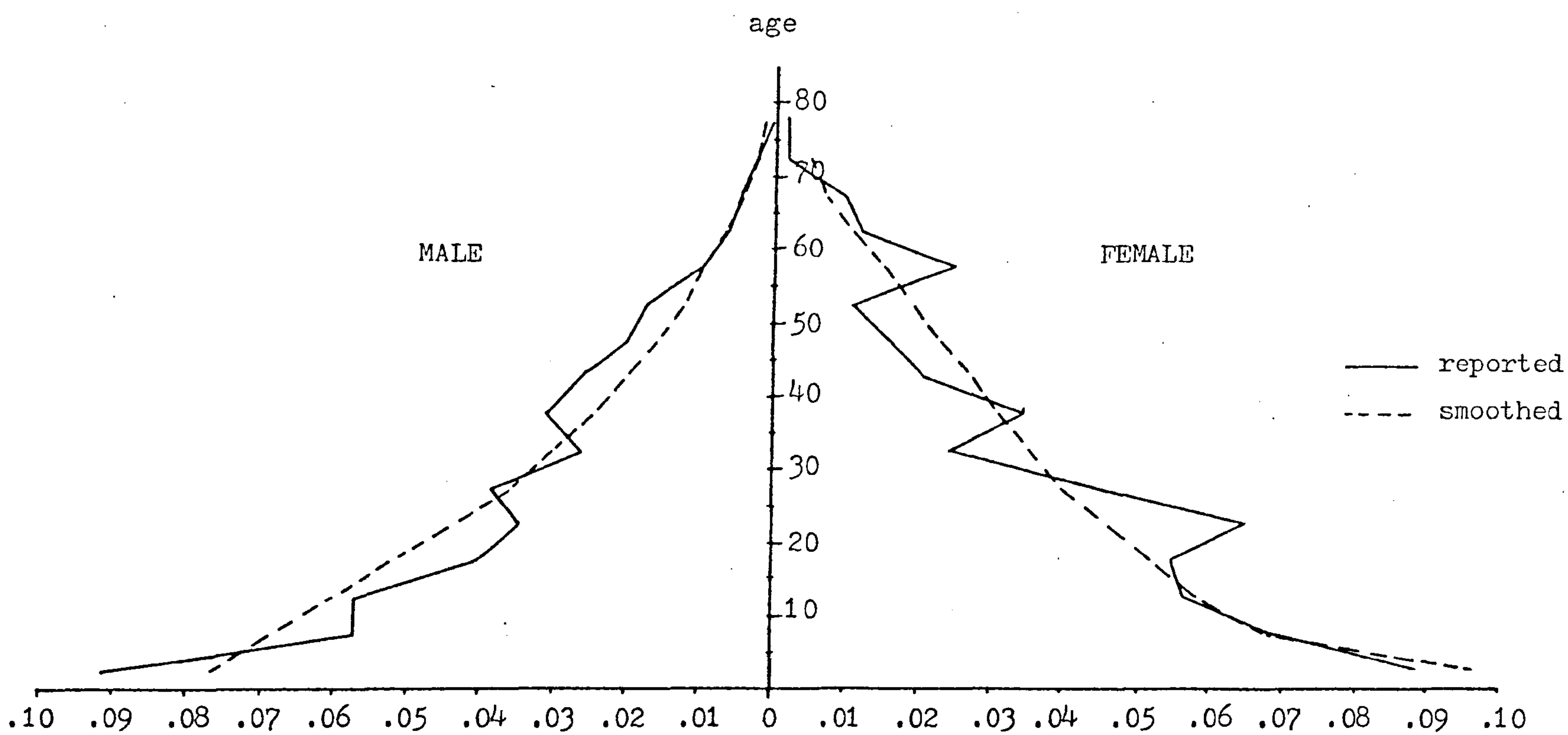
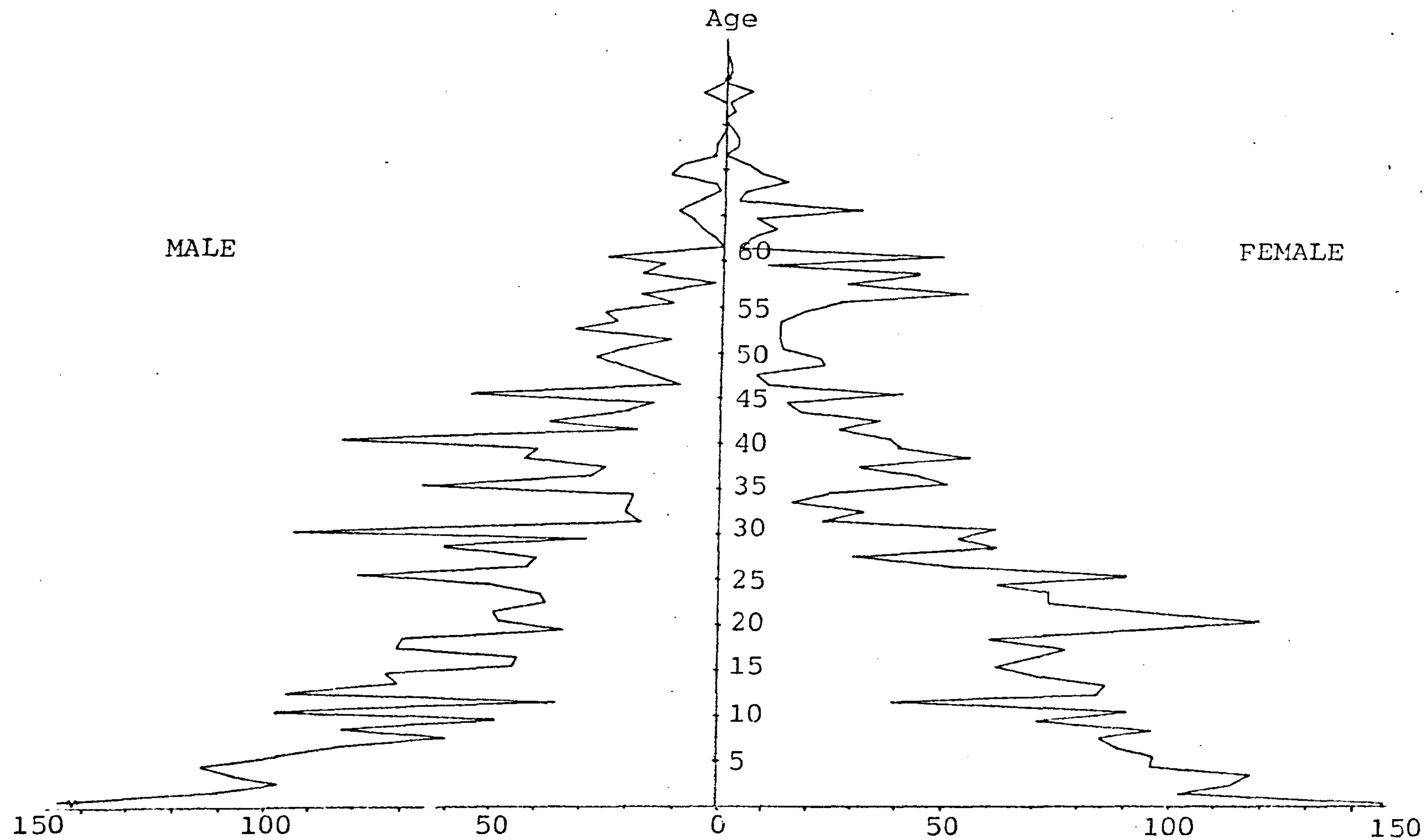


FIGURE 6.2 GOURMA TAMASHEQ: AGE-SEX DISTRIBUTION - SINGLE YEAR AGE GROUPS



of 30-45s indicates that women in their early thirties appear to be under-reporting their ages. For men, deficits at younger ages may well be due to out migration especially of Bella and low-status illelan.

The single year distribution reflects the event calendar used (see appendix 2) with no substantial preference for terminal digits 0 and 5, particularly for women. As the majority of women had absolutely no concept of age, it was usually necessary to establish an event around the time when they first menstruated and work from there ascribing an age of 15 at menarche. This arbitrary age of 15 obviously produces some biases, but they are minimal compared with the problems of age-reporting avoiding this method.

Table 6.2 shows the characteristics of those women who had a birth history interview and those who did not. In every age group a higher proportion of noble women was interviewed than Bella. This is purely a function of division of labour: in the Sahelian Gourma hot season, Bella women spend much of the day at the wells, far from the camps, whereas noble women are rarely far from home. At younger ages a higher proportion of those not interviewed were single and at all ages the interviewed women reported slightly higher parities and much higher current fertility - a phenomenon noticed in both the other two surveys. There is however no systematic variation in proportions dead. The parity differences are too small to have any significant effect on the estimates of fertility from the birth history data.

Literacy

0.5 per cent of the population surveyed were literate in French, having been to a government school, and 3.2 per cent could read and write Arabic which they had learnt at Quranic school. As those who succeed in the national school system generally leave both the area and the pastoral way of life, the real literacy rate of people originating from these camps is somewhat higher than the 0.5 per cent recorded.

Table 6.2

GOURMA TAMASHEQ: CHARACTERISTICS OF WOMEN
INTERVIEWED AND NOT INTERVIEWED

	Total Women		Proportions not interviewed				Proportions single	
Age	Int.	Not Int.	All	Nobles	L-S ill.	Bella	Int.	Not Int.
15-19	285	71	.20	.09	.16	.27	.502	.535
20-24	359	60	.14	.15	.11	.17	.123	.283
25-29	253	35	.12	.13	.09	.15	.051	.200
30-34	142	16	.10	.09	.07	.13	.049	.188
35-39	197	26	.12	.07	.14	.12	.046	0
40-44	122	11	.08	.05	.07	.13	.049	0
45-49	86	19	.18	.20	.14	.22	.023	.105
50-54	12	2	.14	0	0	.67	.034	.077

Parity		a.s.f.r.		Proportion dead of Children ever born	
Int.	Not Int.	Int.	Not Int.	Int.	Not Int.
.32	.31	.165	.056	.154	.409
1.51	1.18	.301	.200	.214	.254
2.74	2.09	.306	.147	.323	.315
3.61	3.31	.230	0	.398	.340
4.07	3.88	.138	.040	.380	.347
4.82	4.45	.076	.100	.422	.592
5.33	5.05	.074	0	.415	.427
5.25	3.50			.524	.286

Marriage

Figure 6.3 shows the age sex distribution by marital status. The most remarkable feature is the high proportion of widowed and divorced women compared with men, a pattern created by a combination of monogamy and large age differences within couples. It is not only at older ages that once married women are currently not married; the process starts at the beginning of the child bearing years. As in the Delta, for nobles the majority of child bearing is within marriage, although Bella extra marital fertility is rather more widespread and acceptable.

Fertility

Levels and patterns

Figure 6.4 shows the reported age-specific fertility rates and parities from both the household and birth history data sets, by social class. The irregularity of the age-specific fertility rates is caused partly by fluctuations due to small numbers, but also by age misreporting, especially for 30-34 year old noble women, who form a very small reported age group. High parity women actually aged 30-34 probably had their reported ages systematically raised and this is reflected in the parity data where the 30-34 parity is both low and out of line with other parities.

The overall pattern of childbearing is one of low fertility at older ages for all the classes, but quite high at younger ages. The parity reporting is generally quite good with only the low status illelan appearing to substantially underreport at older ages.

Tables 6.3 and 6.4 show the P/F ratios for both data sets, for the whole population and by social class. For the total population the ratios are quite even. They fall off gradually, but rise again at older ages. The ratios for the different social classes are

FIGURE 6.3 GOURMA TAMASHEQ: AGE-SEX DISTRIBUTION BY MARITAL STATUS

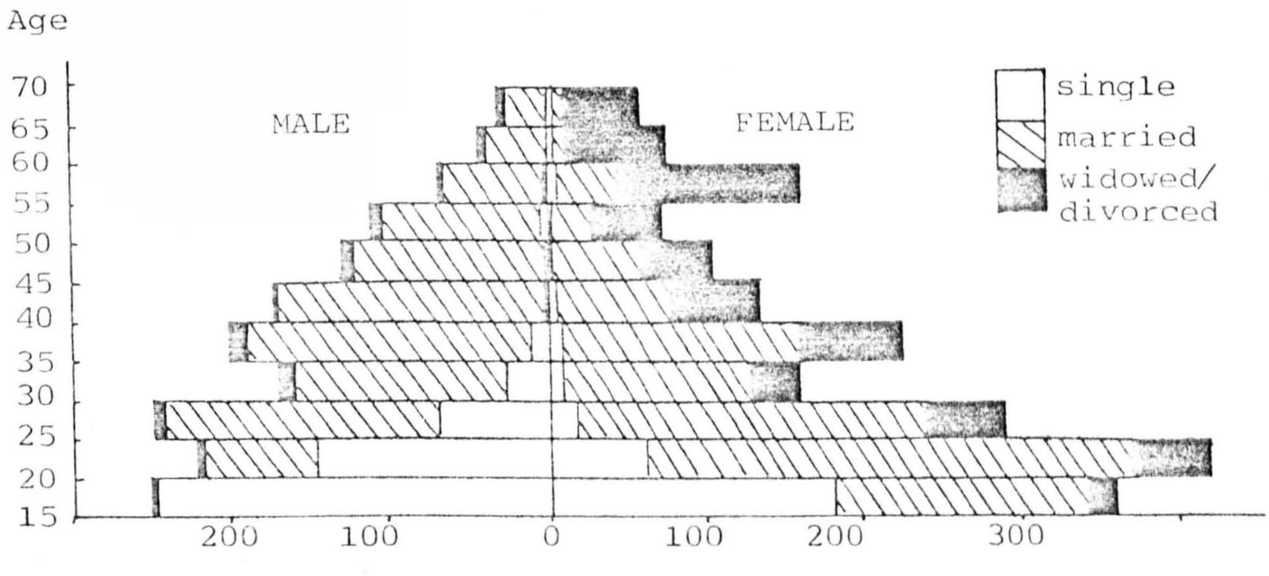


FIGURE 6.4 GOURMA TAMASHEQ: REPORTED CURRENT FERTILITY AND PARITY

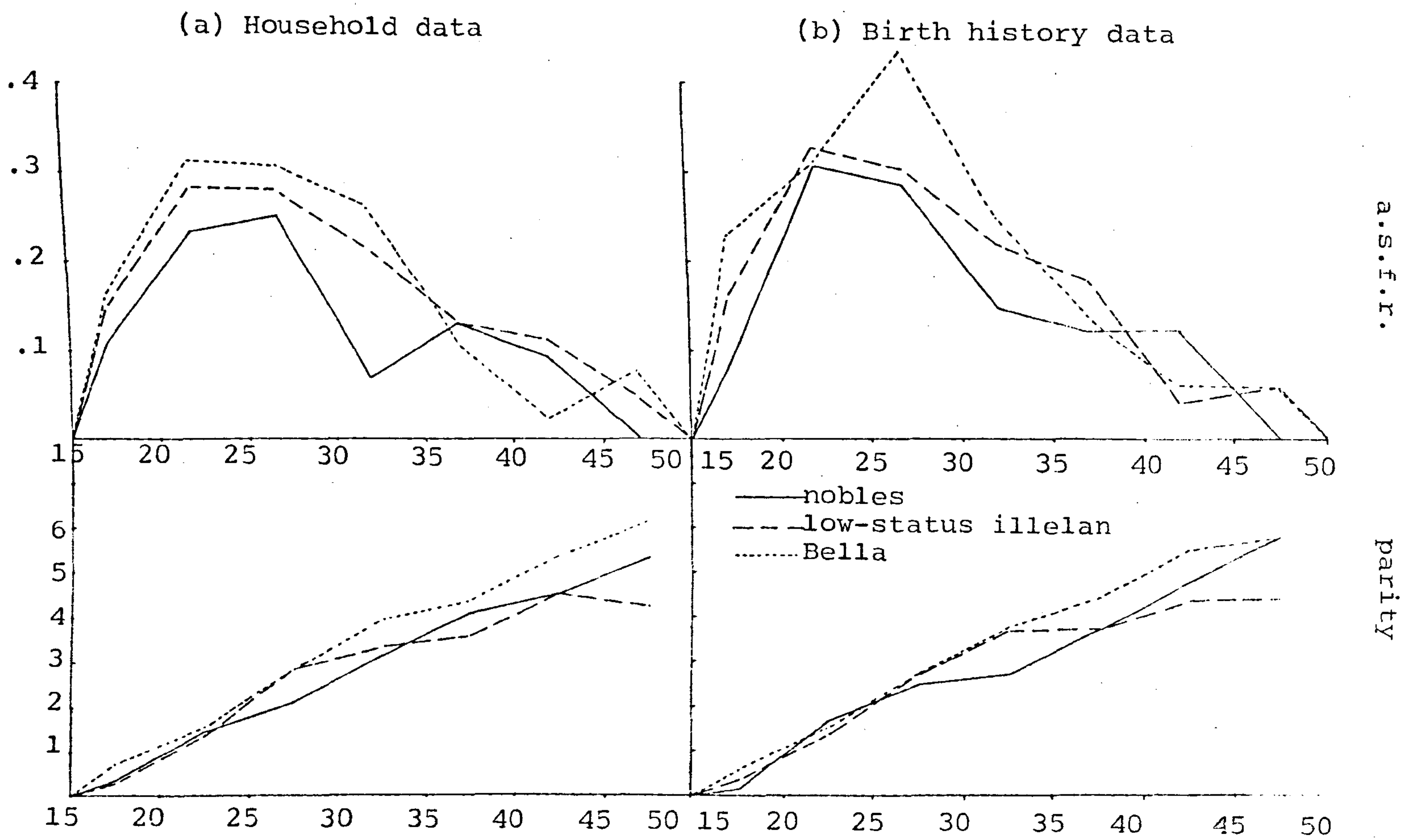


Table 6.3

GOURMA TAMASHEQ: PARITY, CURRENT FERTILITY AND P/F RATIOS (HOUSEHOLD DATA)

a) All

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	356	113	51	.317	.143	.984
20-24	419	614	120	1.465	.286	.948
25-29	288	767	82	2.663	.285	.876
30-34	158	566	31	3.582	.196	.854
35-39	223	903	27	4.049	.121	.822
40-44	133	637	10	4.790	.075	.903
45-49	105	554	6	5.276	.057	.917

5. = 5.82

b) Nobles

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	64	20	7	.313	.109	1.287
20-24	97	144	23	1.485	.237	1.219
25-29	60	126	15	2.100	.250	.817
30-34	45	141	3	3.133	.067	.994
35-39	46	187	6	4.065	.130	1.097
40-44	42	189	4	4.500	.095	1.038
45-49	10	53	0	5.300	0	1.192

5. = 4.44

c) Low Status Illelan

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	123	32	18	.260	.146	.784
20-24	141	187	40	1.326	.284	.849
25-29	104	292	29	2.808	.279	.933
30-34	41	139	9	3.390	.220	.799
35-39	76	276	10	3.632	.132	.723
40-44	45	203	5	4.511	.111	.803
45-49	44	186	2	4.227	.046	.701

5. = 6.08

d) Bella

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	169	61	26	.361	.154	1.046
20-24	181	283	57	1.564	.315	.928
25-29	124	349	38	2.815	.307	.861
30-34	72	286	19	3.972	.264	.838
35-39	101	440	11	4.356	.109	.783
40-44	46	245	1	5.326	.022	.946
45-49	51	315	4	6.177	.078	1.005

5. = 6.25

Table 6.4

GOURMA TWAREG: PARITY, CURRENT FERTILITY AND P/F RATIOS (BIRTH HISTORY DATA)

a) All Twareg

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	296	107	50	.362	.167	.942
20-24	355	522	112	1.470	.316	.851
25-29	229	615	82	2.686	.358	.756
30-34	171	591	36	3.456	.211	.709
35-39	173	702	25	4.059	.145	.709
40-44	134	654	9	4.881	.067	.797
45-49	82	424	4	5.171	.049	.794

5. = 6.54

b) Nobles

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	63	10	5	.159	.079	1.019
20-24	75	124	23	1.653	.307	1.286
25-29	49	124	14	2.531	.286	.888
30-34	48	130	7	2.708	.146	.711
35-39	41	153	5	3.732	.122	.843
40-44	33	158	4	4.788	.121	.927
45-49	13	75	0	5.769	0	1.088

5. = 5.31

c) Low Status

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	110	34	17	.309	.155	.897
20-24	131	174	43	1.328	.328	.765
25-29	79	215	24	2.722	.304	.810
30-34	55	205	12	3.727	.218	.810
35-39	51	189	9	3.706	.177	.660
40-44	51	222	2	4.353	.039	.736
45-49	35	154	2	4.400	.057	.696

5. = 6.39

d) Bella

Age	Total Women	CEB	BLYR	reported parity	reported asfr	P/F
15-19	123	63	28	.512	.228	.956
20-24	149	224	46	1.503	.309	.769
25-29	101	276	44	2.733	.436	.674
30-34	68	256	17	3.765	.250	.665
35-39	81	360	11	4.444	.136	.679
40-44	50	274	3	5.480	.060	.797
45-49	34	195	2	5.735	.059	.784

5. = 7.39

rather more erratic, as much due to small numbers as to reporting errors. In all classes except low-status illelan the ratios rise at older ages, a phenomenon usually associated with falling fertility. Changing marriage patterns are the only factor likely to lead to noticeable fertility changes in this population at the moment. It seems far more likely that errors in reported current fertility or random fluctuations in actual births in the last year are responsible for these apparent falls in fertility.

Table 6.5 - Gourma Tamasheq total fertility rates estimated using P/F ratio method.

	All	Nobles	Low status illelan	Bella
Household file	5.31*	4.48	5.23	5.58*
Birth history file	5.28* (5.07)	5.10	5.08	5.19

using average of P_2/F_2, P_3/F_3 and P_4/F_4

* using average of P_2/F_2 and P_3/F_3

Table 6.5 shows the estimated total fertility rates using the averages of either two or three P/F ratios, depending on the series. The household estimates give Bella the highest fertility and nobles the lowest. The estimate for the nobles, however, is lower than the reported parity for the 40-49 age groups, indicating falling fertility which I think is improbable. This anomalous result is due largely to irregularities in the current fertility distribution and small numbers. The estimates from the more regular birth history data seem to be more plausible. These show no difference at all in the total fertilities for the three classes.

Marital fertility

Having already rejected the current fertility distributions from the household data, the marital total fertility rates for the Gourma have been calculated using data from the birth history questionnaires (table 6.6), although for comparative purposes the household estimated total marital fertility rates are shown. From both data sets the total marital fertility for the whole sample is about the same (7.9 household, 8.2 individual) but the pattern between the classes differs. Low-status illelan marital fertility is consistently the lowest. Probably all we can say from these results is that small numbers, random fluctuations and age misreporting have combined to conceal any conclusive class differentials save this rather low level of low-status illelan marital fertility. Implicit in these marital fertility estimates is the assumption that all births occur within marriage which is false for the Bella who have quite high levels of premarital illegitimacy, and also illegitimate children born in between marriages or during husbands' migration periods. It is impossible to control for these unknown factors with the data available.

Mortality

Infant and child mortality

Infant and child mortality estimates were made using Brass multipliers and the General Standard Model life table. The alphas and the estimates of ${}_1q_0$ and ${}_5q_0$ are presented in table 6.7 along with a mean of the estimates obtained from all women excluding those aged 15-19. For all of the social classes, the estimate obtained from women aged 20-24 shows much lower mortality than the estimates for the older women. As estimates from women aged 25-29 are also consistently lower than those from 30-34 year olds it is possible that this represents a genuine fall in child mortality. It is clear that there are substantial mortality differentials between nobles and Bella, with the low-status illelan occupying an intermediary position. As these differences are reflected at every age they are unlikely to arise out of vagaries of the data and the small numbers, but rather to show genuine differences. Figure 6.5 shows the time location of the estimates for ${}_5q_0$ for each social class

Table 6.6

GOURMA TWAREG: MARITAL FERTILITY

(BIRTH HISTORY DATA)

	(1) asfr corrected using P/F	(2) proportion currently married	(3) marital asfr	(4) cumulated marital fertility	Total Marital Fertility Estimated from household data
a) All					
15-19	.1598	.471	.3393	1.696	
20-24	.2590	.730	.3548	3.470	
25-29	.2797	.799	.3501	5.221	
30-34	.1615	.749	.2156	6.299	
35-39	.1106	.659	.1678	7.138	
40-44	.0508	.530	.0958	7.617	
45-49	.0335	.512	.0654	7.944	8.211
b) Nobles	(1)	(2)	(3)	(4)	
15-19	.0975	.302	.3228	1.614	
20-24	.3050	.787	.3875	3.552	
25-29	.2624	.837	.3135	5.119	
30-34	.1353	.646	.2094	6.167	
35-39	.1177	.561	.2098	7.216	
40-44	.1026	.485	.2115	8.273	
45-49	0	.538	0	8.273	7.744
c) Low status Illelan	(1)	(2)	(3)	(4)	
15-19	.1469	.555	.2647	1.323	
20-24	.2629	.756	.3478	3.062	
25-29	.2359	.797	.2960	4.542	
30-34	.1692	.800	.2115	5.600	
35-39	.1297	.686	.1891	6.545	
40-44	.0298	.569	.0524	6.807	
45-49	.0409	.429	.0210	6.912	7.235
d) Bella	(1)	(2)	(3)	(4)	
15-19	.1830	.488	.3750	1.875	
20-24	.2233	.678	.3294	3.522	
25-29	.3000	.782	.3836	5.440	
30-34	.1648	.779	.2116	6.498	
35-39	.0899	.691	.1301	7.148	
40-44	.0405	.520	.0779	7.537	
45-49	.0361	.588	.0614	7.844	8.664

Table 6.7

GOURMA TAMASHEQ: ESTIMATES OF INFANT AND CHILD MORTALITY – HOUSEHOLD DATA USING BRASS MULTIPLIERS AND GENERAL STANDARD

a) All

Age group of mothers	Proportion dead of CEB	Age x	$_xq_o$	α	$_1q_o$	$_5q_o$
15–19	.204	1	.1861	.1292	.1861	.2800
20–24	.218	2	.2126	.0606	.1662	.2532
25–29	.322	3	.3131	.2623	.2298	.3366
30–34	.392	5	.3857	.3687	.2696	.3857
35–39	.377	10	.3731	.2903	.2399	.3493
40–44	.435	15	.4197	.3511	.2627	.3774
45–49	.417	20	.4016	.2557	.2275	.3337
			mean (excluding 1st gp)			.3393

b) Nobles *

Age group of mothers	Proportion dead of CEB	Age x	$_xq_o$	α	$_1q_o$	$_5q_o$
15–19	.450	1	.4379	.7418	.4379	.5695
20–24	.264	2	.2660	.2074	.2111	.3127
25–29	.365	3	.3625	.3724	.2714	.3877
30–34	.440	5	.4357	.4719	.3124	.4357
35–319	.444	10	.4435	.4360	.2973	.4182
40–44	.540	15	.5257	.5647	.3536	.4823
45–49	.453	20	.4401	.4619	.3082	.4308
			mean (excluding 1st gp)			.4112

c) Low Status Illelan

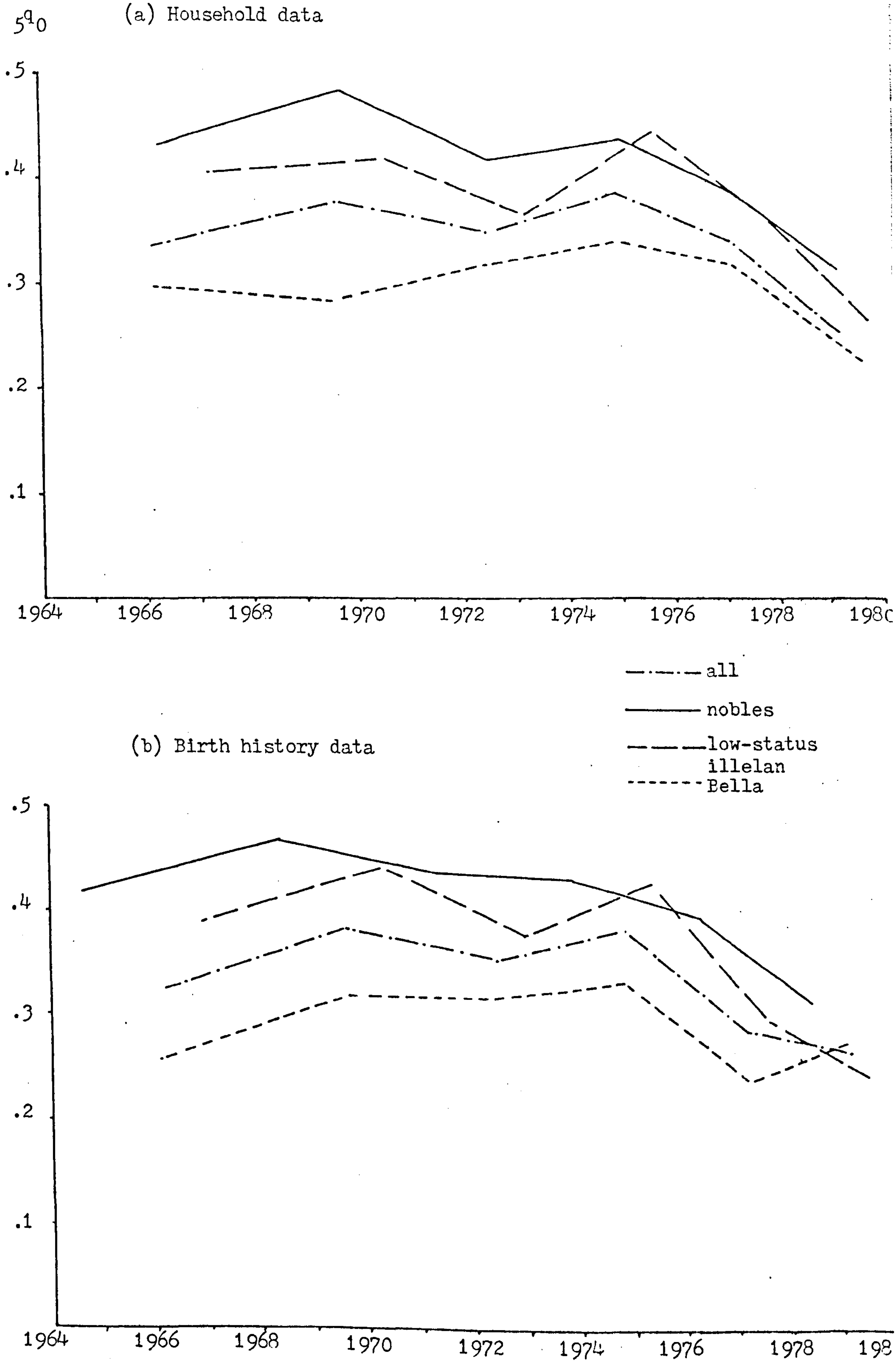
Age group of mothers	Proportion dead of CEB	Age x	$_xq_o$	α	$_1q_o$	$_5q_o$
15–19	.188	1	.1875	.1339	.1875	.2819
20–24	.219	2	.2240	.0941	.1757	.2660
25–29	.336	3	.3358	.3141	.2487	.3601
30–34	.439	5	.4419	.4848	.3177	.4419
35–39	.384	10	.3904	.3269	.2535	.3660
40–44	.463	15	.4602	.4333	.2958	.4167
45–49	.478	20	.4747	.4045	.2839	.4028
			mean (excluding 1st gp)			.3756

d) Bella

Age group of mothers	Proportion dead of CEB	Age x	$_xq_o$	α	$_1q_o$	$_5q_o$
15–19	.131	1	.1193	–.1327	.1193	.1872
20–24	.194	2	.1888	–.0138	.1466	.2261
25–29	.295	3	.2863	.1986	.2080	.3088
30–34	.346	5	.3398	.2694	.2323	.3398
35–39	.343	10	.3395	.2170	.2141	.3167
40–44	.331	15	.3184	.1326	.1871	.2814
45–49	.375	20	.3601	.1676	.1980	.2957
			mean (excluding 1st gp)			.2947

*calculated using conversion factors obtained from P1/P2 for first three values and mean age of fertility distribution for last 4 – could not use P2/P3 because was off the scale.

FIGURE 6.5 COURMA TAMASHEQ: TIME LOCATION OF $_5q_0$ ESTIMATES USING BRASS MULTIPLIERS



and the two data sets. Despite the differences in the recorded patterns of fertility from each data set, the two sets of mortality estimates are very similar to each other. In both cases there is high mortality for noble children, intermediate levels for low-status illelan and low Bella child mortality.

Adult mortality

Tables 6.8 and 6.9 show the proportions of respondents with mothers and fathers alive respectively; the alphas and $\overset{o}{e}_{15}$ estimated from these using Brass orphanhood techniques, are also shown.

The proportions orphaned are very high indicating extremely heavy adult mortality; in some cases the alphas were absurd (off the end of the General Standard scale). This applies mainly to the estimates of male adult mortality, and may just reflect the intrinsic problem of estimating the ages of fathers at the birth of their children; differences in the median ages of the currently married were used for this. An examination of the raw proportions shows that more Bella have their fathers alive than the other two social classes, but Bella men do marry earlier and have their children at younger ages.

For women the most striking difference is that between the Bella and the other two groups. Few estimations could be made for the nobles because mortality is so high, but the proportions indicate the degree of class variation, particularly as the mean ages of women at the birth of their children do not differ much. There is no evidence of change or improvement in adult mortality.

The adult mortality estimates for some of the sub-groups are so high that either there must be extraordinary conditions prevailing or substantial systematic data errors. On the latter subject we know that for the higher social classes (but not the Bella), taboos prevent a man from mentioning his father's name. However, the interview did not demand this as the only question was "Is your father alive?". This taboo does not affect the responses for younger

Table 6.8

GOURMA TAMASHEQ: PROPORTIONS WITH MOTHERS ALIVE, ALPHAS AND $\overset{o}{e}_{15}$ ESTIMATED USING BRASS ORPHANHOOD TECHNIQUES

AGE OF RESPONDENT	PROPORTION WITH MOTHER ALIVE	$\frac{l_{(25+N)}}{l_{25}}$	ALPHA	$\overset{o}{e}_{15}$	MEAN AGE OF MOTHERS AT THE BIRTH OF THEIR CHILDREN
All					
5-9	.872	.818	.877	32.8	
10-14	.742	.726	.968	32.2	
15-19	.695	.682	.661	34.7	
20-24	.646	.616	.560	35.7	
25-29	.510	.498	.705	34.2	
30-34	.447	.425	.577	35.5	
35-39	.333	.310	.643	34.8	25.73
Nobles					
5-9	.826	.756	**	**	
10-14	.649	.628	**	**	
15-19	.583	.568	**	**	
20-24	.521	.508	1.546	29.7	
25-29	.449	.444	1.122	31.3	
30-34	.414	.392	.764	33.7	26.14
Low Status illelan					
5-9	.857	.805	1.061	31.6	
10-14	.729	.701	1.297	30.5	
15-19	.644	.636	1.013	31.9	
20-24	.612	.582	.750	33.8	
25-29	.461	.446	1.098	31.4	
30-34	.375	.360	1.019	31.9	25.94
Bella					
5-9	.899	.851	.533	36.0	
10-14	.786	.784	.496	36.4	
15-19	.780	.772	.182	40.5	
20-24	.755	.715	.129	41.3	
25-29	.596	.579	.329	38.5	
30-34	.522	.497	.274	39.2	25.43

Table 6.9

GOURMA TAMASHEQ: PROPORTIONS WITH FATHER ALIVE, ALPHAS, AND ESTIMATED USING BRASS ORPHANHOOD TECHNIQUES

a) All

Age of respondent	Proportion with father alive	$\frac{l_{40+N}}{l_{37.5}}$	α	$\mathring{e}_{15}$	Mean age fathers at birth of childr
5-9	.825	.730	.838	33.11	
10-14	.629	.579	1.249	30.72	
15-19	.516	.474	.997	32.01	
20-24	.423	.330	1.317	30.45	
25-29	.262	.211	1.728	29.36	
30-34	.195	.107	***	***	37.70

b) Nobles

Age of respondent	Proportion with father alive	$\frac{l_{40+N}}{l_{37.5}}$	α	$\mathring{e}_{15}$	Mean age fathers at birth of childr
5-9	.804	.736	.769	33.67	
10-14	.532	.521	***	***	
15-19	.446	.443	1.540	29.76	
20-24	.400	.382	.680	34.47	
25-29	.238	.237	.974	32.15	
30-34	.232	.157	.654	34.72	40.89

c) Low status illelan

Age of respondent	Proportion with father alive	$\frac{l_{40+N}}{l_{37.5}}$	α	$\mathring{e}_{15}$	Mean age fathers at birth of childre
5-9	.813	.691	1.575	29.67	
10-14	.595	.552	2.485	28.63	
15-19	.516	.427	4.444	28.43	
20-24	.361	.281	***	***	
25-29	.250	.154	***	***	
30-34	.146	.094	***	***	36.75

d) Bella

Age of respondent	Proportion with father alive	$\frac{l_{40+N}}{l_{37.5}}$	α	$\mathring{e}_{15}$	Mean age fathers at birth of childre
5-9	.842	.754	.604	35.22	
10-14	.687	.610	.844	33.07	
15-19	.549	.515	.638	34.88	
20-24	.492	.341	1.097	31.44	
25-29	.288	.207	2.041	28.93	
30-34	.201	.116	***	***	35.64

*** Alpha too high for scale of The General Standard

* Calculated using mean age mothers at the birth of their children and differences in median age of the currently married

individuals because they themselves did no answer the question. Adoption or mobility and separation of parents and children would tend to cause errors in the opposite direction to that observed, with mortality recorded as lower than in reality. Age misreporting of respondents obviously does affect these estimations, and since we do not know the degree by which ages were pushed up or down we cannot tell whether this is a principal cause of the apparent high adult mortality. If it were, there would be a tendency towards very irregular estimates of mortality levels which in fact only occur for some groups, notably the male nobles. Really, the only conclusion that can be drawn is that mortality is very high with the exception of Bella women.

Discussion

A major problem encountered with the Gourma Tamasheq is the heterogeneity disclosed by these estimates, with the three social classes showing manifestly different levels and patterns of demographic parameters. Unfortunately the sample is too small to allow for detailed analysis by social class and we are forced to rely on measurements for the total population surveyed.

The principal findings are a low total fertility rate with no differences between social classes. There is substantial variation in both adult and child mortality with the Bella having lowest mortality. As with the Delta Tamasheq, there is a temptation to link the lower mortality of Bella women and children and contrast them with the high mortality of noble women and children, and consider the mother-child relationship for an indication of the causes of the differentials.

The total marital fertility rates indicate that although the marriage patern does explain much of the low fertility this is a population which is not approaching its full reproductive potential[1] and is

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1. Contraception is virtually unknown, and there is no anecdotal evidence indicating systematic abortion.

living up to the traditional expectations that nomadic past oralists have low fertility. It is commonly said in Mali, by doctors and lay people alike, that the Kel Tamasheq are riddled with syphilis which is why they have few children. Yet syphilis has far less fertility reducing effects than gonorrhoea, and anyway, there is little medical evidence to support this idea of a high prevalence of syphilis. The proportions of ever-married women aged 35-54 with zero and one child are .045 and .073 respectively; this does not indicate very high levels of sterility. Thus the relatively low level of fertility in the absence of contraception and abortion remains rather inconclusive, but other factors involved will be considered in the next chapter.

CHAPTER 7 - DEMOGRAPHIC PROFILES: BIOLOGICAL AND BIO-DEMOGRAPHIC RELATIONSHIPS

The demographic patterns

The separate demographic profiles presented in the three previous chapters are hard to compare without using some summary measures. As our interest here lies in the overall patterns rather than the levels of precise measures table 7.1a presents a series of summary figures derived from the indirect estimates of fertility and mortality. The patterns are then made clearer (table 7.1b) by categorising the fertility, child mortality and adult mortality of each population as high, medium or low according to somewhat arbitrary measures, which, nevertheless indicate the demographic patterns quite clearly. This is not an attempt to place these populations in a world-wide context, but rather to show their demographic profiles in relation to one another. In any other context they would all be high fertility, high mortality populations.

The picture emerging from table 7.1 is one of three different demographic regimes, although the two Tamasheq populations do show similar patterns of social class variation within the community. Bambara have high fertility, moderate to high child mortality and low adult mortality. Delta Tamasheq have lower fertility, moderate child mortality and higher adult mortality, whereas the Gourma Tamasheq manifest low fertility, moderate child mortality and extremely high adult mortality. The patterns for the sub-groups within each population indicate an association of higher fertility with lower child mortality (except for Delta Bella). High child mortality is associated with high adult female mortality, but independent of the level of adult male mortality.

It would be unrealistic to try and explain all this variability with a single all-encompassing theory. The frameworks of intermediate

Table 7.1

SUMMARY MEASURES OF FERTILITY AND MORTALITY
FOR THE THREE POPULATIONS

(a) measures

	FERTILITY household data TFR	CHILD MORTALITY[3] household data $_5q_0$	ADULT MORTALITY[1] female alpha	male alpha
Bambara	8.1	.36	-.188	-.056
Delta Tamasheq	6.6	.30	.006	.299 [2]
Gourma Tamasheq	5.3	.34	.724	1.323
Bambara				
Doura	7.5	.37	-.088	-.019
Monnimpe	9.2	.33	-.474	-.204
Delta Tamasheq				
Nobles	6.7	.35	.065	.278
Bella	6.4	.26	-.081	.351
Gourma Tamasheq				
Nobles	4.5	.41	>1	>1
L-S Illelan	5.2	.37	1.040	>1
Bella	5.6	.29	.284	>1

1. Mean alphas for respondents aged 10-29
2. Mean alphas for respondents aged 10-24
3. Mean estimated $_5q_0$ from women aged 20-44

Table 7.1 continued

(b) Schematic representation of summary measures

	Fertility	Child mortality	Adult mortality female	Adult mortality male
Bambara	***	**	*	*
Delta Tamasheq	**	**	**	**
Gourma Tamasheq	*	**	***	***
Bambara				
Doura	***	**	*	*
Monnimpe	***	**	*	*
Delta Tamasheq				
Nobles	**	**	**	**
Bella	**	*	*	**
Gourma Tamasheq				
Nobles	*	***	***	***
L-S Illelan	*	**	***	***
Bella	*	*	**	***

		TFR	$_5q_0$	alpha
***	HIGH	>7.5	>0.4	>.5
**	MEDIUM	6 to 7.5	0.3 to 0.4	0 to 0.5
*	LOW	<6	<0.3	<0

determinants of fertility and mortality tend to deal with each aspect separately and although this analytic structure will be used in the discussion of determinants of the demographic parameters, here, the results will be considered in the context of biological and bio-demographic factors which may be related to the variation observed. Particularly pertinent are the relationships between;

(i) fertility and mortality

(ii) nutrition and fertility

Fertility and mortality

The relationship between fertility and infant and child mortality operates on two levels, one of which is biological. The other, sociological level, is connected with theories of the demographic transition, and the value and need for children. Fertility is considered to be dependent on mortality because parents wish to be assured of the survival of a certain number of children. Replacement and insurance strategies are the two different approaches, but both are dependent on a contraceptive technology that permits conscious fertility decisions to be made. Thus they are irrelevant for these Malian populations.

Scrimshaw (1978) straddles the biological and sociological approaches when she argues that high mortality results from high fertility in the absence of conscious fertility controls because an excess of children leads to under-investment in care. She points out that much research fails to separate out the biological from the behavioural because of their synergy. There is also the added complication that behavioural factors range from the conscious actions of individuals, to the unconscious customs dictated by cultural norms, which are generally unquestioned by their practitioners. Many behavioural factors related to mortality operate through such unconscious, culturally determined, intermediate variables, but others, such as infanticide, may be a conscious social response to the problems created by high fertility. [1]

1. See Shostak (1982) - Kalahari bushmen practice infanticide when birth intervals are too short.

For non-contracepting populations, biological relationships between fertility and child mortality may be important determinants of different demographic patterns. These relationships reduce largely to birth interval effects, maternal age and parity, where birth intervals are substantially dependent on patterns of breast-feeding and post-partum abstinence. Where infant mortality is high, particularly neo-natal mortality, an infant death and cessation of breast-feeding leads to the increased probability of pregnancy. The reverse effect is also experienced, whereby high fertility, and concomitant shorter birth intervals, lead to higher infant mortality, particularly when the intervals are less than two years (Preston 1978; Federici & Terrenato 1980; Fortney & Higgins 1983).

Although closely correlated with each other, both maternal age and parity are independently linked with infant mortality, usually operating through birth weight and gestational age (Federici & Terrenato op. cit.) Iranian data have shown that children of mothers under 20 and over 30 have higher infant mortality, and that this increases thereafter with the age of the mother (Fortney & Higgins op. cit.). The same study showed that first born children and those of birth order six and over also have higher mortality than other birth orders. Similar results were obtained in a study in Senegal (Lecomte-Enselme 1983). Thus, one would expect the Bambara, with their early and unbroken marriage, and continuous exposure to childbearing from young to old ages, to have higher infant mortality than the Kel Tamasheq, whose women's childbearing is more restricted at these extreme ages. Higher Bambara total fertility also mean more high parity births, another risk factor also linked with shorter birth intervals.

For the Bambara, these bio-demographic factors may explain the maintenance of high child mortality in Monnimpe, where adult mortality is much lower than in Doura, and the general standard of living is better. Higher Monnimpe fertility, which is not entirely explained by earlier marriage, must be accompagnied by shorter birth intervals. Added to the earlier childbearing, this means an increased proportion of higher mortality risk children (see Preston 1980, Somoza 1980 and

Mott 1982 for data showing this elsewhere). Thus, the higher Monnimpe fertility may be causing Monnimpe mortality to be higher than if fertility were the same as in Doura.

Although for the Bambara, the expected relationship between high fertility and mortality does exist, biological factors are not the sole components of the observed patterns. They fail to explain the variation found within the two Tamasheq groups, and their social classes. Here, either low fertility is found with higher mortality (Gourma Tamasheq sub-groups) or fertility is entirely disassociated from mortality (Delta Tamasheq sub-groups). This phenomenon is not unknown in Tropical Africa where "every possible combination of levels of fertility and mortality is encountered... and the overall pattern is one of little association between the two rates" (Cantrelle, Ferry, Mondot 1978). These authors point out the importance of intermediate factors such as breast-feeding, postpartum amenorrhoea and the pathological factors of infection and nutrition. They use data from large surveys undertaken in Africa in the 1950's and 1960's, and show that, even when the data are analysed by region, there are no consistent fertility-mortality connections, with no evidence of cause and effect between the two, despite occasional associations. For example, a multi-round survey in Senegal (Cantrelle, Leridon and Livernais 1980) has produced similar results to those obtained from the Tamasheq surveys in Mali. In Senegal, two different zones showed identical fertility rates (TFR = 6.6 in Saloum and 6.8 in Sine) yet there were substantial differences in infant mortality with ${}_1q_o$ being .125 in Saloum and .210 in Sine. These mortality differentials exist despite better medical services and more health campaigns in the latter zone.

Nutrition, fertility and mortality

Maternal characteristics other than the purely bio-demographic variables such as age and parity may offer some clues as to the determinants of fertility and mortality; for example the relationship between maternal nutrition and fertility. Although extreme levels of malnutrition may be related to reduced fertility [2] in general, nutritional status appears to have only a minor effect on fecundity and fertility (Cantrelle and Ferry, 1978). Maternal nutrition may be more important in determining the duration of the child-bearing period. For American girls, there appears to be a mean weight necessary for menarche to occur, whether girls are early or late maturers, and thus girls with good nutritional status will mature earlier (Frisch 1978). This would have little general effect on fertility in Mali, as few girls marry immediately after menarche [3].

There is some evidence that age at menopause is related to nutritional status (Bongaarts, 1980). Developed countries appear to have later age at menopause than developing countries, although it is likely that there are other factors involved than nutrition alone. Data on age at menopause is lacking in both quality and quantity, and anyway, menopause itself may be preceded by several years of subfecundity. As the mean age at last birth is about 40 years for most natural fertility populations, this factor too, is unlikely to have a significant effect on fertility.

The most important effect of maternal nutrition on fertility is probably in its relationship with lactation, as there is evidence that poor maternal nutrition is linked with longer breastfeeding and longer

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2. In a starvation situation, psychological factors affecting libido and desire for children may be as important as physiological factors in reducing fertility.

3. Tamasheq noble women are an exception to this. It may be significant that the girls who are married before puberty are often the fattest women who were the most force-fed. Kel Tamasheq say that one of the reasons that husbands like very young wives to be force-fed is that it speeds up maturity and thus the onset of sexual relations. The latter may start before menarche, as soon as a girl has any physical development that may be identified as breasts.

lactational amenorrhoea (Mosley 1978, Wray 1978, Wenlock 1981, Caraël & Stanbury 1983). This may be provoked by more intensive breastfeeding by a hungry child, greater nipple stimulation and thus reduced probability of resumption of ovulation (MacNeilly 1978). In a purely biologically determined situation, the complex of relationships, particularly the correlation of short birth intervals with high mortality, would then tend towards lower mortality for these longer breastfed children. This moves towards a balance of mortality differentials between well-nourished, high fertility groups with short birth intervals, and poorer nourished but lower fertility groups with longer birth intervals.

Maternal nutrition is of course linked with a whole series of socio-economic conditions, themselves related to fertility and mortality. In developed countries socio-economic status is a good predictor of demographic variation, generally with a negative correlation between socio-economic status and mortality, and a J-shaped relationship with fertility. In these Malian populations, there is a strong association between socio-economic status and mortality for the Kel Tamasheq but variation in fertility is more closely related to ethnic differences than socio-economic status.

Discussion

None of the biological or bio-demographic relationships are very effective in explaining the unavoidable fact that the pastoral Tamasheq populations have much lower fertility than the Bambara cultivators,[4] as well as totally different mortality regimes. Hence, to understand

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4. The differences in fertility between Delta and Gourma Tamasheq have been noted elsewhere, the Delta Tamasheq being considered an exception to the general perception of low Twareg fertility (Gallais 1975, p78). "Les Kel Antassar (Delta Tamasheq) de l'Est offrent une situation différente. 'La natalité est relativement importante. Les ménages ayant quatre ou cinq enfants ne sont pas rares, parfois plus de dix. Mais, l'originalité ethnique et sociale de cette tribu est bien connue et expliquerait une situation démographique exceptionnelle."

why these differentials occur, we must discuss how they are achieved. Throughout the descriptions of the populations, several dominant themes kept appearing; the environment, household relationships, marriage and breastfeeding. The way to apply these themes to the data is through the intermediate variables frameworks. Through this means some of the important factors can be evaluated, and a forum is provided for the exploitation of the natural experiment formed by these data; populations of the same ethnic group living in different environments: different social classes living in the same environment and camps: the wealthy and powerful sections of society in the same living conditions as the poor and powerless. All of these can only increase our understanding of the processes at work on the relationships between the various determinants.

CHAPTER 8 - INTERMEDIATE DETERMINANTS OF FERTILITY

In Chapter 1 the basic principles underlying the Bongaarts framework of intermediate determinants of fertility were underlined. These are represented here in figure 8.1 [1]. If it were possible to calculate the effect of each intermediate variable in reducing fertility from its biological maximum, we would be closer to identifying the socio-economic determinants. Even then, a single factor can affect the intermediate variables in different ways, and the most profitable discussion of these socio-economic determinants remains based on descriptive, qualitative information.

Table 8.1 indicates:

(i) the data available for each intermediate variable for the three Malian populations;

(ii) whether these data are quantitative or qualitative;

(iii) if qualitative, whether the factor is thought to have a major or minor effect on their fertility.

Table 8.2 shows the quantitative effects of the different intermediate fertility determinants. The substantial difference in proportions of Bambara women married, compared with the two Tamasheq groups, is the most striking feature, and controlling for the marriage pattern reduces much of the fertility variation. In contrast, the mean duration of breastfeeding varies little between the populations, neither does the mean length of postpartum amenorrhoea. The total natural fertility rate, which assumes that contraception and abortion are not practised in any of the populations, shows high natural marital fertility for both Bambara and Delta Tamasheq, and rather lower for the Gourma Tamasheq.

Two other measured factors which might affect fertility are spousal separation and sterility. The Gourma Tamasheq have the highest rates of spousal separation with 7.1 per cent of husbands having

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1. Bongaarts' original 8 proximate determinants have been expanded by two. Within marriage, both spousal separation and abstinence can be considered important determinants of exposure.

FIGURE 8.1 THE INTERMEDIATE DETERMINANTS OF FERTILITY (after Bongaarts 1978)

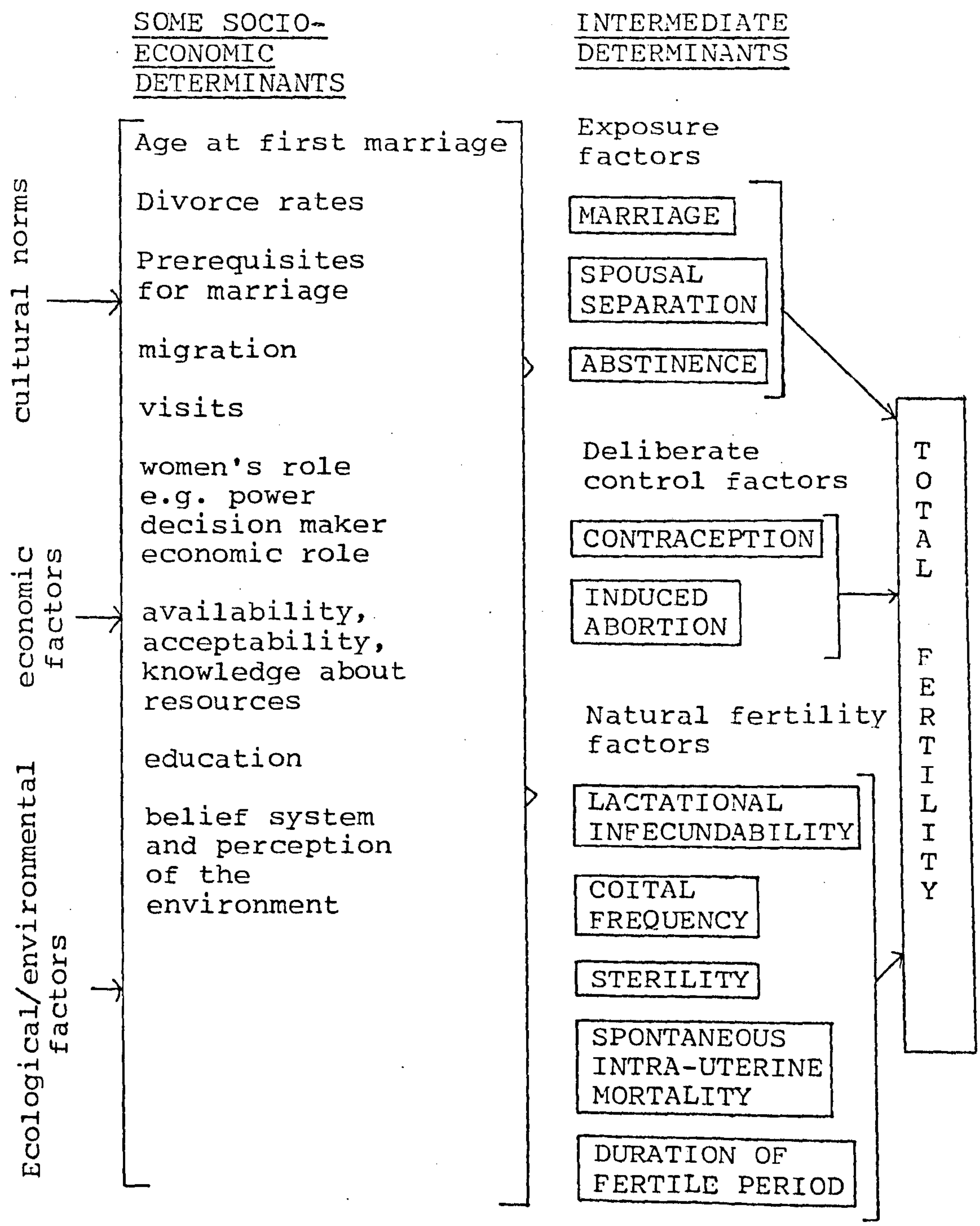

Table 3.1

DATA AVAILABLE ON INTERMEDIATE DETERMINANTS OF FERTILITY

		Bambara	Delta Tamasheq	Gourma Tamasheq
Marriage		Q	Q	Q
Spousal Separation		Q	Q	Q
Abstinence		D_o	D_o	D_o
Contraception		D_o	D_o	D_o
Induced Abortion		D_o	D_o	D_o
Lactational Infecundability		Q	Q	Q
Coital Frequency		X	X	X
Sterility	primary	Q	Q	Q
	secondary	D_o	$D_{o/i}$	D_i
Spontaneous Uterine Mortality		D_o	D_i	D_i
Duration of Fertile Period		(Q)	(Q)	(Q)

X no information

Q = quantitative data

D_o = descriptive qualitative data leading to conclusions of little importance in fertility reduction

D_i = descriptive qualitative data leading to conclusions of possible importance in fertility reduction

Table 8.2

(a) DATA FOR THE INTERMEDIATE FERTILITY VARIABLES

	Bambara	Delta Tamasheq	Gourma Tamasheq
percentage of women aged 15-49 currently married (household data)	85	64	64
mean duration of breastfeeding (2) (months)	21	23	21
reported mean (3) duration of post-partum amenorrhoea (months)	15	16	17
percentage of husbands absent for more than one week	12.9	9.6	12.0
(more than 12 weeks)	(5.2)	(1.9)	(7.1)
percentage of ever-married women aged 40-49 (40-54 Gourma) with no children	3.0	4.1	4.5

(b) ESTIMATES OF THE TWO PRINCIPAL INTERMEDIATE FERTILITY INDICES

	Bambara	Delta Tamasheq	Gourma Tamasheq
estimated TFR	8.1	6.6	5.3
C_m (4)	.91	.65	.66
Total marital fertility rate	8.9	10.1	7.9
C_i (5)	.61	.58	.61
calculated TFR (6)	8.5	5.8	6.2

2. For living children only
3. Truncated at 30 months
4. Taken from tables 4.6,5.6,6.6.
5. $C_i = \frac{20}{18.5+L}$ $L=1.753e^{0.1396B-0.001872B^2}$ where B = mean duration of breastfeeding
6. Calculated TFR $15.3 \times C_m \times C_i$

been absent for 12 weeks or more at the time of the survey. Similarly, although the sterility rates do not indicate major problems for any of the populations (compared with other areas in Africa where sterility may reach levels as high as 15-20 per cent) there is slightly more primary sterility for the Gourma Tamasheq. This, with the higher level of spousal separation explains some of the natural marital fertility differences.

For the data for which only qualitative data exist, the following facts are known.

Abstinence: All the populations abstain for forty days after a birth. Some older Delta Tamasheq women talk about two year periods of post-partum abstinence to prevent pregnancy, but they also said that few people practise this. Women who did abstain condemned those who did not, saying that the first child would suffer because of enforced early weaning. Judging from the frequency of birth intervals of less than two years, long-term post-partum abstinence is not frequent enough in this population to have any significant demographic effect.

Contraception: Knowledge of contraception was minimal or non-existent in all the groups. Generally, the attitude to the idea of contraception was amazement that women anywhere would want to reduce their fertility.

Induced abortion: There was no evidence of widespread abortion; it is possible that it is used in certain rare cases of unmarried pregnant women.

Sterility: For primary sterility there are data on the number of women at the end of childbearing years who have never had a live birth. For secondary sterility, although there are data on women with only one or two children followed by nothing, the lack of marriage histories means that, except for women currently married to their first husbands, we cannot know whether secondary sterility inhibited further childbearing or whether marriage breakup ended exposure. Both the Tamasheq groups, particularly in the Gourma, talk of women who have had one or two children and then no more for no apparent reason. The Kel Tamasheq are rumoured to be riddled with syphilis (though no proper epidemiological studies have been done) which would produce this sort of syndrome.

Spontaneous intra-uterine mortality: No statistical data exist, but again, both groups of Tamasheq women complain of a lot of miscarriages. Without objective comparisons it is impossible to judge whether their miscarriage rates are significantly higher than those of other populations.

Duration of the fertile period: Indirect data on this could come from the question on menstruation in the last month - but many women were aged by ascribing as age of 15 at menstruation and calculating their current age from there. This, along with the widespread age-misreporting means that, effectively, there are no data on the duration of the fertile period. It is unlikely to have any significant effect on fertility, as marriage is not dependent on menarche, and many women cease to be married before the end of their fecund years.

Coital frequency: No information is available on this. Barrett and Marshall (1968) have shown that this will only have a major effect on fertility when coital frequency is very low. With intercourse every six days fecundability is .17.

This method of analysis indicates that amongst these populations marriage is certainly the principal component of the fertility differences between Bambara and Delta Tamasheq, and it also explains much of the Gourma Tamasheq low fertility. In the latter case we cannot disprove entirely the popular theories of sterility and high levels of veneral diseases leading to low fertility. We can however examine in detail marriage patterns as a major cause of fertility reduction.

Of all the intermediate determinants, marriage is the furthest from the biological components, and the most deeply rooted in the whole socio-cultural system. Implicit in the marriage patterns are the role of women, the ritualised marriage procedures, the incest laws, the importance of alliances as well as the creation of reproductive units. Quantitative aspects of marriage such as polygamy rates, spousal age differences, age at first marriage and proportions married are ultimately rooted in the social control of marriage and cultural perception of its importance.

CHAPTER 9 - MEASURING MARRIAGE

Marriage is a central and complex component of the demography of most populations. Some form of marriage is essential in most cultures for legal reproduction to take place, and marriage thus influences fertility. It also generates population movement and the creation of new residential units. Its complexity arises from the fact that it is a socially defined institution where every group has its own combination of rules which are entangled with kinship, inheritance, politics, economics, religion and residence. Thus, for analysis of the marriage patterns of any population and the relationships between marriage and fertility, it is essential to consider the motives behind marriage. Van de Walle summed this up when he said that "Censuses and anthropological studies are essentially complementary" (Brass et al.1968). This chapter will consider the census aspect of marriage in the three communities, and the next chapter uses an anthropological perspective in an attempt to interpret the differences that arise both between and within the groups.

Demography isolates two major aspects of marriage; entry into first marriage and dissolution and re-marriage. In his nuptiality model, Coale (1971) identifies three parameters which explain all the variation in patterns of entry into marriage, for populations with the European marriage pattern[1] and those with the pattern of early and universal marriage typical of developing countries. These parameters, which are:

(i) Age at first marriage

(ii) The rate of marriage

(iii) The proportion ever marrying

will be considered in turn for a comparison of Bambara and Kel Tamasheq marriage.

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1. The European marriage pattern is one whereby women marry comparatively late , and a substantial percentage of women never marry.

Age at first marriage

In populations where marriage patterns have not been changing and the data come from a single round survey, there are generally two sources of data on age at first marriage; retrospectively reported age at first marriage and the proportions married at each age. The latter leads to a measure of the median age at first marriage as a period measure. Both data sources are subject to errors. We know already that there is major age mis-reporting in all these Malian populations, particularly the two Tamasheq groups, and van de Walle's point about African surveys is very relevent:

> "Respondents who don't know their age at the time of the survey deserve no confidence when they report their age at an event in the past."
>
> van de Walle in Brass et al. 1968.

The deficiencies in the retrospectively reported data lead me to concentrate here on current marital status.

The singulate mean age at marriage (SMAM) is one method of estimating the mean age at first marriage [2]. This method assumes that there is no differential mortality according to marital status, that the proportions single by age are accurately reported and that marriage occurs at the same rate throughout the five year age groups. Age-misreporting, however, particularly in the early ages of adulthood, is not usually independent of marital status. This may be especially true when a population has a normative idea of age at menarche, and marriage follows soon after a girl's first menses. SMAMs frequently lead to an over-estimate of mean age at first marriage because of marital status dependent age misreporting (Brass et al. 1968 - chapter on Marriage in Africa censuses and enquiries).

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2. The singulate mean age at marriage was originally elaborated by Hajnal (1953). It is the mean number of years spent single by the ever-married members of a population, and is calculated from the proportions single at each age.

Table 9.1

AGE AT FIRST MARRIAGE CALCULATED IN VARIOUS WAYS

	Bambara		Gourma Tamasheq		Delta Tamasheq	
	Men	Women	Men	Women	Men	Women
Median (5 year age groups)	28.9	18.3	24.7	18.0	27.2	19.3
Median (single year age groups)	28.3	17.5	23.9	17.9	26.3	18.2
Median (van de Walle's method)	26.4	17.0	25.1	17.3	27.1	18.2
SMAM	29.5	18.2	25.4	18.1	28.1	19.5

Table 9.1 shows a series of estimates of age at first marriage for the three Malian groups. All estimates assume that the marriage pattern has not changed recently, and they are based on reported proportions currently single. Account has been taken of those never marrying. The median using five year age groups was estimated using linear interpolation; for the median using single year age groups graphical interpolation was used. In the cases where the distribution was very irregular, it was first smoothed using a three point running mean. This smoothing never altered the estimation by more than 0.1 year. In all cases the single year median is lower than the five year median, indicating that the rate of marriage is not constant, and in fact diminishes after fifty per cent are married. This is particularly true for the Bambara where 90-95 per cent of women marry during the 15-19 age group. In an attempt to overcome problems of marital status dependent age-misreporting medians were calculated following van de Walle's stable population method (Brass et al. 1968). Princeton model stable populations were used, South model, fixing the level from l_5 of the life table estimates, and selecting the female GRR giving approximately the right proportion of 5:15-44 and the crude birth rate for the population.

These medians give the lowest estimates of age at first marriage for all groups except the Tamasheq men, indicating that there is some age misreporting dependent on marital status. In all cases, the SMAM gives the highest estimates. For women, the similarity between the single year median and the stable population estimate shows that much of the error in using five year age groups arises from different rates of marriage within the age group, rather than age-misreporting. All the methods give relatively consistent results, however, with little difference shown between the women of all the groups. The total range of all the female estimates is only two and a half years. There is much more variation in male age at marriage, with Bambara men marrying latest and Gourma Tamasheq men earliest.

Although the retrospectively reported data are less reliable, it is worth considering them to see if they are consistent with the above data. One problem with retrospective data is the truncation effect whereby younger age groups have younger ages at first marriage. Table 9.2 shows the mean reported age at first marriage for men aged 40-60 who married before age 40 and for women aged 30-60 who married before age 30. This controls for truncation, but only provides measures for a period long before the survey. The breakdown of these data shows no trend in age at first marriage (table 9.3).

Table 9.2

REPORTED MEAN AGE AT FIRST MARRIAGE:

men aged 40-69 married before age 40
women aged 30-69 married before age 30

	Bambara	Gourma Tamasheq	Delta Tamasheq
men	28.2	24.7	26.2
women	16.9	16.7	17.8

Comparison of tables 9.1 and 9.2 shows that all women report themselves as marrying younger than the current status data indicate. This effect is less marked amongst the men except for the Delta Tamasheq.

Table 9.3

TRENDS IN REPORTED AGE AT FIRST MARRIAGE

	Bambara	Gourma Tamasheq	Delta Tamasheq
Females			
Current age			
30-34	16.6	16.2	17.1
35-39	16.8	16.5	17.3
40-44	16.9	16.5	17.9
45-49	16.9	16.7	18.0
50-54	17.0	16.3	18.1
55-59	17.2	17.3	18.9
60-64	17.3	17.7	18.6
65-69	17.2	16.5	18.5
Males			
40-44	28.2	25.1	26.9
45-49	28.0	24.1	25.5
50-54	28.8	24.6	26.4
55-59	28.1	24.6	26.2
60-64	27.9	25.1	26.0
65-69	28.2	24.5	25.2

Proportions never married

Figures 9.1 and 9.2 show the proportions ever-married by age and sex for all three populations. For both Bambara men and women marriage is universal, but in both Tamasheq groups there is a small proportion who never marry. Irregularities in the data and small numbers at higher ages mean that the proportions never marrying have been estimated using an average over 15 years. The results are shown in table 9.4. The two Tamasheq groups do not differ and although marriage is not universal the proportions never marrying are very low when compared with the European marriage pattern.

Table 9.4

PERCENTAGE NEVER MARRYING BY SEX AND ETHNIC GROUP
(men: mean ages 50-64, women: mean ages 45-59)

	Bambara	Gourma Tamasheq	Delta Tamasheq
men	0	1.7	1.1
women	0	4.1	5.5

FIGURE 9.1 PROPORTIONS EVER-MARRIED OF ALL WOMEN, BY AGE AND ETHNIC GROUP

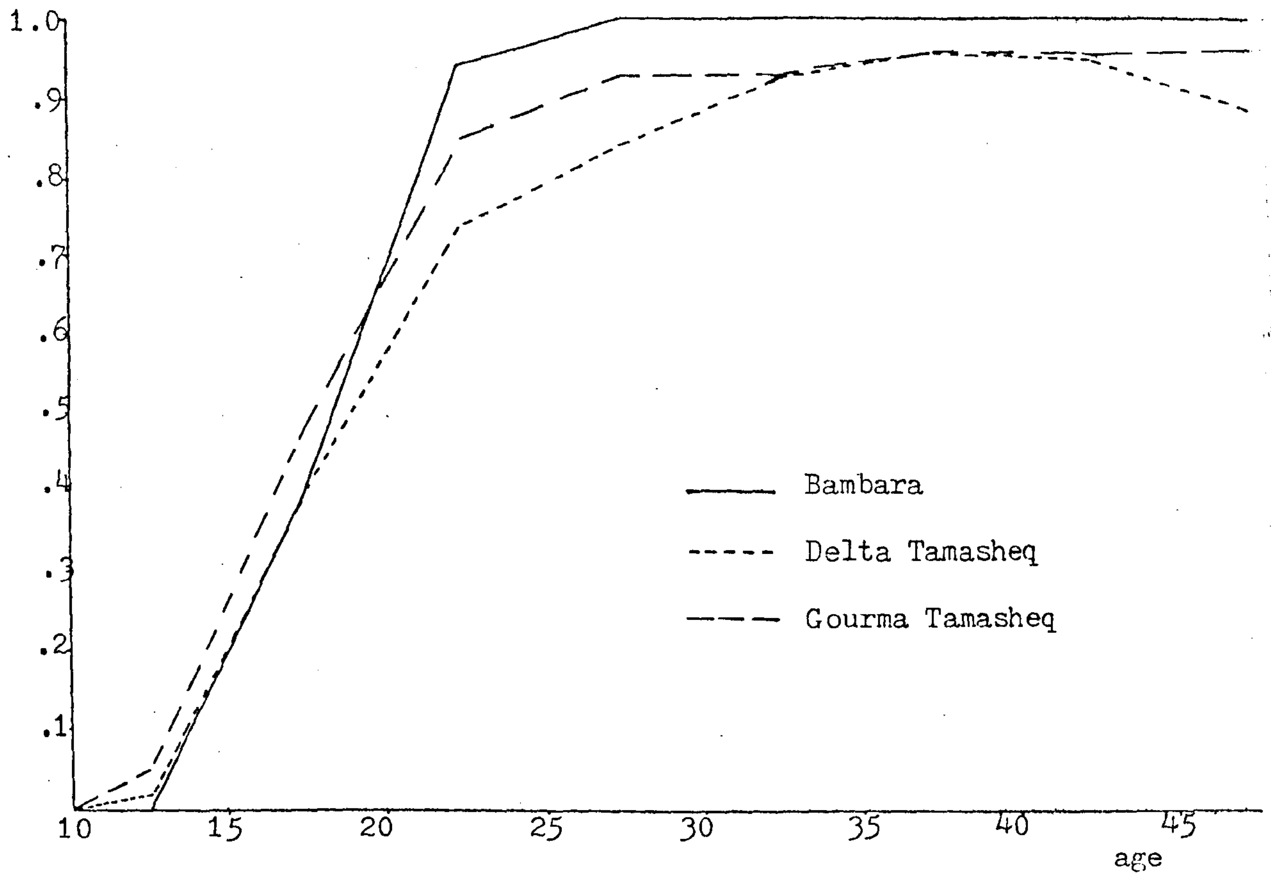
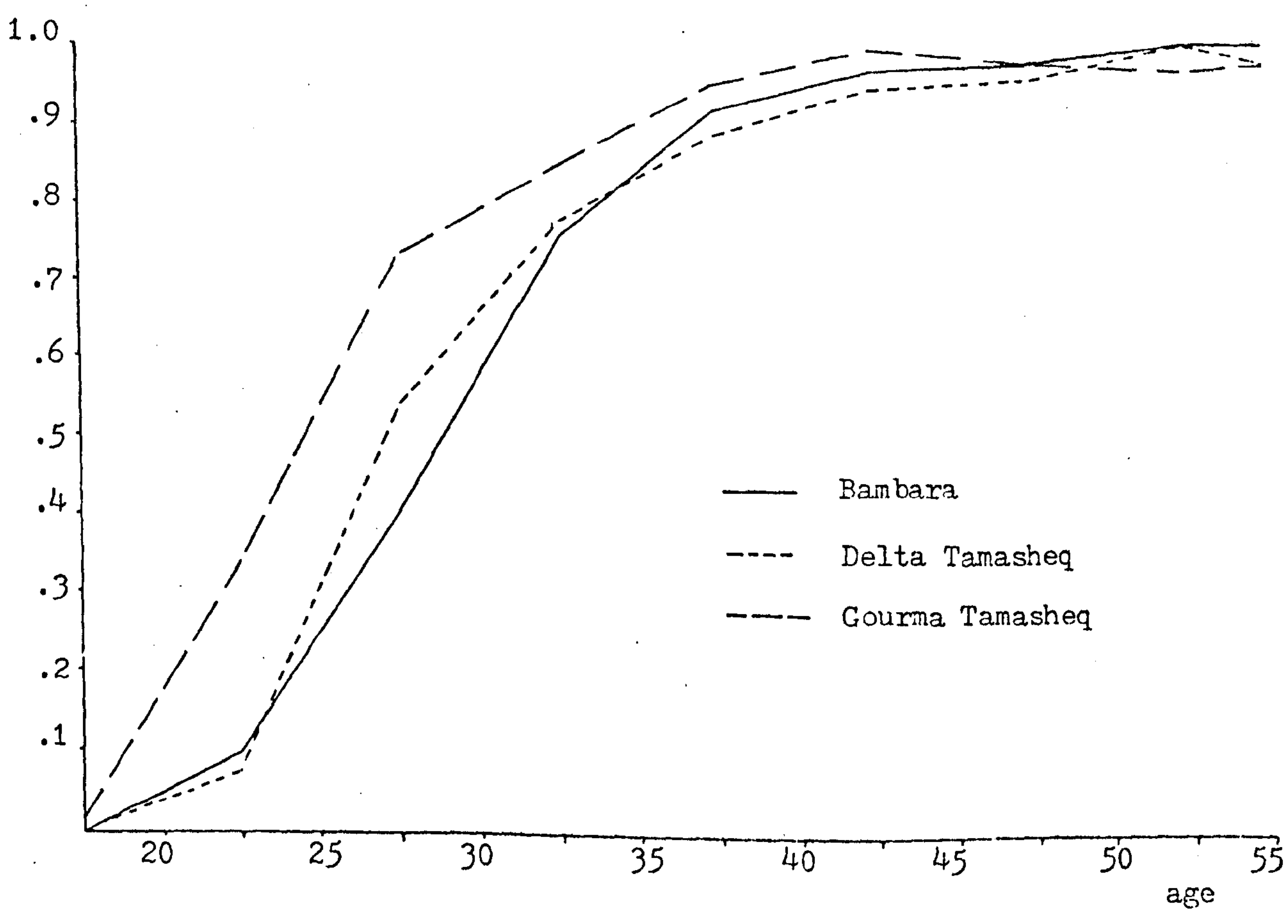


FIGURE 9.2 PROPORTIONS EVER-MARRIED OF ALL MEN, BY AGE AND ETHNIC GROUP



Rate of marriage

One measure of the rate of marriage is the number of years it takes for a given percentage of the population to marry. To avoid biases from skewed and long-tailed distribution, the time it took for the central 50% of the population to marry was estimated using linear interpolation from the proportions married in 5 year age groups (the total population rather than the ever-married was used). However, as for women the rate of marriage was thought to change substantially within 5 year age groups, the same measure was also calculated using the smoothed proportions married for single year age groups. Table 9.5 shows this measure to be much lower than that calculated using 5 year age groups, confirming that the rapid original rate of marriage does slow down for women as age at first marriage rises.

Table 9.5

NUMBER OF YEARS FOR THE PERCENTAGE EVER MARRIED TO INCREASE FROM 25% TO 75% OF THE POPULATION

	Bambara	Gourma Tamasheq	Delta Tamasheq
Men	7.4	7.4	7.7
Women (5 year groups)	5.2	6.3	7.5
Women Single year groups	2.5	3.7	5.9

Although the median age at first marriage differs for the groups of men, the rates of entry into marriage are very similar. On the contrary for women the median ages at marriage are similar but the rates of marriage by community are very different with Bambara women marrying very fast.

Dissolution, remarriage and polygamy

Coale's nuptiality model only considers entry into marriage, but, once married, an individual's status may change through divorce, widowhood and remarriage. Polygamy is important too, and the polygamy rate is a vital consideration when looking at the availability of marriage partners. Unfortunately the surveys did not include a complete marriage history, although both questionnaires included questions on current marital status and number of marriages. The women's questionnnaire also asked if she had any co-wives.

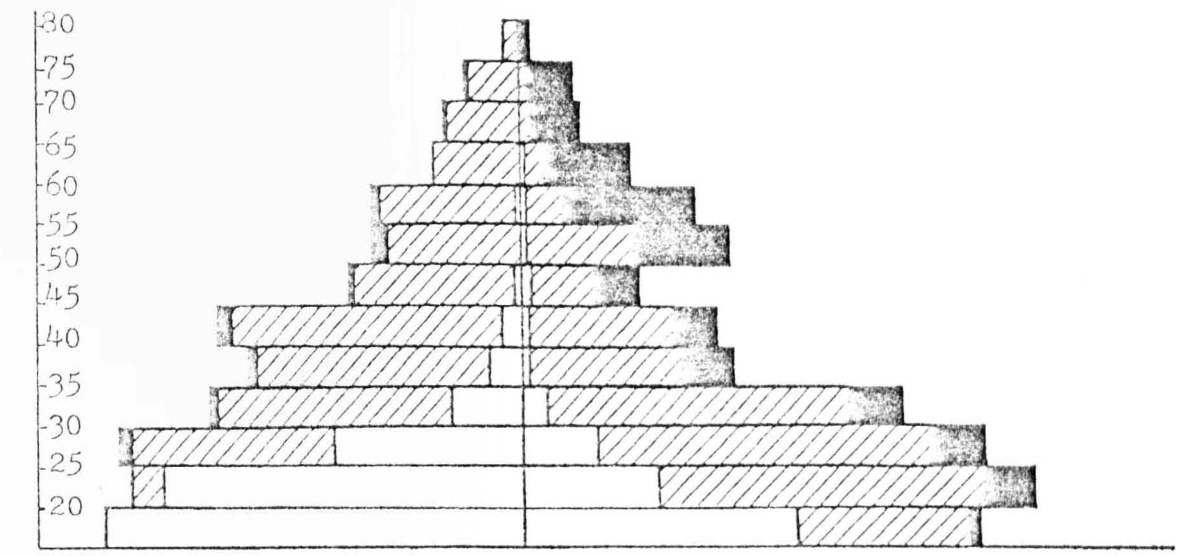
Figure 9.3 shows the population pyramids by marital status. The two Tamasheq populations differ from the Bambara in that, at all ages, a sizeable proportion of Tamasheq women is unmarried, being divorced or widowed. By the post-menopausal ages over half the female population is unmarried. Unlike Bambara men who, once married stay married, at all ages a small proportion of Tamasheq men are widowed or divorced. The proportions do not increase with age, indicating that men not only remarry much faster than women, but continue to do so up to an advanced age.

The proportions unmarried at any age do not necessarily reflect marriage instability, because a cross-sectional measure is dependent on the speed of remarriage. The levirate, practised by the Bambara but not by the Kel Tamasheq, means that a widow who is taken over by her dead husband's brother is rarely in an unmarried state. Similarly, polygyny conceals the fact that a man may have recently lost or divorced a wife. Polygyny probably explains the continuity of marriage for Bambara men, whereas the monogamous Tamasheq necessarily have gaps between marriages which are registered in a single round survey. The large number of unmarried Tamasheq women does not merit such a simple explanation; they must be considered within the wider context of Tamasheq society.

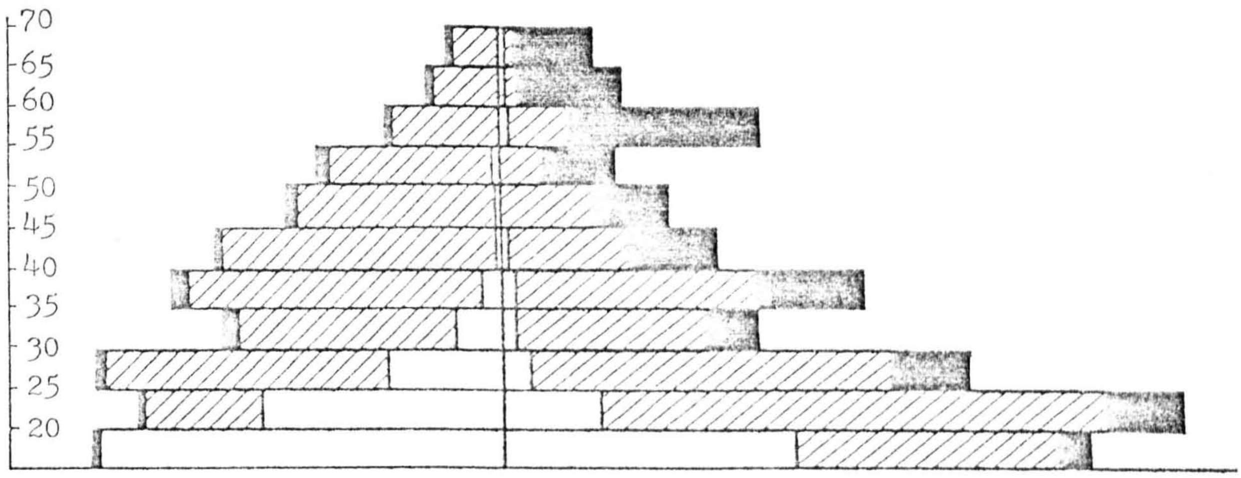
Marriages break up either through divorce or death, but generally the concept of marital instability is considered through divorce alone, because of the involuntary nature of widowhood, whereas

FIGURE 9.3 AGE-SEX PYRAMIDS BY MARITAL STATUS

(a) Delta Tamasheq



(b) Gourma Tamasheq



(c) Bambara

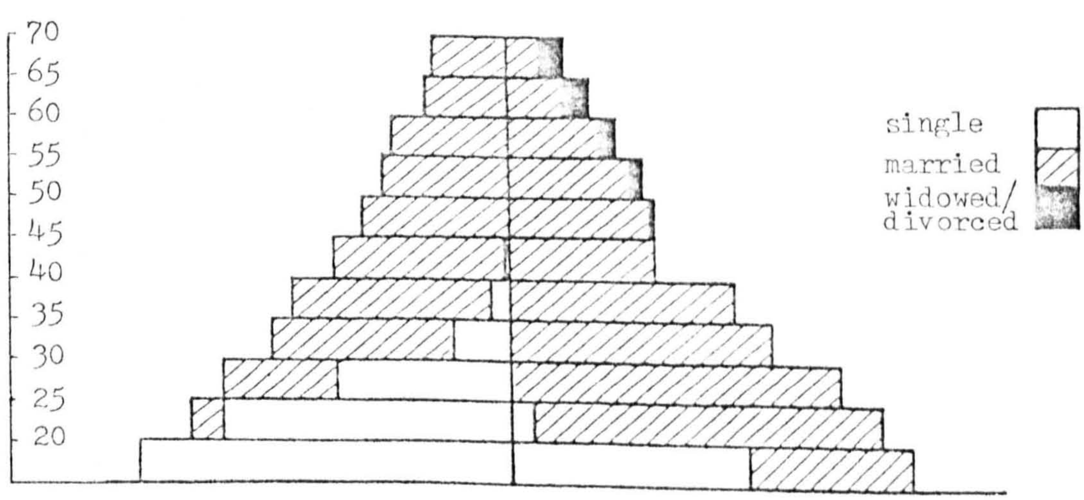
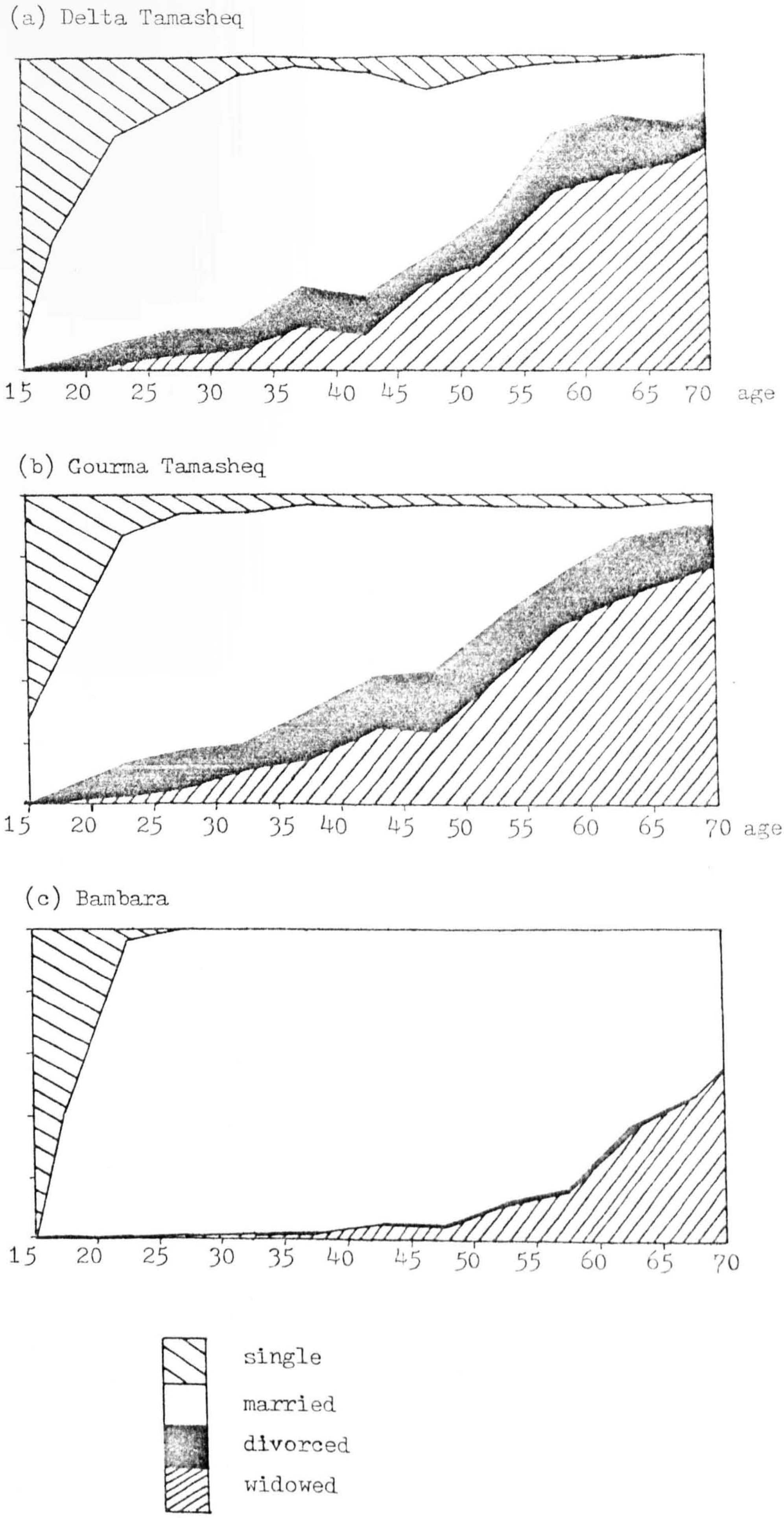


FIGURE 9.4 PROPORTIONS OF WOMEN CURRENTLY SINGLE, MARRIED, DIVORCED AND WIDOWED BY AGE AND ETHNIC GROUP

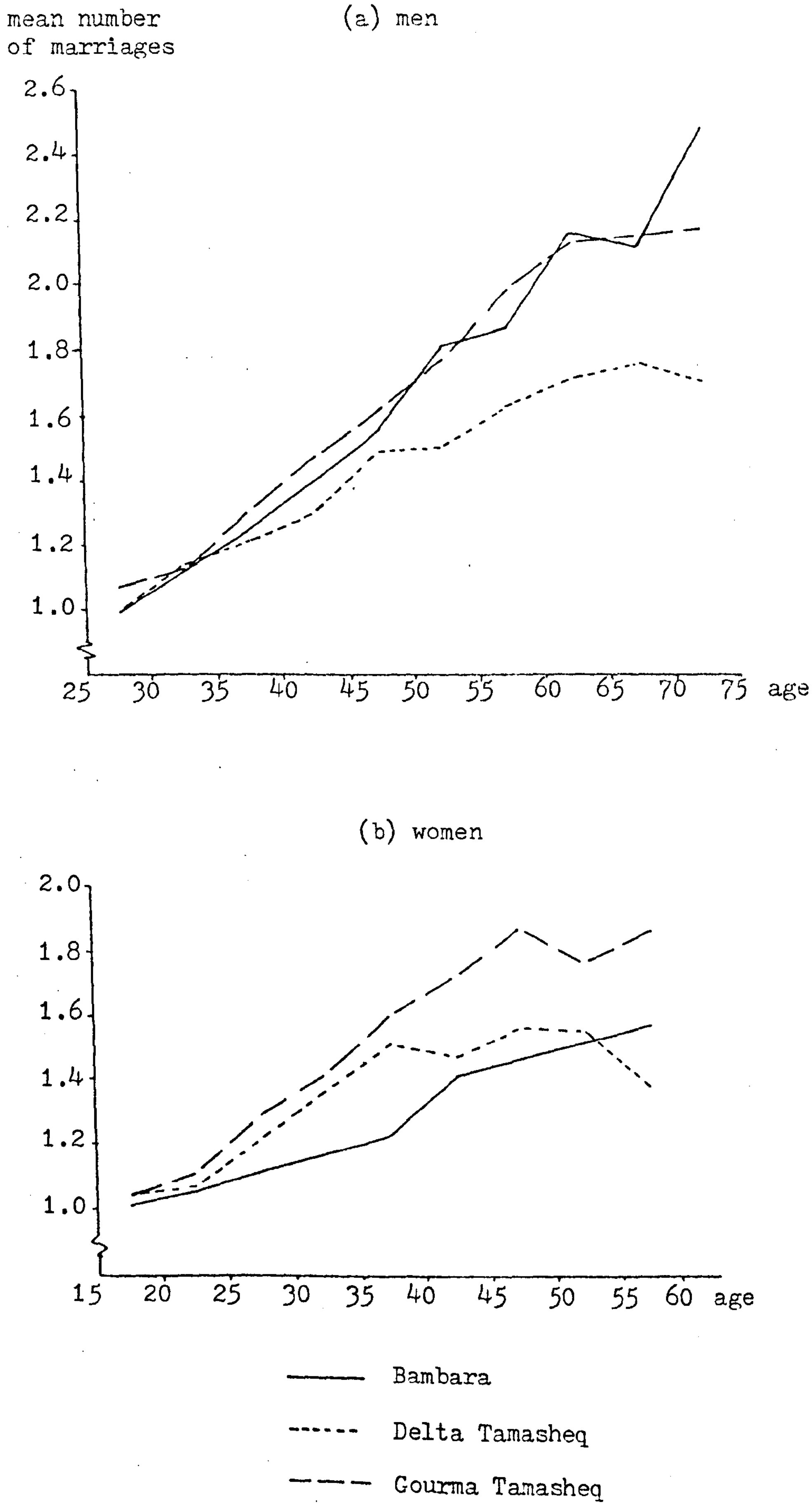


divorce is part of a decision making process. Figure 9.4 shows the proportions currently married, widowed and divorced by age for each of the three groups of women. Despite the disadvantages of using cross-sectional data, the fact remains that, at any point in time, many Tamasheq women are unmarried and at all ages about 10-15 per cent are currently divorced. At every age less than one per cent of Bambara women are divorced, and although the proportion of widows rises once childbearing has ceased, it is never as high as amongst the Tamasheq.

The Tamasheq cross-sectional pattern with its high and constant proportion of divorcees could result either from young women divorcing early and never remarrying, producing cohorts of divorcees which pass through the age distribution, or from a relatively constant divorce rate and period to remarriage for all ages. The qualitative data indicate that reality is closer to the latter. Divorce is not limited to younger women and there is no stigma attached to young divorcees which might inhibit remarriage. The rapid rise in the proportions widowed after age 45 in all the populations shows that after this age a woman is unlikely to remarry when marriage ends. The rise is less marked for the Bambara, partly because of the levirate and also because some remarriage does occur after the menopause.

The mean number of marriages by age gives an indication not only of the stability of marriage but also up to what ages people continue to remarry. Figure 9.5a shows that monogamy does not prevent men from having as many wives during a lifetime as polygamous men, with no difference in mean number of marriages for Gourma Tamasheq and Bambara men. Delta Tamasheq men achieve less marriages by any given age, and, unlike the other two groups, where men continue to remarry into their 60s, for the Delta Tamasheq the number of marriages tails off after 55. All three groups of women differ (Figure 9.5b) Bambara women have a steady rate of marriage which continues well beyond the end of childbearing. Young Delta Tamasheq women achieve a lot of marriages until age 35 after which remarriage becomes

FIGURE 9.5 MEAN NUMBER OF MARRIAGES FOR THE EVER-MARRIED



rare. Gourma Tamasheq women have a high level of marital instability and remarriage and this only slows down after the end of childbearing at around age 50, but until then the mean number of marriages increases sharply with age.

Thus, Gourma Tamasheq men achieve many marriages despite monogamy, and the women too, marry frequently although there is a high percentage of divorcees and long periods between marriages. Delta Tamasheq women also experience long gaps between marriages and have quite a high proportion of divorcees, but both men and women stop remarrying earlier than in the other populations. Bambara men achieve many marriages but this is through polygyny rather than serial monogamy. Bambara women not only remarry very rapidly after the end of a previous marriage, but they also continue to remarry after the end of childbearing.

Table 9.6

SOME MEASURES OF POLYGYNY

	Bambara	Gourma Tamasheq	Delta Tamasheq
Percentage of women reporting polygynous unions	58.2	2.2	3.7
Number of married women per married man	1.48	1.10	1.04

The prevalance of polygyny amongst the Bambara as compared with the almost monogamous Tamasheq can be seen from table 9.6. From the women's questionnaires data are presented on the proportions of women reporting being in polygamous unions, and from the household data, the mean number of married women for every married man. This latter measure is not very satisfactory because of migration. Any person who had been absent for more than 6 months was not included in the survey, and many Gourma Tamasheq men had been absent for some time leaving their wives behind in the camps. This leads to an exaggerated estimate of polygyny in the Gourma, which is evident when compared with the very low percentage of women reporting themselves being in polygynous unions.

Although divorce as a means of ending marriages is interesting because it arises from decisions rather than uncontrollable events such as death, widowhood is not entirely devoid of human manipulation. In a population where age differences between spouses are considerable, young women will frequently be widowed, particularly in high mortality groups. It was not possible to look at spousal age differences for the Bambara but the two Tamasheq groups show substantial class variation with nobles showing much larger age differences than lower status groups. (Figure 9.6)[3] In 25 per cent of Gourma Tamasheq couples the husband is more than 20 years older than his wife and in both areas the husband is more than 10 years older than his wife in about 50 per cent of couples. In a population practising the levirate this would not have much effect on the marital status of women, but Kel Tamasheq do not practise the levirate, and apart from the 5 months obligatory mourning, widows often remain unmarried for long periods. As sexual relations outside marriage are taboo these large age gaps effectively reduce fertility, though not necessarily through biological mechanisms.

Marriage and Fertility

Not only does marriage affect fertility because it is the state in which childbearing is most acceptable, but different forms of marriage are also claimed to influence fertility. Polygamy is said to reduce coital frequency and thus the risk of contraception but this is unlikly to be the case where men only have two or three wives, as do the Bambara. It is more probable that husbands of sterile women will take co-wives; there is no statistical evidence of this amongst the Bambara where 2.6% women aged 35-50 in polygynous unions have no children and 1.9% in monogamous unions. Parities by type of union do not differ either (Figure 9.7).

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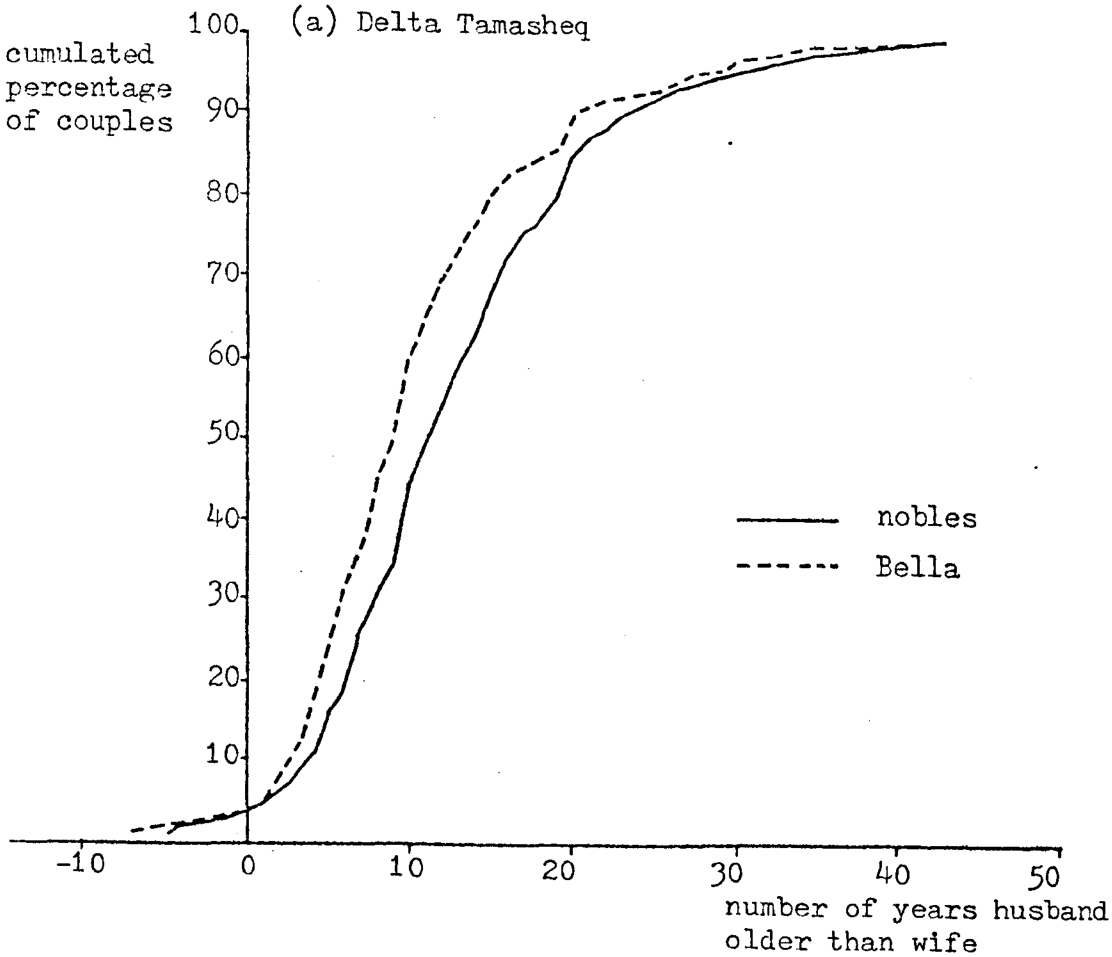
3. These were estimated as follows: The units of enumeration were tents; and as every married women ideally has her own tent, on the household forms the husband of the tent was person number 1 and his wife was person number 2. To calculate the age differences between spouses, all the tents were selected where persons number 1 and 2 were currently married, and person 1 was male and person 2 was female.

FIGURE 9.6 AGE DIFFERENCES BETWEEN CURRENTLY MARRIED TAMASHEQ COUPLES

(a) Delta Tamasheq



(b) Gourma Tamasheq

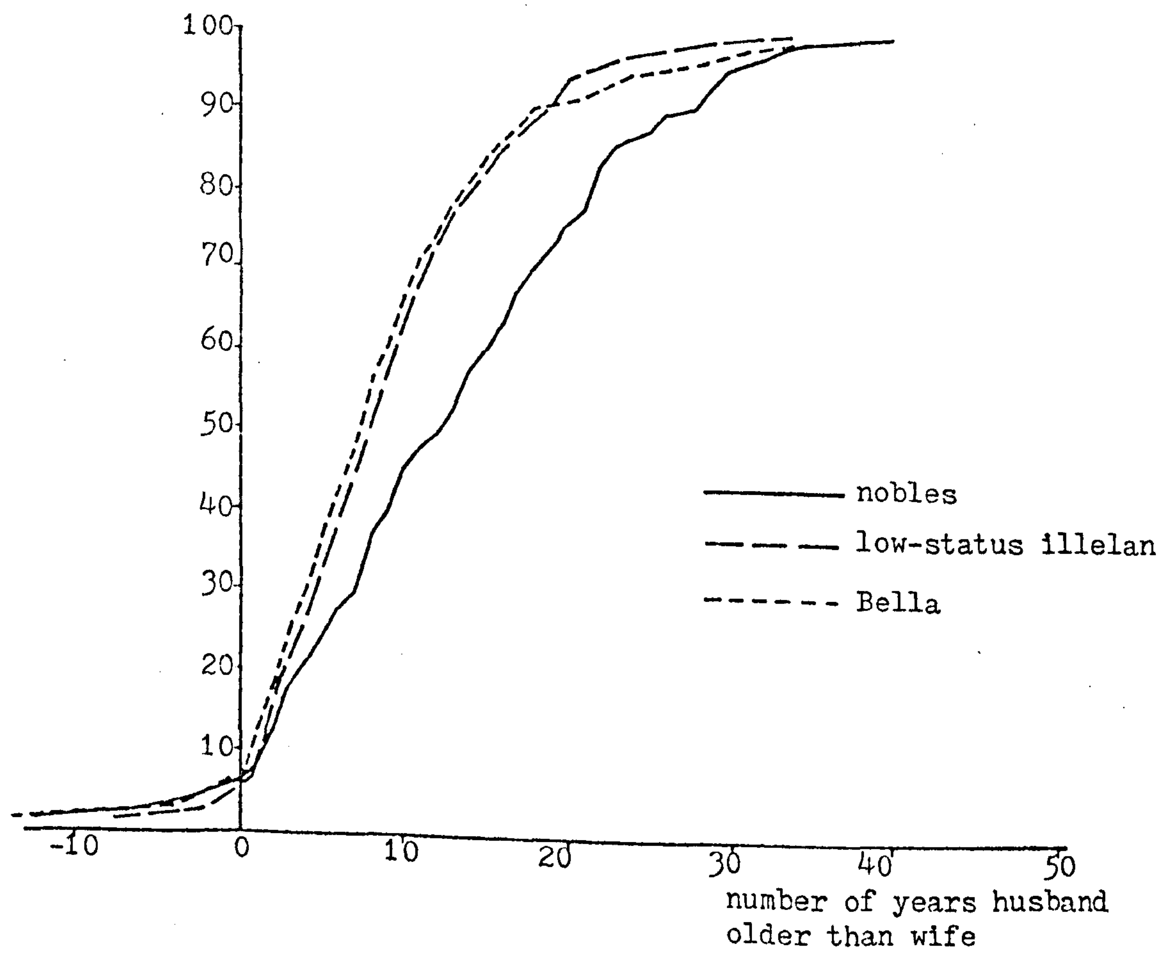
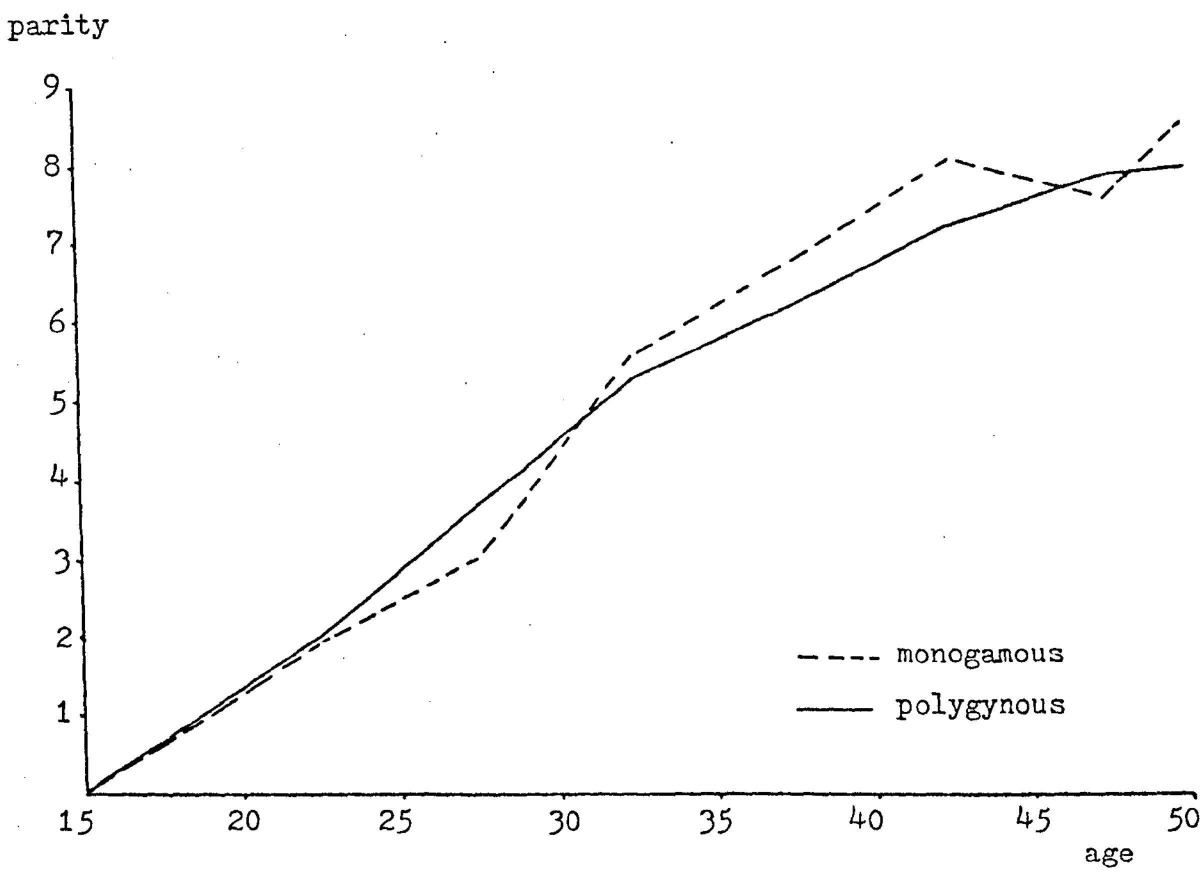


FIGURE 9.7 PARITIES OF BAMBARA WOMEN IN MONOGAMOUS AND POLYGYNOUS MARRIAGES



Number of marriages and frequency of divorce are other factors cited to be related to fertility. Here one must be careful to distinguish between cause and effect. Women who are sterile or sub-fecond may be divorced for this reason. On the other hand, women who have had a lot of partners are more likely to have contracted a veneral disease which affects their childbearing capacities. Table 9.7 presents the percentage of women aged 35-50 with no children and those who have only 1 child by the number of marriages. For the Bambara the percentages rise with with the number of marriages,

Table 9.7

PERCENTAGES OF WOMEN AGED 35-50 WITH
O CHILD AND 1 CHILD, BY NUMBER OF MARRIAGES

	Bambara			Gourma Tamasheq			Delta Tamasheq		
Number of Marriages	0 Children	1 Child	N	0 Children	1 Child	N	0 Children	1 Child	N
1	2.6	2.6	454	5.3	9.4	245	4.1	7.1	187
2	3.6	3.1	194	2.6	13.6	192	3.4	5.6	89
3+	11.1	11.1	18	7.0	7.0	71	3.8	11.5	26

(no significant differences)

but the changes are not statistically significant. The Tamasheq have higher overall rates of sterility (they are still low when compared with the Bobo areas in Upper Volta - Retel-Laurentin and Benoit 1976, the Kanuri of Nigeria - Cohen 1971, or the Bakweri of Cameroon - Ardener 1962) These data dispel the myths heard frequently in Mali both from the Tamasheq themselves and from others, that the Tamasheq are riddled with veneral disease, particularly syphilis, and that this is the reason for their low fertility.

Having outlined the basic similarities and differences in marriage patterns between the three groups we should consider within group differences, which are very important when marriage strategies are considered.

Bambara arrondissments' marriage variation

The two Bambara arrondissments have basically the same pattern of marriage with universal and continuous marriage for both sexes. The principal difference lies in the age at first marriage. A series of estimates of mean and median age at first marriage obtained from the current status data, (Table 9.8) shows that men in Doura marry 4 to 5 years later than men in Monnimpe, and Doura women marry about 2½ years later than Monnimpe women.

Table 9.8

SOME MEASURES OF AGE AT FIRST MARRIAGE
FOR THE BAMBARA ARRONDISSMENTS

	Doura		Monnimpe	
	Male	Female	Male	Female
SMAM	30.9	19.1	26.1	16.2
Median (5 year age groups)	30.1	19.3	25.5	16.6
Median (single year age groups)	29.2	18.7	25.6	16.2

Retrospectively reported mean ages at first marriage echo these results with a mean age at marriage for women over 25 who married before 25 of 17.3 for Doura and 16.1 for Monnimpe. Of all the retrospectively reported age at first marriage I have most confidence in those of the Bambara women because (a) their age reporting is quite good, and (b) the spread of age at marriage is small, and Bambara women have a keen perception of relative ages, and who married before whom, which was used in collecting the data. Table 9.9 shows the mean reported ages at first marriage for all the different age groups. The pattern of residuals from the mean in Doura indicates that age at first marriage in this group may have been declining whereas no such pattern emerges from Monnimpe.

Table 9.9

REPORTED AGE OF FIRST MARRIAGE AND PATTERN OF RESIDUALS FROM THE MEAN FOR WOMEN AGED 25+ AND MARRIED BEFORE AGE 25

Current age	Doura	Monnimpe
25-29	17.16 -	16.22 +
30-34	16.85 -	15.96 -
35-39	17.04 -	16.14 +
40-44	17.19 -	16.31 +
45-49	17.16 -	15.95 -
50-54	17.43 +	15.85 -
55-59	17.61 +	16.40 +
60-64	17.67 +	16.27 +
65-69	17.66 +	15.87 -
	17.31	16.11

The differences in age at first marriage between the arrondissments may reflect the different degrees of wealth and isolation. Monnimpe is less marginal and isolated, with more seasonal migration. It is thus possible that people can acquire the prerequisites for marriage more quickly than in Doura.

Tamasheq class differences

As with the previous analysis, the Gourma Tamasheq have been analysed for 3 social status groups, and it is clear that in marital behaviour the three groups are very different. Delta Tamasheq, who are only divided into two groups, can be compared with the Gourma as the same pattern of nobles and Bella exists there. The SMAMs and median

Table 9.10

SMAM AND MEDIAN AGES AT FIRST MARRIAGE FOR TAMASHEQ SOCIAL CLASSES

	SMAM		MEDIAN 5 YR AGE GROUPS		MEDIAN SINGLE YR AGE GROUPS
Delta	M	F	M	F	F
Nobles	30.2	20.1	29.2	19.4	18.1
Bella	27.0	19.1	26.0	19.1	18.2
Gourma					
Nobles	30.9	19.3	29.4	18.6	18.0
L-s illelan	24.1	16.4	23.0	17.2	17.0
Bella	23.5	18.6	23.5	18.2	18.0

ages at marriage for the classes (table 9.10) show that there are few differences between the women apart from the low-status _illelan_ women but the men show very different ages at first marriage. In both areas, noble men marry much later than the Bella or the low-status _illelan_, and in the Gourma, the men of the latter two groups are indistinguishable. The Gourma rates of marriage are the same for all groups, both male and female (6¼-6½ years) except for the noble men who take 9.6 years. There is slightly more variation in the Delta but here again the noble men have the largest span of 9.4 years.

Table 9.11

PERCENTAGES NEVER MARRYING FOR TAMASHEQ SOCIAL CLASS

(men: mean ages 55-69, women: mean ages 45-64)

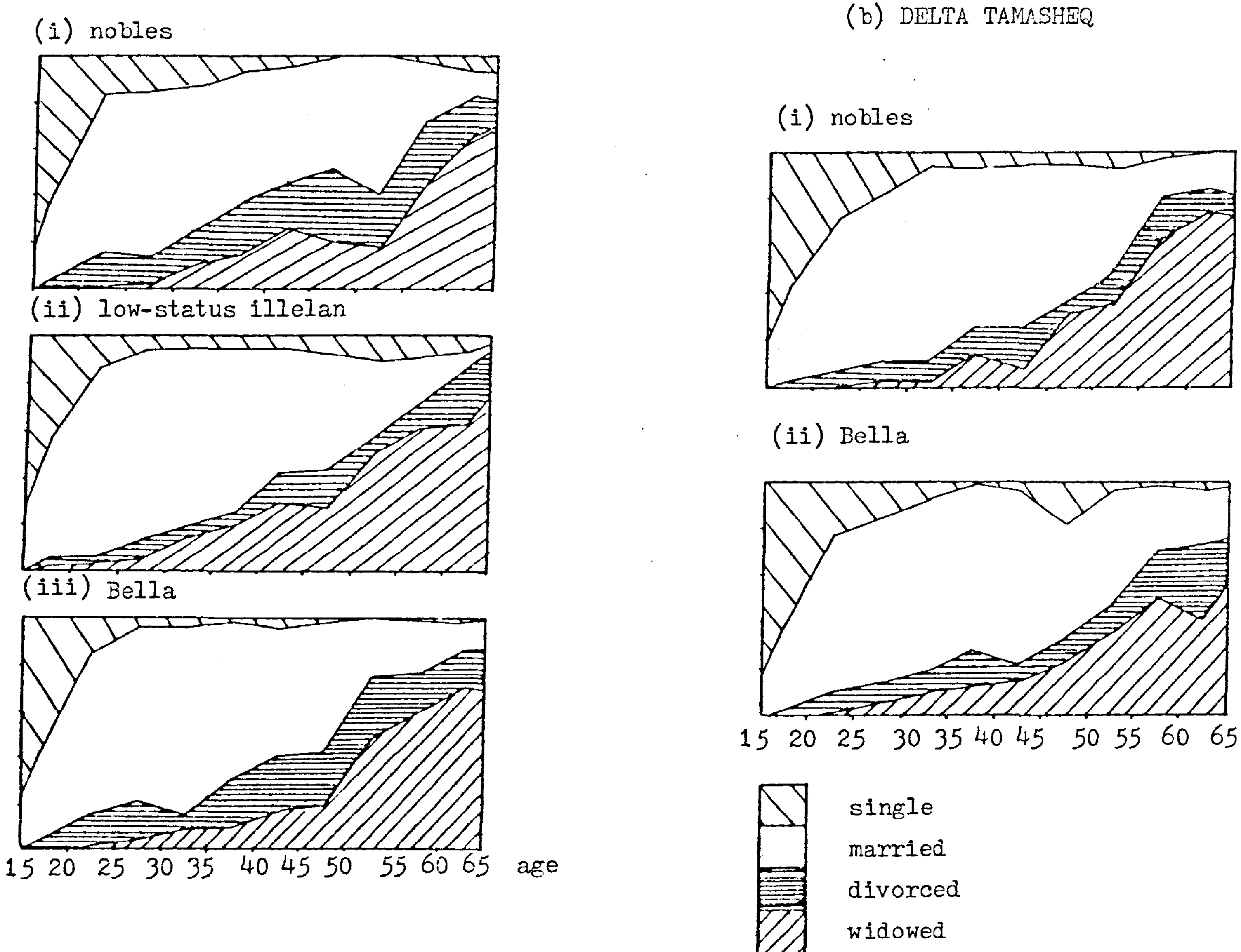
	Men	Women
Delta		
Nobles	2.9	3.9
Bella	0	5.5
Gourma		
Nobles	0	3.3
L-s illelan	0	8.0 (4.9% women aged 30-44 never married)
Bella	2.3	1.7

The proportion never marrying also varies by social class. In the Delta, all low status men marry but a small percentage of noble men do not. (table 9.11) The converse is true for the Gourma. In both areas the percentage unmarried is small and based on few cases. For the women the group with the highest proportion of spinsters is the low-status _illelan_ but this is changing as shown by the lower proportion of spinsters aged 30-34 than in later age groups. In both areas the few recorded cases of polygyny are amongst the lower status groups, but are still rare.

Figure 9.8 shows the proportions of women with each marital status by age. In the Delta there is little difference between the classes save that a higher proportion of noble women are widows at older ages. The Gourma pattern is interesting in that Bella and nobles

FIGURE 9.8 TAMASHEQ WOMEN: PROPORTIONS SINGLE, MARRIED, DIVORCED AND WIDOWED BY AGE AND SOCIAL CLASS

(a) GOURMA TAMASHEQ



are the same but low-status illelan women show far fewer currently divorced women. This means either that less marriages are dissolved by divorce or that divorcees are remarrying very quickly. The mean number of marriages by age do not differ much by social class (figure 9.9) although Gourma low-status illelan women do achieve the fewest which is consistent with the lower prevalence of divorced women.

The other principal class difference is the age differential between spouses (see figure 9.6). In both areas the nobles have much larger age differentials than the lower status group which is partly related to the differences in age at first marriage between the classes. However, the data are from extant households which include many couples one or both of whom are not in their first marriage.

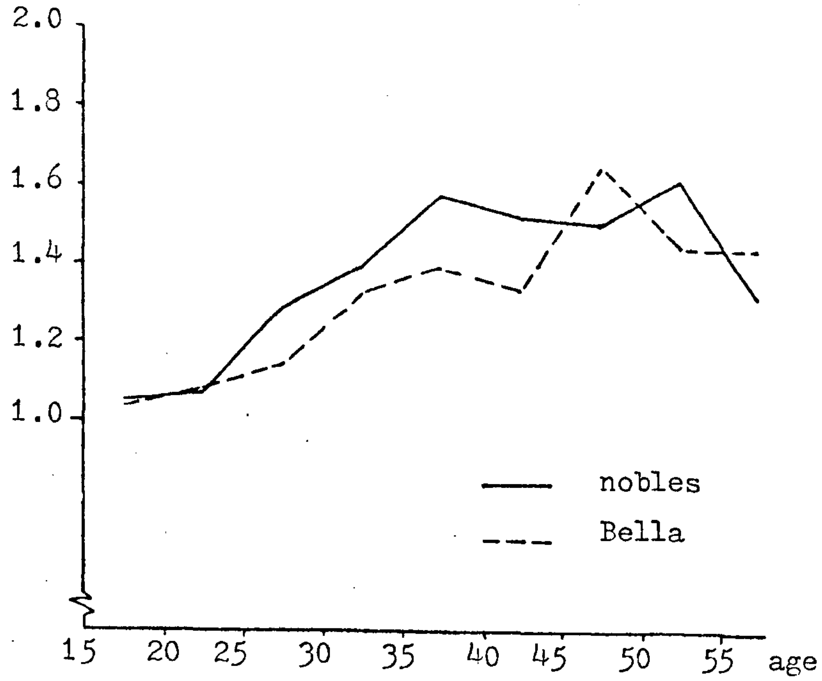
Ideally, a full statistical description of the marriage patterns and dissolution of marriages would use life table measures such as those outlined by Barnes (1949). However this involves the collection of a large number of marital histories which are not available for these groups.

Discussion

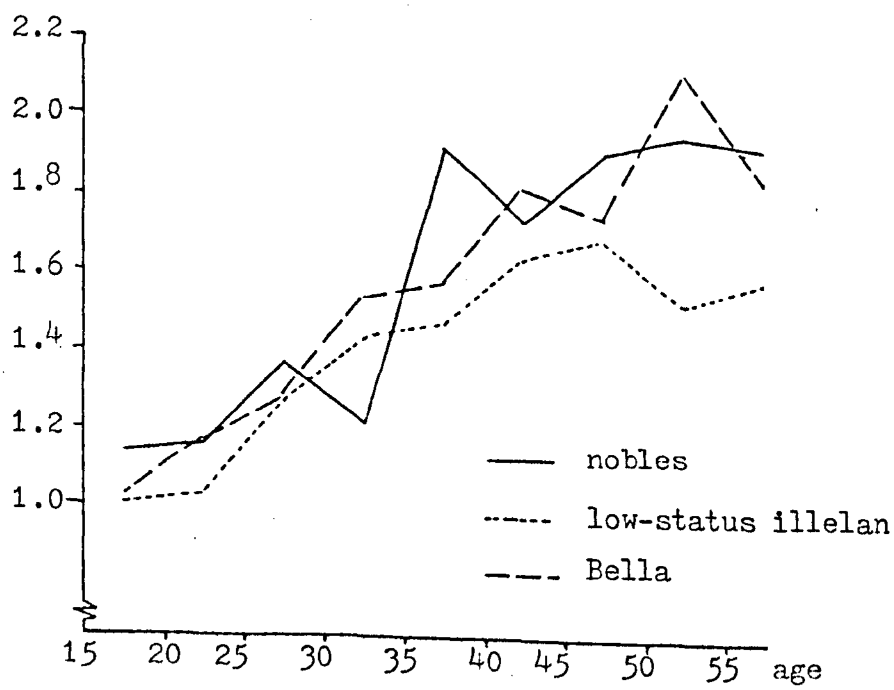
The two ethnic groups do have very different marriage patterns but these occur during married life rather than entry into marriage. All Bambara once married tend to stay married and there is a high degree of polygyny. A small proportion of Kel Tamasheq never marry, but it is more important that many individuals, particularly women, do not remain married for all their reproductive years. Tamasheq men too have unstable marital lives but tend to remarry quickly after the end of a previous marriage, thus at any one time few are not married. Within each ethnic group the main differences by sub groups are in entry into marriage, age at first marriage and rate of marriage. This has implications for spousal age differences and levels of widowhood. The only Tamasheq group who differed substantially from the general Tamasheq pattern were the low-status illelan whose women and men marry very early and who have a lower percentage of currenty divorced persons.

FIGURE 9.9 MEAN NUMBER OF MARRIAGES FOR EVER-MARRIED TAMASHEQ WOMEN BY SOCIAL CLASS

(a) Delta Tamasheq



(b) Gourma Tamasheq



The demographic picture of these communities is only the manifestation of a whole series of decisions, social norms and behavioural patterns. In order to understand this picture and to appreciate some of its ramifications it is necessary to consider other aspects of marriage. Different ages of entry into marriage are the results of constraints and pressures on individuals or groups. The role of marriage in the creation and expansion of domestic groups must be considered along with the properties of alliance. The roles of women within the marriage partnership, the household, as mothers and as a source of labour differ substantially. An awareness of these roles is crucial in understanding how Tamasheq society supports a high proportion of single women and why Bambara society does not. Implicit in all this are the different perceptions of women, as economic assets, as transmitters of wealth, as decision makers, as child-bearers, and as sexual objects. Each group has a different set of priorities which emerge finally in the demographic patterns of marital behaviour outlined above, and these will be considered in the next chapter.

CHAPTER 10 - SOCIAL ASPECTS OF MARRIAGE AND DIVORCE

"Divorcing is like moving camp. You are somewhere and you wake up in the morning and decide that you don't want to be there any more. So you move. It's the same with a wife - so you divorce her."

quote from Imghad man in the Delta.

The two major issues which emerged from the numerical analysis of marriage concern firstly the variation between the ethnic groups in time actually married, and secondly the internal class differences for the Kel Tamasheq. They raise questions such as: Why are Bambara continuously married? What are the rules which maintain this state, the constraints preventing the existence or emergence of a group of single persons? What are the dominant institutions demanding this marriage pattern? Conversely, why are Tamasheq ideals and constraints different? How does a society that is rigidly divided along class lines with different mores, economic standards and forms of dependence contain such similar patterns of marriage for all the social strata? Are these fortuitous similarities achieving the same results by different means, or does some common denominator exist which is intrinsic to both nobles and Bella, and the principal determinant of the observed marriage pattern?

Most of the data and descriptions below concern the ineslemen and Bella of the Delta. The comparable information on the other two groups was obtained from Mike Winter (Gourma Tamasheq) and Duncan Fulton and Camilla Toulmin (Bambara).

Van de Walle's discussion of the problems of defining marriage in Africa (1983, Brass et al. 1968) concluded that most censuses achieved the best results when accepting that respondents can best define for themselves whether they are married. This is relevant here where Radcliffe-Brown's description of marriage as a process (1950) applies to both Bambara and Kel Tamasheq and residence and the concept of the household are crucial components of this marriage process. Stenning's analysis of the pastoral

Wodaabe household is one approach which is drawn upon here, where he states that a viable Wodaabe unit must reach:

> "... certain size commensurate with its responsibilities towards its herd ... when the size and increase of the herd is adequate for the subsistence of the family and the size and composition of the family are suitable for the control and deployment of the herd, then family and herd may be said to be in equilibrium."
>
> Stenning in Goody (1958)

Marriage may be the starting point for this household unit, or it may be one of the means used to increase the viability of an existing household by transfer of either resources or labour. Bambara and Kel Tamasheq have different strategies of approaching household viability and the marriage patterns are closely entwined with these strategies.

The change of status undergone by an individual on entering marriage is another component which is considered here. Dixon (1971) had identified three factors which determine entrance into marriage:

(i) availability of mates
(ii) feasibility of marriage
(iii) desirability of marriage

Each of these are considered in turn for the three populations and thus a clearer picture is formed of the benefits and disadvantages of marriage for different groups of individuals and how these are reflected in the various patterns of first marriages.

<u>Bambara</u>

The principal residential and economic units of Bambara society are patrilineally related groups (gwa). These may range in size from 2 to 100 individuals, (mean size in survey 14) and generally consist of married brothers or a man and his (married) sons, their wives and children, who live in the same compound, cultivate and eat together. On a larger scale, Bambara society is made up of exogamous patrlineages. Patrilocal residence follows from marriage and new households are rarely created at that point. Marriages are arranged between the parents of partners, and, although bridewealth is paid to the bride's father and lineage, it is often spread out over several years and may also be paid partly in labour. The principal marriage expenses are incurred in the actual celebration and as they are paid for by the groom, marriages may have to be postponed until he has amassed sufficient resources. A system of premarital lending exists which alleviates some of the stresses inherent in the system; a young girl may spend a wet season living in her fiance's household and helping with the cultivation. THey may sleep together during this period, and there is no real shame attached to any ensuing pregnancy. During the subsequent dry season she returns home and the marriage is generally celebrated during the next rainy season. Many Bambara marriages take place during the heavy cultivation season, and the importance attached to the events is manifested in the fact that the village will cease working for a couple for days for the celebration, despite the importance of agricultural work.

Bambara divorce is relatively unusual and occurs most frequently at the beginning of marriage. The relationship between the spouses' lineages is a deterrent to divorce, which not only involves the return of the bridewealth but affects the whole reciprocity of the marriage system. A woman who runs away from her husband will generally be forced to return by her kinsmen. Older women who remarry after the death of a husband may subsequently reject the new husband , but in this case neither bridewealth, nor rights over her future children nor lineage reciprocity are called into question. They practice the levirate whereby a man inherits his dead brothers' wives, which explains some of the continuity of women's marriage but some older women choose not to accept their new husbands and for post-menopausal women the marriage may be in name only. However, middle-aged women may be sought in their own right as attractive economic propositions with their own small fields and culinary skills.

CASE 1

Jomine is in her late fifties and demonstrates a case of a woman who, lacking blood relatives to whom she could turn or through whom negotiations for her re-marriage could take place, was pursued by a large number of men on the death of her husband. Widowed 8-10 years ago by her first husband, she re-married a man who died soon after. On his death, there was considerable competition for her, despite the fact that by this time she was beyond child-bearing age. Her son was still in his late teens and her father's family had died out (she herself was one of three daughters and her parents had no sons). There appeared to be an unseemly rush for her hand. Medicines and charms were hung about her house by supporters of one or other contender, and she felt under such pressure that she decided to leave the village with her son and go to the next-door hamlet from which her husband's family had originated. She has since been taken as wife by one of the elder men within the hamlet's founding lineage.[1]

Younger women are an important labour resource in the household where not only do they cook and draw water but they also participate fully in agricultural production. Child-bearing is another crucial role, and a woman gains prestige and status through her children who increase her husband's lineage. The importance of women as child-bearers is demonstrated by the attitudes to barren women, who are often considered to be witches. They are feared by women with children who suspect them of jealousy and thus evil and destructive behaviour towards their own children.

The different social groups, households and individuals all obtain different benefits and disadvantages from a marriage, and it is the interplay of these that largely determine the pattern of entrance into marriage. The husband's lineage acquire not only the woman's labour but *de jure* rights over all her children. The woman's

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1 Provided by Camilla Toulmin

lineage get the bridewealth - which is small - along with renewal or creation of links with another lineage which may be mobilised on different occasions, and can be expanded into a more general exchange of women and resources. More specifically the husband's lineage acquires the woman's labour, and the man himself sexual rights in the woman and juridical rights over their children, as well as the independence of having someone to cook for him, and security and power through sons who ensure the continuation of his line, labour and support in old age. However the costs of marriage to the individual are high and may involve him in several dry-seasons of work outside the village.

Through marriage the woman is socially sanctioned to bear children and she receives the prestige and security that will accrue from them. She also obtains long term security from her husband's lineage and independent control over her own hearth. The speed at which women marry after puberty indicates the degree to which being married is the accepted and only state for women.

For Bambara women polygny assures availability of mates. FOr this very reason men have more problems in finding a spouse, which is one of the causes of their late age at marriage. Another reason is lack of feasibility, as many youngmen have to go on seasonal labour migration several times to pay not only for the bridewealth but also the cost of the whole wedding ceremony. For a woman the feasibility of marriage is no problem, because her mother will provide her with the household utensils generally out of her own private resources.

Desirability of marriage operates on two levels. For women marriage is generally desirable because it enhances their status and provides the opportunity of developing a certain economic power through labour and through children. An unmarried woman is a curious anomaly. On the individual level though, a certain marriage may be less than desirable with the particular partner chosen for her and running away from the marriage does not solve the problem as she is generally returned to her husband by kin. Sometimes lovers elope and may eventually get married, but this is discouraged as it leads to a breakdown of the system of alliances and reciprocity. Pre-marital lending alleviates some of the stresses because a girl gets to know her in-laws; it could of course have the reverse effect from the desired one. For men marriage is unequivocably desirable despite the expense, because: "Women are the source of sons, and more sons in this society means greater wealth and more influence and power" (Fulton & Toulmin 1982). The husband also gets sexual rights in the woman, a cook, and the prestige of bringing in more labour. He does not necessarily incur unwanted responsibility because the newly married couple continue to live with his father's or brother's gwa.

Women retain strong contacts with their own kin as do their children with their maternal kin, although their primary allegiance is to their patrilineal kin. This is enhanced by the patrilineal residence and economic groups. Bambara marriage does not result in any major transmission of resources, as rights to land operate within the patrilineage through use and few effects are transferred through women. It is far more important that marriage entails the movement of women themselves and their potential reproductive ability. Thus labour is transferred both through the woman and her eventual children. Polygyny and the levirate are natural consequences of this marriage system and its transfers, and equally they enable its continuity.

Delta Tamasheq

It is important to realise from the outset that the heterogeneity of Twareg society operates not only on a regional basis, but also within areas where behaviour differs substantially between social classes even where they live in the same camps. Suzanne Bernus writesabout "(une) diversité camouflée par une unité qui cependant reste réelle" (1976) and this unity is symbolised not only by a (almost) common language and the veil for men, but also by the ubiquitous existence of a complex class structure and a high degree of endogamy (Murphy 1964, Bourgeot 1972, Jemma 1972, Bernus 1976, Bonte 1976, Gast 1976, Keenan 1977). Murphy in his discussion of the veil (1964) states that "membership in one class or another is the single most important criterion of a Twareg's worth and standing". Thus a discussion of Tamasheq marriage necessitates the consideration of the classes separately, but also their relationships with one another, as these play an important role in the demographic regime.

Delta Tamasheq marriage operates on a series of totally different principles from that of the Bambara, and although pastorialism as opposed to cultivation plays a role, it should not be considered the prime motivator. It will be argued that mobility and livestock ownership are implicated in the marriage system but not that nomadic pastoralism in its own right is or could be a cause of the emergent patterns.

Bridewealth - taggalt

For the Kel Tamasheq no marriage exists without the payment of taggalt[2]. This is a certain number of aminals which the husband-to-be has to acquire and produce to give either to his wife or her kin. Each social class has different rules regarding both the quantity of animals paid, and the uses the taggalt is put to.

Imushar

From what I have been told, imushar taggalt is not fixed but is decided upon by the girl's father and is subject to his appraisal of the suitor'sphysical and kinship distance from his daughter.

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2 They consider that everyone in Britain lives in a state of continual promiscuity because no taggalt is paid.

Generally the further away, the higher the taggalt. This makes sense in a social class whose power does not arise so much from wealth, as from birth and prestige. The taggalt may range from 10 to 60 head of cattle, and the animals are physically transferred to the woman's father's herd where they remain. Unlike other Tamasheq women, imushar women are not expected to come with their own tent into marriage, it is provided by the husband.

Ineslemen

A woman's taggalt is fixed according to the taggalt that her mother received. When asked about taggalt levels people invariably say that it is the woman's mother who decides. This gives a false impression of female power and decision-making; what is actually meant is that, from the amount of animals in her mother's taggalt people know how much a woman should receive. In most Delta ineslemen groups this is fixed at either 20 or 15 cattle and is not negotiable even when the spouses are closely related. According to older people the quantity has not changed recently even though herds are now smaller than in the past, although it seems that the quality of the animals has diminished, with mcre calves given and less milk cows.

The taggalt is not paid to the father of the woman and then redistributed amongst her kin, but is her own property. Theoretically, no taggalt animal can be sold without her prior permission and ideally the whole taggalt herd moves with the woman when she joins her husband and is then herded with his cattle. In practice, the animals often never leave his herd, and a kinsman of the woman goes to mark them with her cattle mark (which is the same as her father's). Thus the bridewealth is not a form of compensation for women lost to their own lineage, but is what Goody and Tambiah (1973) call an 'indirect dowry'. Although the taggalt cattle are owned juridically by the woman, in practice her control over them varies considerably according to her age and status. Ideally the animals remain with her, but sometimes, once the taggalt has been gathered together, her father demands that all or some of the animals remain with him rather than with the husband. This decision may be taken after weighing his son-in-law's wealth against his own and deciding that he has more need of the animals. Sometimes the animals may be sold to help pay for the tent and chattels that the bride needs but in this case the taggalt retains its form of indirect dowry. Some animals may be given by the bride to the blacksmiths in payment for all the bowls and cushions that they have made for her. Despite her de jure ownership of these animals, the woman may have little de facto control over them, as they tend to be manipulated and controlled by the two men who have most control over her. If either her husband or her father sells the animals without her permission he is condemned but nothing is done about it[3]. It is said that what is hers is her father's and solidarity between a father and daughter gives him free control over her animals. In the case of her husband, the attitude is that if the couple don't agree enough for him to sell her animals then they should not be together.

The de jure ownership comes into play on the break-up of the marriage either through divorce or widowhood. The woman returns to her kin with any of the taggalt animals which are still alive, and these are used towards supporting her, although they are managed by her male kin. Occasionally, in a divorce provoked by the woman herself, she returns the taggalt to her husband as a final gesture to emphasise her desire to annul the marriage. This occurs most frequently amongst very young girls who run away from arranged marriages, often because they consider their husbands too old.

Imghad

Theoretically Delta imghad work on the same principle as inesleman, but in practice the arrangements are more flexible. A woman ideally

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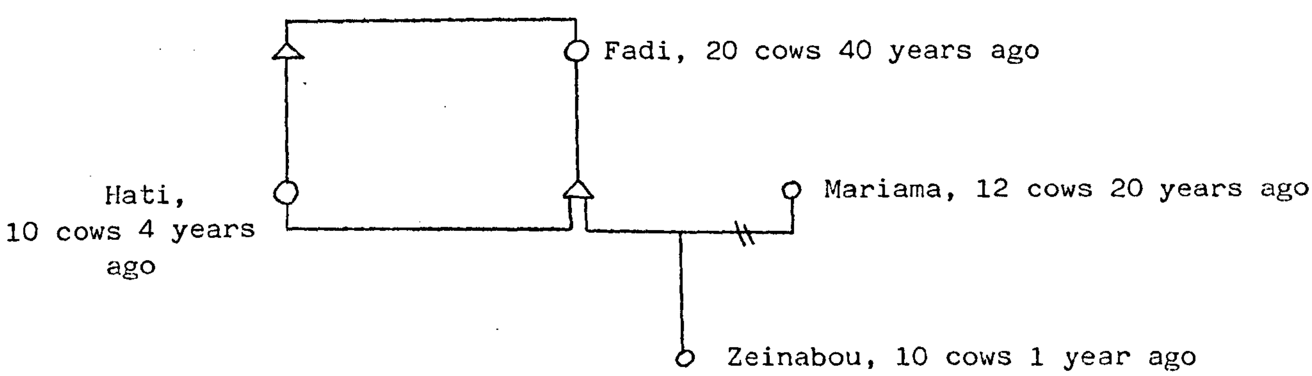
3 There is also a case to be made for the fact that a certain amount of control over the animals by both her father and her husband inhibits either one of them from exploiting her taggalt excessively to his own advantage.

receives the same as her mother, but they recognise that they are poorer now than in the past and the taggalt is diminishing accordingly (see Figure 10.1). Imghad taggalt rarely remains with the husband but is generally controlled by the girl's father who uses some of it to buy her tent, chattels and baggage beasts. He chooses whether to retain or send the remaining animals with her although nominally the animals are hers.

Figure 10.1 Changes in imghad taggalt levels.



Inhaden

The number of taggalt animals is decided by the woman's father. On receiving them he promptly sells them to buy his daughter's marriage prerequisites, and if any remain he may buy himself baggage animals. If the marriage breaks up he will support his daughters. Inhaden themselves rarely have cattle herds and prefer to convert any animals they do receive into baggage animals or functional items.

Iklan (Bella

Delta Tamasheq say that although the Quran states that bridewealth for slaves should be paid to their masters, Tamasheq custom insists that the woman must bring a tent and its content with her into marriage. To accommodate these two aspects, half of Bella taggalt is paid to the master and half to the woman's family. This is the traditional system but since Malian independence (1960) the status of Bella vis à vis their owners has changed, and although vestiges of traditional behaviour remain, what is observed today neither adheres to the original customs nor to a new and homogenous system. Where Bella still live with their masters, half of the taggalt is usually given to the latter but this is not obligatory. From the viewpoint of the Bella man the current system is less beneficial than the traditional one where the owner would pay the taggalt, whereas now he has to pay it himself although the owner may contribute something. The taggalt today is around 20 or 30 goats and the woman's parents determine it exactly. It goes to the bride's family who may give half to her mistress. The remainder is immediately converted into a tent, chattels and donkeys which remain with the woman during and after the marriage.

Thus in the Delta the taggalt is an indirect dowry for all social classes (Goody and Tambiah 1973), although moving down the social status scale there is a concomitant reduction in the retention of the taggalt as cattle, and increasing quantities are converted into the woman's pre-requisites for marriage. This reflects economic status which also tends to determine the proportional distribution of inesleman taggalt between the husband and the woman's father. In all cases the taggalt does not diminish for subsequent marriages, which indicates that its role is as joint fund for the newly married couple rather than a reimbursement for the woman's labour or a payment establishing rights over her children. It becomes a woman's security and a woman who has been married and divorced several times may have acquired quite a sizeable herd through taggalt alone.

For all social classes the acquisition of _taggalt_ does not necessarily involve depletion of a man's resources. Frequently, many of the _taggalt_ cattle are obtained through _terjit_ which are unreturnable gifts. A man about to marryvisits friends and kin asking for _terjit_ and sometimes the whole of _taggalt_ is made up in this way. People give what they want and may refuse to give anything. In the cases of divorce when the woman returns the _taggalt_ the man is not obliged to return any cattle obtained through _terjit_ to their original owners. _Terjit_ gifts are permanent gifts.

Hence, _taggalt_ payments, at whatever level they are set, do not really directly inhibit marriage. It could be argued that friends and relatives will not provide gifts if they disapprove of the marriage, but this is not the case.

CASE 2

> Abubacrine fell desperately in love with Aicha and wanted to marry her. Unfortunately she had already been married to his father's brother, and thus, by Tamasheq and Islamic prescriptions the marriage would be incestuous. Nevertheless, Abubacrine decided to go ahead with the marriage, but as he owned very few animals, he had to acquire most of the _taggalt_ through _terjit_. Despite the fact everyone had deplored the marriage he had few problems in obtaining enough animals.

From this example we see that _terjit_ consists of obligations and rights to the individual and is independent of the actions that that individual will make. Because anyone can obtain animals through _terjit_, the high level of _taggalt_ is not a factor which limits male marriage.

The _taggalt_ is not the only movement of resources at marriage. Women are expected to bring certain things with them, and where her family is poor the _taggalt_ may be converted into these items. It is a matter of pride for high status families to send their daughters not only with a tent but also baggage animals which become hers, a slave woman to work for her and some marriage cattle (_iwan 'n azeli_). These are milk cattle which belong to her close family who retain possession of the animals and can recall or replace them. Their milk is for the use of the woman, her children and her husband. Nowadays, it is only the wealthier families who can afford to send these azeli cows. All the items with which the woman arrives at marriage are functional, baggage animals, tent, milk cows and slave women and are all necessary prerequisites for a viable independent household. The movement of taggalt cattle with the woman also leads to this end. For a noble family, the only factor which is missing is the male slave labour needed to herd the animals and this can be resolved in three ways:

(i) the husband herds them himself

(ii) he has his own slave man to herd for him

(iii) he joins forces with other households and the herds are amalgamated for herding purposes. These households may or may not be kin

Marriage Strategies

Having considered the material prerequisites for marriage and the concomitant movement of resources I turn now to an examination of marriage strategies and what benefits or disadvantages that different individuals and social groups stand to get from marriage. Again, the social classes behave very differently and ineslemen and Bella will be considered separately. Applying Mary Douglas' (1966) concept that populations are at an optimum size because of strategies regarding basic resources versus political power, Bambara are seen to be mazimising numbers, labour force and economic power in an economy and environment where land is (at present) unrestricted. Kel Tamasheq fall into her category of groups that prefer to maximise prestige. This is articulated in their generally accepted cause for divorce that if a man cannot afford to keep his wife in milk, grain and clothes, he should divorce her. Maximisation of prestige can be achieved either through marriage strategies or by limiting reproduction so that the powerful groups do not become too large. Inesleman power is related to limited social advantages and the separateness of class is retained by enforced endogamy which also retains resources within the group. Their power and prestige and wealth are symbolised by obesity achieved by the manipulation of the two primary rescurces, milk and slaves. At the individual level a milk surplus permits force feeding, and a supply of slave labour entails that women need do no work and may thus be and remain fat. Inesleman population increase exceding that of either animals or slaves would reduce the numbers of fat women and amount of families accruing prestige from them.

Noble marriage

Tamasheq marriage is a process of contracts, exchanges of stock and movement of chattels, and at some point in the proceedings the woman moves to join her husband. In the surveys it was this point that was defined as marriage, whether the other exchanges had finished or not. Unlike the Bambara, sex outside marriage for noble Tamasheq is unacceptable, although there is much premarital courtship and petting.

Marriage is invariably initiated by the man or his kinsmen. Neither a woman nor her kin should make the first move towards marrying her off as this would be very shameful. For a girl's first marriage when she is still young and in her teens, the man or his emissary will approach her parents to ask their consent. Some will accept or refuse outright, others will consult the girl. This is partially dependent on her age; the older she is, the more likely she it to be consulted. The opinions of very young girls are seldom taken into account. If she is consulted and refuses the marriage then the affair is generally over. Sometimes the man will approach the woman first, unofficially, but is is only after consultation with her parents that the marriage is announced. Older widows or divorcees may be asked directly and age gives them the power over their own destiny.

Several months of acquisition and exchange of bridewealth and dowry pass before the woman joins her husband. Soon after the announcement of the prospective marriage, any person related to the woman entirely through the female line, but not first or second cousins can claim a bull calf from the husband. These distant relatives through the female line are ebattegh to the woman. The bull-calf (tajoné) can only be claimed once and as a woman has many ebattegh it is first come first served. This is said to symbolise the woman's maternal kin's approval of the marriage. After much of the bridewealth and all the dowry have been acquired, and the marabout has pronounced the marriage and the conditions upon which it is based, the woman can move to join her husband. Except in the case of the imushar the woman always brings her own tent with her and the couple set up a new residential unit, generally in the camp where the husband was previously living. This is not necessarily the camp of his father or brothers. The new household formed on marriage is symbolised by the tent and this household, with its Bella, is expected to be an independent and viable unit.

Marriage not only links individuals but also can created alliances between different social groups. Some groupings remain relatively unaltered by the marriage of their members, whereas others have vested interests in promoting various marital strategies. The Tamasheq fraction (towsit) is not a corporate group and nowadays only exists an entity for tax collecting purposes and there are no corporate kin groups above the nuclear family. A camp is not a fixed unit with membership defined by kinship, and it reaps no benefit as a unit from a marriage. There are no groups that benefit economically from a woman's or her children's labour, the benefits of Tamasheq marriage have to be considered at the level of the individual. An inesleman man acquires unique sexual rights over his wife and over her children. In marrying he is obeying the Quran which says that a man should marry and have children. He acquires a tent in which to live and the power of being head of that household and, depending on his father-in-law he may also have de facto control over his wife's taggalt and her azeli cattle. In return for this, the husband's obligations and responsibilities are heavy. He must provide his wife with grain, milk and meat and must behave in a responsible manner (which many young unmarried men do not). Although the woman may have her own cattle it is very shameful if the husband cannot support her satisfactorily from his own resources. Thus a man does not marry until he owns, or can borrow, enough cattle. He obtains no labour from his wife just an additional dependent, although she may bring a Bella woman for domestic chores.

Through marriage, a woman obtains the possibility of bearing legitimate children, security and a better standard of living because of the obligations on husbands to provide for her. She also becomes mistress of her own tent rather than being subordinate to another woman in her own camp. However she is expected to obey her husband, to sell her animals if he requests it (reasonably) and she generally lives in a different camp from her closest kin with whom she feels most solidarity. For both spouses, affines are not trusted to look after one to the same degree that close kin are, although this is mediated somewhat by high levels of close kin marriage. Women are free to visit their kin and frequently do so for long periods. Significantly a woman rarely returns from her kin on her own accord but waits until her husband sends for her.

Both men and women have high expectations of happiness and fulfillment from marriage which are rarely met in practice. These expectations may be dashed before the marriage takes place, when a young girl is compelled by her kin to marry someone she does not want. Within marriage, high expectations lead to little tolerance of conflict. A husband expects his wife to obey him in public at least, and it is very degrading for man to quarrel with his wife. If he feels he can no longer tolerate her behaviour without losing his temper, a husband should divorce his wife rather than lose face by arguing. Although the public facade proclaims male domination, in private many households have discussions and arguments on a more equal basis. It is important that a man is not seen to be disobeyed by his wife in public because women "n'ont pas d'esprit" and should such a situation arise then a divorce may result.

CASE 3

> Ibrahim's wife was pregnant with their first child. Ibrahim had been away from the camp for several months and she wanted to go home to her parents' camp to give birth. As he was absent she went without asking him. When he found out he divorced her *in absentia* a few days after the child's birth. The divorce was much condemned by his father and older kin because they felt that not only did he not have grounds for divorce, but that his poverty made it very irresponsible as he would have problems finding enough animals to remarry. Ibrahim's justification for the divorce was that his wife had not shown respect in leaving without his permission and this was the only way of retaining his pride.

Kel Tamasheq do not readily accept conflict and prefer to solve conflict situations by leaving them. This happens not only in marriage but in other spheres of daily living and is facilitated by their mobility and the relative economic independence of each household. If someone does not like the migration route or pastures, they leave. If members of a household disagree with another, one may leave. If a man feels oppressed by members of his camp or feels another camp would be better, he moves. Similarly with marriage, mobility arises out of conflict. Sometimes movements are temporary with one partner leaving on a prolonged visit to kin, at other times divorce ensues. This contrasts strongly with the Bambara view of marriage:

> "The Bambara theory of marriage - both the system of preferences in choice of partners and the ideology of relations within marriage - is premised on the assumption that conflict is inevitable in marriage and concentrates on ways of limiting the potential damage."

(Fulton & Toulmin 1982)

Individuals are important both as characters and decision makers, but Tamasheq society is also reinforced by strong reciprocal needs and obligations. It is thus possible for a couple to repudiate each other in marriage because of the back-up support provided for both partners by their kin. Although a woman may be economically independent in that she owns cattle, she is always perceived as dependent on a man - husband, father, brother or son - who will manage her cattle and under whose protection she lives. Intolerance of disputes within marriage reflects the knowledge that marriage is a contract within which one has the right to expect fulfillment of certain expectations[4]. If the contract is broken then the woman returns to her kin with whom her relationship is not contractual and therefore cannot be broken. Kin only provide support within their means, but it is this support which not only permits the frailty of inesleman marriage to persist, but also inhibits rapid remarriage.

Close kin marriage attempts to overcome this division between kin and affines, although there are two opposing attitudes towards marrying close relatives. One viewpoint holds that close marriage is desirable because the spouses know each other and their families, will care for each other more and kinship will reduce conflict. The other argument hold that disputes between closely related spouses can have undesirable far-reaching ramifications because relatives are forced to take sides against each other. Be that as it may, out of 42 recorded inesleman and imghad marriages, 5 (12%) were the first cousins, and 17 (40%) with second or first cousins once removed. 14 were with classificatory cousins, 1 related but untraceable, and only one was with someone acknowledged to be unrelated (5 not stated). Although the numbers are too small for statistical analysis, with 50% of marriages being with kin related within 2 generations, close kin marriage is an adhered-to preference. 36% close related marriages ended in divorce (rather

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4 As marriage is such a contract, when a young girl runs away at the beginning of a marriage, for no reason except that she cannot love her husband, then the return of the taggalt recognises that he has not broken the terms of the marriage contract, but she wishes to return to a pre-contract situation.

than being extant or ending in death) and 40% of the more distantly realted couples divorced. The precedence of kinship roles over affinal one emerges through the cases where a woman's former husband who has divorced her takes her in to live under his protection because he is her closest kinsman.

CASE 3

Leyla has been married 4 times. Her second husband was Mohammedoun with whom she had a son and a daughter. She says that she and Mohammedoun did not mean to divorce, it just happened, and that they are still very good friends. After the death of her fourth husband she went to live with her patrilineal cousins but when her son grew up he wanted to live with his patrilineal kinsmen, so he brought his mother to Mohammedoun's camp, where her tent is next to her ex-husband, and her cattle are herded with his.

Bella marriage

Bella marriages incorporate different strategies from those of the nobles. This is partly because the two classes, and their marriage systems are not independent of one another. Bella are not members of lineages or fractions in their own right, but belong to their master's fraction for taxation purposes. Their orientation is towards their owner, and as Bella children belong to their mother's owner, marriage does not give Bella men jurisdiction over his offspring. His *de facto* control is increased in the cases where he and his wife have the same owner or when their owners live in the same camp because otherwise virilocal residence after marriage leads to the loss of her labour. Thus there is a tendency towards 'arranged' marriages with increased contributions by the owners.

CASE 4

Erless, an *inesleman* man, was going to marry Fadimata. He owned a young Bella man, Rhaly, and Fadimata had a Bella woman, Tawi whose labour would be necessary in the new household. Erless took Rhaly to Fadimata's camp, introduced him to Tawi

> and suggested that they marry. Rhaly courted her briefly, discussed marriage with her parents and it was all settled. Erless gave Rhaly a bull (equivalent of 10 goats) towards the taggalt.

In the past nobles could veto Bella marriages, and as they were the providers of the taggalt this was an effective control. Nowadays the taggalt is provided by the Bella man and his family but endogamy still prevails and frequently both owners live in the same camp. This benefits the Bella as well as the nobles as they receive the added security of guaranteed work for both of them.

The quantitative analysis showed that the principal difference between the two classes is in the male age at first marriage, with Bella men marrying much earlier than inesleman. This is incongruous if the determinants of marriage are limited to purely economic considerations, as the wealthy inesleman men can amass the prerequisites for marriage far quicker than Bella. But marriage is not simply a desirable situation to which all men aspire and for the inesleman man marriage brings responsibilities, economic restrictions and demands which may be accepted only reluctantly when the pressure from the senior generation compells it. Marriage for the Bella man, however, spells out increased independence since before marriage he usually sleeps in his master's tent, is dependent on others for food and does not even have the advantage of living with his closest kin. Through marriage a new household is created, and the personal power of the Bella man is increased through the acquisition of a wife, and later children, over whom he will have some control. His marriage is also desirable for his owner, for not only will dependence of him be reduced whilst maintaining the labour, but frequently the Bella's owner acquires de facto access to the Bella's wife's labour and skills even if she belongs elsewhere.

Unlike men, women's age at first marriage does not differ by social class. Like men, Bella women benefit from the increased independence that marriage and tent ownership provide, and enjoy the advantages of control over a household rather than the subordinate status they have at their masters'. However the benefits are less pronounced for women than for men, since their skills and labour mean that in the Delta they can be economically independent for half the year. Through marriage a Bella woman acquires a tent and chattels and the right to bear legitimate children and although these provide labour for her master rather than their own family unit it is through this labour that she is provided with security for her old age. Although marriage removes a Bella woman from dependence on her master, she supposedly becomes subject to her husband's domination. Economic independence and a different value system mean that Bella women are far less dominated and controlled by their husbands than noble women. There is not the pressure on Bella men to maintain prestige and status that there is for nobles, and therefore their behaviour vis à vis their wives does not have to symbolise their power and control. Bella domestic arguments do not lead to divorce because the woman as an economic asset is far more important than her presence as a symbol of her husband's power.

Bella marriages should not be considered as an isolated phenomenon since despite the advantages of semi-independent living, the change in status for men and the possibilities of improving status and security through children, the owners stand to gain or lose as much as the individual Bella involved. The woman's owner may receive some of her taggalt but generally gives a present in return. She loses the woman's labour temporarily because of virilocal residence, but she stands to gain in the long run from the increase in her potential labour force. On the other side the man's owner may contribute towards the taggalt (usually a trivial amount) but he acquires temporarily the labour of the new wife.

Out migration of young men leading to an imbalanced sex ratio and monogamy[5] means there is a plentiful supply of women for men,

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5 Although the few examples of polygyny were Bella the numbers were so small that monogamy can be said to be the norm.

but not the reverse. Although marriage may not be financially feasible for a young man, support from his kin and migrant labour overcome initial problems. Unlike the noble man who needs cattle to support his wife, and labour, the Bella man earns his own keep and needs no resources for the creation of a household. Thus much earlier marriage is possible, and desirable because of the increased independence and autonomy that it brings. For dependent Bella women the advantages of marriage are less clear cut as it brings little reduction in work load and effectively just transfers their labour from their masters to their husbands. Unmarried Bella women are as capable of earning their keep as married women. Availability of spouses is not perceived as a major problem despite the fact that out migration has lead to a sex ratio in the over 15s of .813 and in the 15-34 age group it is only .741. After age 35 the sex ratios approach unity. This dearth of young men is certainly one of the reasons behind the relatively late age at first marriage for women. Feasibility of marriage is not a constraint because the taggalt pays for all the marriage prerequisites and the fact that Bella survive through labour rather than possession of resources means that no fund has to be set up to support the new household.

Like the nobles, Bella and blacksmiths are endogamous although it is not to maintain prestige. Blacksmiths need spouses with skills because male and female labour are complementary, whereas Bella are endogamous partly due to manipulation of marriages within ownership and partly because endogamy is the Tamasheq cultural norm. Class endogamy becomes obligatory because the other classes are endogamous. Close kin marriage is frequent. In the camp, of 23 Bella marriages recorded 8 (35%) were with first generation cousins and 12 (52%) with second generation cousins or relatives of a similar genealogical distance. 20% of all these marriages were with matrilateral parallel cousins, a marriage which solves all problems of conflicting masters.

Marriage does not appear to be a particularly desirable state for the dependent Bella women, but it must be remembered that some of the demographic data applies to independent Bella where marriage, households and children have different roles. Independent Bella have certain livestock prerequisites for marriage, as they are not solely dependent on survival through labour. Households approach Stennings' viable units with necessary resources and labour, and there are more pressures on spouses to stay together because of their complementarity and dependence on one another. Dependent Bella and nobles are different in that in neither case is the household a viable unit with both resources and labour; this viability come from uniting the noble household with the Bella. Bella do not have incentives for large families because they themselves accrue small benefit either in terms of power or wealth from increased labour force for the nobles.

Divorce

Tamasheq divorce follows the Islamic prescription whereby a man can divorce his wife simply by pronouncing the correct formula. Women have the right to ask for a divorce under certain circumstances such as gross maltreatment or impotence, but a woman who is very unhappy within her marriage may provoke her husband to the extent that he will divorce her.

Measures of Divorce

Divorce was considered to be an important part of the Tamasheq marital system because current marital status by age shows a relatively high percentage of women currently divorced (see figure 9.4) although this is a function of time to remarriage rather than an estimate of the frequency of divorce which can only be measured when complete marital histories are collected. Even then the percentage of marriages ending in divorce is a function of the total marriages and those ending in widowhood. Large spousal age differences increase the proportion of marriages terminated by death. Barnes (1949) developed a methodology for examining divorce rates, attempting to overcome the problems of incomparability of groups where divorce was variously described as 'rare' or 'common'. He outlined three divorce rates:

A. The number of marriages ended in divorce as a percentage of all marriages

B. The number of marriages ended in divorce as a percentage of all completed marriages

C. The number of marriages ended in divorce as a percentage of all marriages except those ending in death

Each of these measures has its disadvantages and biases. For example, differences in B might be due entirely to mortality, a relevant factor here as Kel Tamasheq spousal age differences vary considerably by social class (see figure 9.6).

In the Delta, marriage histories were collected for all the women living in one large camp plus several women from other camps. 23 noble women were interviewed giving 40 marriages and 18 inhaden and Bella women giving 24 marriages. The aim of the histories was to collect details of bridewealth, other exchanges, residence and reasons for divorce rather than statistics on a large number of marriages.

Table 10.1 combines Cohen's rates for a selection of West African countries where divorce rates are said to be "high", with those calculated for the Delta Tamasheq, and a group of Niger Twareg (Clare Oxby, thesis 1978).

Table 10.1 Divorce Rates (from Cohen 1971, table 10.2)

	A	B	C
Rural Kanuri (men)	52	79	56
Bakweri (women)	42	66	54
Yao (women)	35	68	41
Ngoni (both sexes)	29	56	37
Delta Tamasheq nobles (women)	45	64	60[7]
Delta Tamasheq Bella (women)	33	67	33[7]
Niger free Twareg (women)	49	79	56[6]
Niger slave Twareg (women)	62	94	64[6]
Mali Fulani (women 15-54)	17	65	19[8]

Delta Tamasheq clearly fit into the scale of these high divorcing populations, although Bella divorce rates are rather lower (the Bella sample was very small and contained a high proportion of very young women in their first marriage). The similarity of 'B' in both cases demonstrates the effect of mortality. Because Bella couples are closer in age, fewer marriages end in death and thus a higher proportion end in divorce. 'C' is least affected by mortality and here the nobles' divorce rate is twice as high as that of the Bella. Unfortunately Cohen's measures for the Kanuri cover marriages reported by men rather than women, which, as men are generally older than their wives, biases A and B towards a high divorce rate when compared with that obtained from female reporting.

Whether the divorce rate is high or low the main effect within the society is what happens to divorcees (and widows and widowers) when the marriages end. The high percentage of currently unmarried

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6 From Clare Oxby - thesis 1978.

7 In both groups, two women currently separated from their husbands are treated as divorcees, as it is unlikely that the couples will be reunited.

8 Data provided by M-L van den Eerenbeemt (unpublished).

Tamasheq women indicates that rapid remarriage is not the norm for women though it is for men. Again the nobles and Bella emerge with the same pattern achieved by different means.

Motives for Divorce

Through interviews it is hard to obtain reasons for divorce as such things are not spoken about openly with the persons involved, although this does not inhibit gossip behind their backs. All too frequently the reason given for a particular divorce was "fate", or "it was God's will" and no amount of probing could produce more. Cohen found the same in his research amongst the Kanuri where:

> "(The) response was to blame the divorce on 'fate'. In this way the respondent was being polite, proffering an answer, but avoiding the necessity of revealing anything about his divorce."
>
> (Cohen 1971, p.131)

The Kel Tamasheq often said that they got divorced by accident, that despite the fact that they still love one another, the husband pronounced the divorce words and so they were divorced. In general, by far the most comprehensive accounts given of specific divorces were the comparatively rare cases where the divorce was openly provoked by the woman. This may have been because I interviewed more women, but also because these cases specifically contravened Tamasheq rules and the marriage contract and had already had to be justified in public by the participants; in all four cases the taggalt had been returned to the husband thus severing completely all vestiges of the marriage.[9] These are the exceptions that prove the rule that the taggalt belongs to the woman in return for her fulfillment of the marriage contract which entails her obedience and subjection to her husband's decisions. If she breaks this contract, it is as though the marriage never happened, the taggalt is returned and the situation can be spoken of and justified openly.

9 See next page

Jealousy often provokes divorce, because a flirtatious wife undermines her husband's power and control over her. In this monogamous society, desire for another woman is also a cause for divorce, and although men have occasionally attempted polygyny, it meets with ridicule and invariably leads to divorce of one of the wives. Many other reasons for divorce hinge on the wife's behaviour; telling her husband's secrets, arguing with her husband's visitors, sullying her husband's name, provoking domestic arguments. However, if a man is too poor to maintain his wife, even if they still desire each other, he should divorce her and she should return to her kin.

Economic constraints do not inhibit divorce. Even though a man knows he will lose the use of his wife's taggalt and have to find the animals for a new wife, he never thinks of wasted taggalt when a divorce is perceived as necessary. The principles of behaviour involved are more important than economic criteria. Status and prestige count for more than cows in determining behaviour.

The two main themes which emerge from Tamasheq divorce are the importance of male-female behaviour and status, and the role of kin. Noble marriage incorporates all of Tamasheq ideals about status and prestige. Endogamy maintains class separateness and ensures that resources do not leave the group. Prestige is also reflected in everyday behaviour and is partially maintained for a man by having a fat wife who obeys him. Her size symbolises wealth in cows and slaves, and her obedience reflects his power; together these enhance his status. If she flaunts his power by her behaviour, it is contingent upon him to divorce her, because

9 In two cases a young girl had been married to an older man against her wishes and had finally run away from him. One woman had married a distant relative who happened to be living nearby. After the marriage they continued to live in that zone close to her kin, but eventually the man wanted to return with his wife to his own kin but neither she nor her parents wanted her to go. Although there was no animosity between the couple the wife and her kin decided to annul the marriage and return the taggalt.

this reinstates him in the dominant position, particularly as men alone have the real power to divorce.

Esther Goody's work on Gonja divorce (1962) suggests that in order to understand the process of divorce and remarriage it is essential to look at the stages in women's lives when divorces occur, and the outcome. We can outline three stages for Tamasheq women:

(1) young women before any children
(2) after one or two children
(3) towards the end of childbearing, or at least after several children

A fourth category is that of sterile women. In stage 1 the woman herself is often the initiator of the divorce and the taggalt returned and she is likely to remarry again quickly. This is more common amongst nobles than Bella. Stage 2 is generally initiated by the man, usually on the pretext of dissatisfaction with his wife and her behaviour. Often it is claimed that she flirted too much and courted other men. This is a clear case of marriage not living up to expectations. Divorces occurring very shortly after the woman's first child are not uncommon and may reflect the fact that at this stage the woman returns to her kin for a long period and the husband has the opportunity to reflect on the advantages of a different wife. Stage 3 divorces are relatively rare, but seem to be more frequent amongst Bella than nobles. Noble divorces tend to be in the first few years of marriage and many are marriages arranged for very young girls. Both time and children lead to more stable marriages for nobles, although a lot depends on the character of the woman. Bella divorces tend to occur later in marriage reflecting the lack of precocious marriages arranged with very old men. Different mortality patterns emphasise this effect. Adult noble women have higher mortality than Bella. Thus the probability that an aging noble man will find himself wifeless and looking for a young wife is higher than that of a Bella man finding himself in the same situation. That children and time do not have a stabilising effect for Bella marriages reflects the fact that Bella men effectively have no juridical control over their children who may not even live with him.

Kinship and Support Systems

Kin also define one's position in society, but because it is an immutable fact that they are kin, the relationship cannot be broken or really manipulated. If either spouse considers that the other is not showing true respect for their in-laws, relations become very strained. There is formal avoidance behaviour between individuals and their parents-in-law, particularly for men, but the respect should be taken further, to the extent of not criticising them. Close kin marriage alleviates this somewhat through the ability to select different relationships with people, some of which permit criticism. Kin are important in that they provide a back-up system making divorce possible. A father is always more important to a woman than her husband.[10] The difference in the relationships is that marriage is contractual and a contract can be broken and thus certain behaviour is not tolerated because of the ultimate sanction of divorce. With kin there is no ultimate sanction and they must be accepted and cared for just because they are kin.

After marriage a noble woman retains close contact with her kin, and the marriage may be an undesired break with them. Noble women are always under the protection of a man, be he her father, brother, husband or son, which is manifested in the _de facto_ control of her _taggalt_. Along with control of her stock, goes the obligation to look after her and provide for her. In the contractual case of marriage, when the husband is unable to look after her he divorces her. There is no equivalent escape from the kinship obligations, where support is provided within the means available. Old people with no close kin will be supported by distant kin, usually patrilineally related. Men can also expect support from kin, and young bachelors

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10 The idea that a woman could love her husband more than her father only provoked ridicule.

move from camp to camp living off various relatives and occasionally providing labour in return. Having once been married, men are less likely to want to return to dependence on kin; widowed and divorced men generally lodge with a single female relative who owns her own tent. Remarriage is usually desirable and there is no problem of availability of young women. For once-married women potential spouses are rarer as their own generation of men will be married to younger women, and there are few unmarried men at any one time. Some women prefer to live with kin than to be married and may refuse several suitors on the grounds that they don't love them. Economic status, age, kin with whom she is living all help determine whether a woman accepts or refuses a suitor. Poor young women may be forced into marriages that they don't desire because their kin cannot afford to keep them. This is particularly true if the potential husband is very wealthy, even though he may be very old. It is said that most marriages where the husband is considerably older than the woman are between closely related individuals, because only then can her kin be sure she will be well cared for.

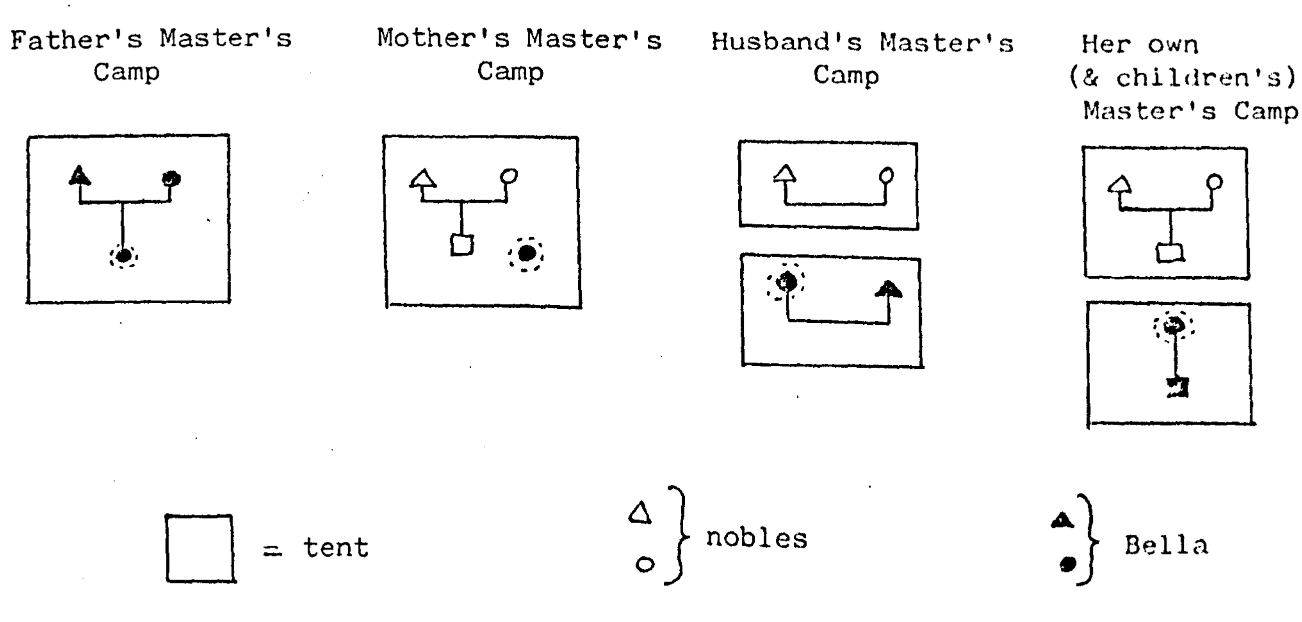
CASE 6

Miriama is about 16 and was married when very young to a much older man from whom she ran away and returned the taggalt. Since then she has been living with her mother who recently married a very poor man. Supporting Miriama is a strain expecially as she wants to forcefeed herself. Thus the prospect of marrying Miriama to Hamad despite his age (about 62) was acceptable to her mother because it would relieve the family resources and Hamad is rich despite being slightly mentally unbalanced. Miriama's mother did not really want the marriage to occur because she knew her daughter would be unhappy, but her father's kinsmen (who are also related to Hamad) said that the marriage would be a good thing so the affair is proceeding.

Noble Tamasheq women have a support system which may be preferable to remarriage in terms of pleasure gained from living companions, access to resources and freedom. A woman is not obliged to obey her brothers in the same way that she is expected to accede to her husband's wishes. A divorcee or widow participates fully in social life, more in fact than a married woman whose jealous husband might prohibit her from entertaining men or going to dancing parties. Some widows and divorcees say they would like to remarry because they miss the sexual side of marriage but apart from that there may be few advantages in remarrying. It is preferred that a woman be married at least once and this is justified by the Quran which states that a woman's role is to be married at least once. Most noble women who never marry have some physical or mental deformity.

For Bella women the support and dependence system after the break up of a marriage is different, but again a single woman is at no disadvantage either socially or economically. Bella women's labour is in demand and can be sold either to their masters, to villagers at harvest time, or in the markets. Thus they are not forced to depend on kin for support, unlike the noble women who are not only unable to supply labour but need to import it. A dependent Bella woman's master has first refusal on her labour and as she belongs to her mother's master and Bella mariage is virilocal she spends much of her life apart from her natal family. FIgure 10.2 shows the series of residences and dependencies that a Bella woman passes through during her lifetime.

Figure 10.2 Bella woman's camps of residence



(Note not only the changes between households but also between camps)

A young Bella girl of about 6 or 7 is frequently summoned to her mother's owner's camp for child minding and housework, where she stays until marriage and sleeps in her mistress's tent. On marriage she moves to her husband's owner's camp, where she may or may not work for her husband's owner; her own household and children are generally her first preoccupation. If her marriage breaks up then she will return to her own owner's camp, and not to her parents, although if her mother's marriage is also over she too will have returned to her owner. An old husbandless Bella woman is usually found in her owner's camp, dependent partly on him and partly on her children there. Her support may come directly from her children if she is no longer able to work, but as they will be working for her owners the support effectively comes from them.

Thus a Bella woman has few incentives for remarriage because her support system is independent of her marital status. Children are important, because in her old age it is through their labour for her master that she is provided for, although a good master would support her anyway. Nobles say "Bella are our children. They belong to us and we should look after them". Marriage only reduces a Bella woman's independence through husband's nominal control over her whereas a once married Bella woman has her own tent, cooking utensils, receives milk from her master and can also have lovers.

The Gourma Tamasheq

Much of what has been said about the Delta applies to the Gourma, particularly the importance of class and endogamy. About half the Gourma nobles interviewed in the survey have a matrilineal inheritance system which removes the incentive for men to marry to have children to inherit their animals. Economic independence is still a prerequisite for marriage, although the taggalt is lower than in the Delta, and women are generally more important as transmitters of wealth through animals. The links tying a woman to her own kin are even stronger than in the Delta partly because of the interest her brothers retain in her sons, who are their inheritors. This means that marriage is a fragile institution with few bonds to maintain it, and explains the higher levels of currently divorced women than the Delta. Men, once married tend to remain married indicating that despite the deterrent of matrilineal inheritance, other aspects of marriage: legalised sexual relations, a tent to live in , de facto control of wife's cattle are positive incitements to marriage once it has been experienced. As in the Delta, viable economic households include not only the nobles' domestic group but also that of the Bella and this provides a certain flexibility because Bella can be moved around to increase or decrease the labour force and the numbers of the consumers. Genealogical study in the Gourma shows that, certainly in the past, Bella marriages closely followed those of their masters, and when a noble couple divorced, a Bella divorce often followed particularly when each of the Bella couples belonged to each of the noble couples (Mike Winter, personal communication).

A major difference between the Bella of the Gourma and those of the Delta, is that the former have very high illegitimacy rates (in one camp, out of 43 resident Bella 15 (35%) were conceived illegitimately (Randall and Winter 1982)). Islam is probably an important factor here as the Delta Bella perceive themselves as Moslems where the majority of nobles are from the maraboutic religious class. Islam is emphatic about the desirability of marriage. Islam is less important amongst many Gourma groups where Bella are not even considered to be Muslims.

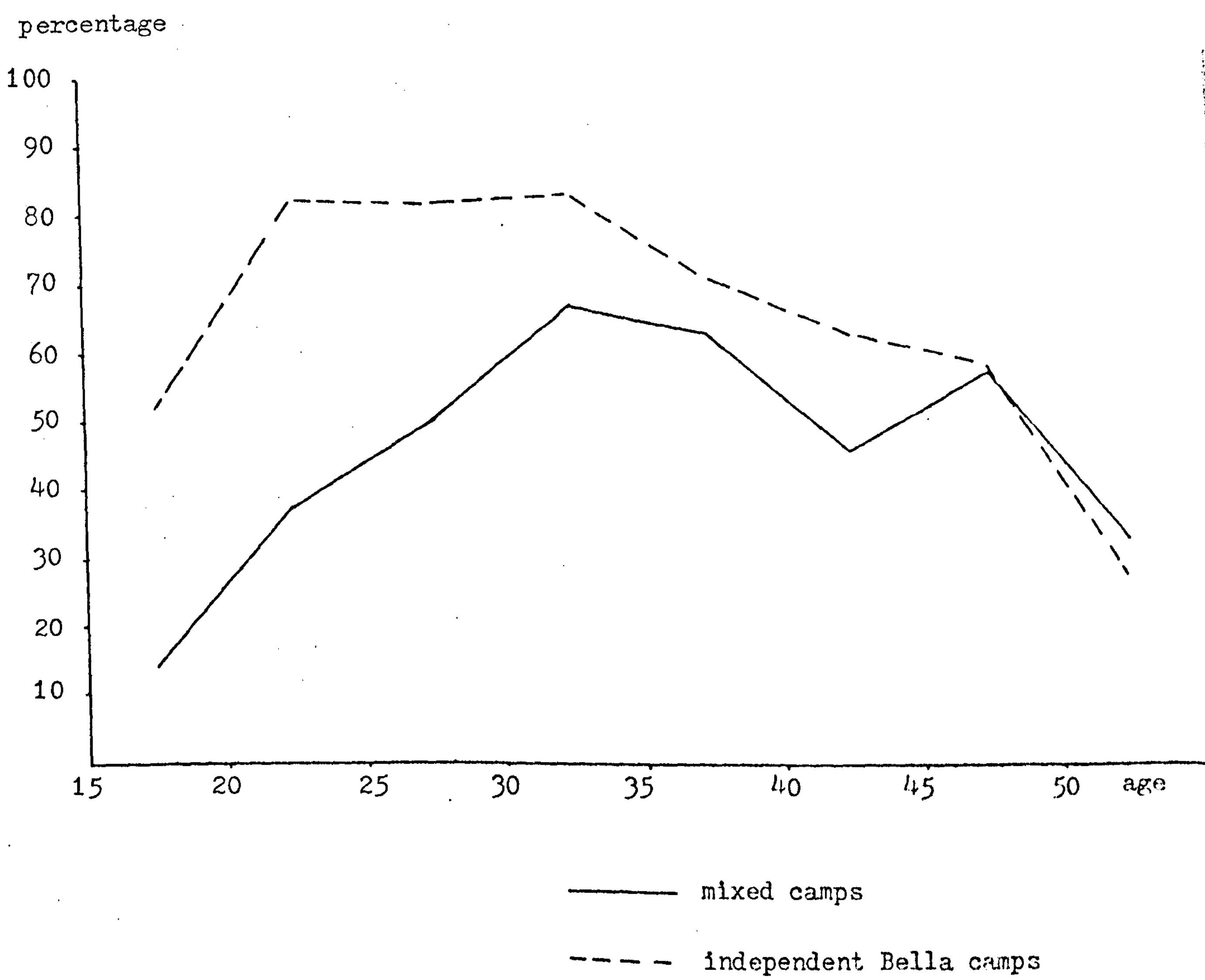
In the Gourma there are many 'independent' camps of Bella who are still linked to nobles but who live separately either with their own cattle or herding their masters' animals but with usufruct rights in the animals. There appears to be a flow of Bella between mixed and independent camps which is conditional upon marital status, showing the dependency patterns of Bella women. Most Bella households in the 'independent' Bella camps have a male household head and are effectively nuclear families. In the mixed camps a greater proportion of tents have single, widowed, divorced or separated women heads who have returned to their masters for support whilst they are husbandless. Figure 10.3 shows that the proportion of women currently married is consistently higher for every age in independent camps.

Little qualitative research has been done on the marriage and divorce patterns amongst the low-status illelan. These have a lower proportion of divorced women than either nobles or Bella (figure 9.8) reflecting either rapid remarriage after divorce, though not after widowhood, or less frequent divorce. The latter is the more likely for two reasons; firstly, lower status men are more tolerant of wifely behaviour that does not accord with the prescribed submission. Secondly spouses are more dependent on one another because in these families, as among blacksmiths, husband and wife complement each other in terms of skills and work and children are more important because labour is not provided by Bella. I suspect that if the Delta blacksmith numbers were large enough to permit separate analysis, a similar pattern would be found. Certainly in the Delta the blacksmiths were the only people who said that it was important to be married, rather than to have been married.

Discussion

In all three groups marriage gives women the right to bear legitimate children, but the allegiance of these children differs, ranging from Bambara children who 'belong' to their father's lineage, through Delta children who are part of their father's fraction but retain rights and loyalty to their mother's groups, to the matrilineal Gourma imghad children who belong to their mother's lineage but have economic and emotional ties with their father's kin. Bella children 'belong' to the mother's owner for whom they work although they maintain links and allegiances to their own families too.

FIGURE 10.3 GOURMA TAMASHEQ: PERCENTAGE OF BELLA WOMEN CURRENTLY MARRIED IN MIXED AND INDEPENDENT BELLA CAMPS



Each group desires women as wives for different reasons; Bambara men want women for the children they bear and the accruing wealth and power; noble Tamasheq men want women for the resources they own, both cattle and Bella, and also for the prestige that accrues from having a fat wife; Bella women are wanted for labour and the means towards increased independence. However, because women are not only desired by their husbands for these attributes, but also by other groups in the society, different marriage patterns evolve. A Bambara woman cannot bear children for her own lineage, so the whole of her husband's lineage has rights over her and her children. These rights are optimised by ensuring that she remains married to one of them. Noble Tamasheq women own cattle and Bella whether they are married or not and thus they are equally valuable in either state. Consequently at any instant many of them are with their kin. A Bella woman supplies labour both for her husband and her master and for both she increases their prestige; for the former through enhanced independence, for the latter through increase in resources over which he has control. Thus Bella women can have a viable and valuable existence in any marital state. Other factors facilitating the continuity of Bambara marriage compared with the changing Tamasheq state, are polygyny and the levirate, along with difficulties in redistributing bridewealth after divorce. For the Tamasheq, monogamy, large spousal age differences, indirect dowry and ease of divorce maintains a large proportion of currently unmarried women, along with the social system to absorb these women. Different expectations of marriage and of relations between affines also exist, whereby Bambara anticipate conflict but have the social mechanisms to overcome it, whereas the Tamasheq ideal of concord results in disillusionment which, coupled with an inability to tolerate conflict, promotes divorce and inhibits remarriage.

Kraeger's (1982) concept of demographic priorities is a useful framework. Bambara priorities are to increase the patrilineage and power through having a maximum labour force to work an unlimited resource of land. Noble Tamasheq priorities are couched in prestige, where the need to retain separateness and status entails class endogamy and separation, male superiority and dominance over women, and wealth and status of women symbolised in obesity. Dependent Bella have few priorities of their own and are largely manipulated by the nobles, but maximisation of independence within the social constraints leads to early and continuous marriage for men, but a female marriage pattern similar to that of nobles.

CHAPTER 11 - DETERMINANTS OF MORTALITY

In contrast with fertility, quantitative measures of the effects of all the intermediate determinants of mortality cannot be made, and thus no single feature can emerge as the principal factor involved, as did marriage for fertility. The whole mortality process is far more complicated than that of fertility and the socio-economic and cultural determinants intervene at several different stages; this can be seen from the simplified version of the system shown in figure 11.1. Infection, accidents and malnutrition are the principal direct factors involved in mortality, though even these operate through a morbidity stage which has two outcomes: survival or death. Sick care intervenes here to modify the effect of the direct variables. Exposure and susceptibility are the mediating indirect, intermediate variables. Even an exhaustive morbidity survey would be unable to measure completely the incidence and prevalence rates of the direct variables because of the complex interrelationships and interactions.

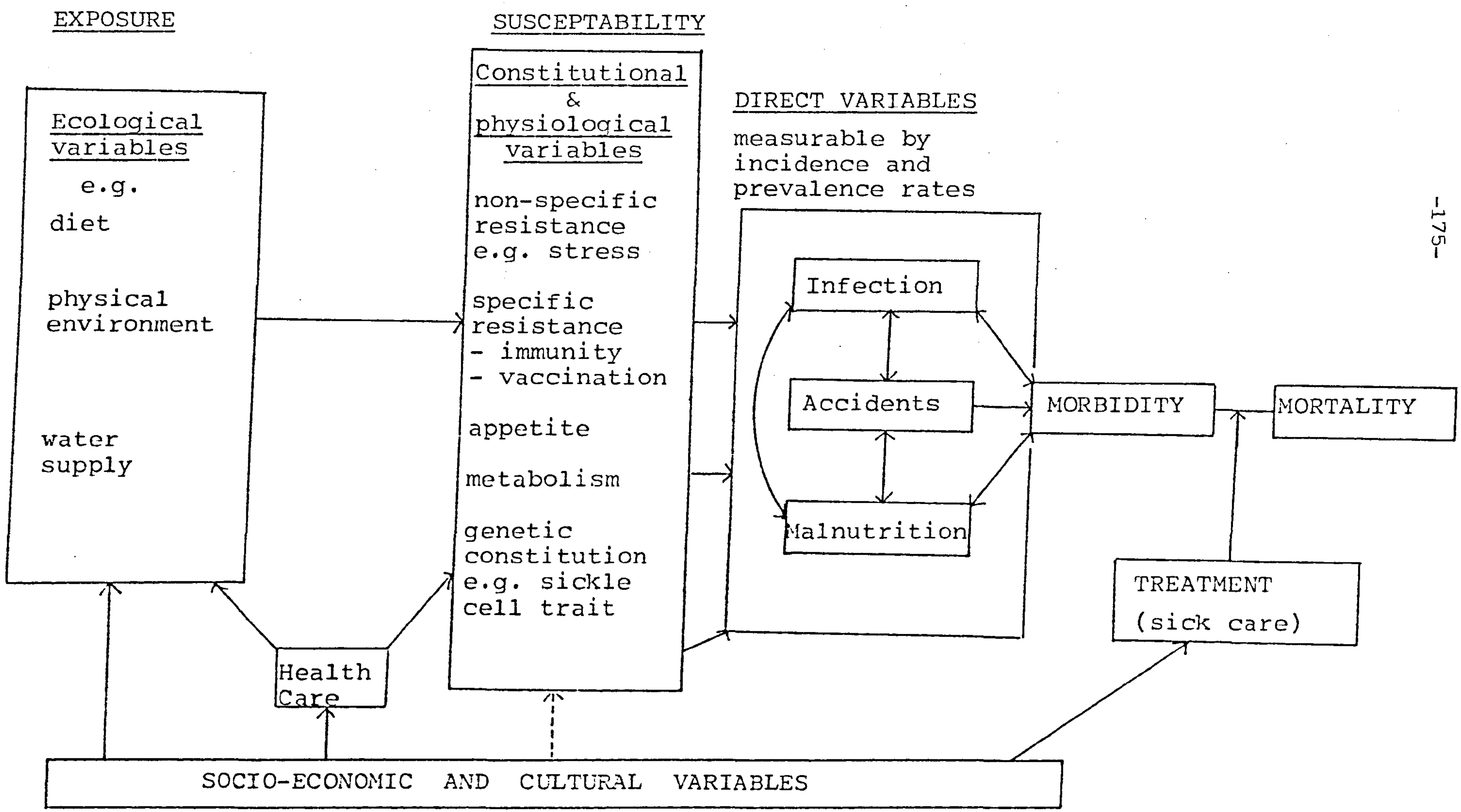
This does not detract from the value of the schema as a framework for qualitative comparison of different populations. Below is a resumé of our knowledge about each of the principal stages between the socio-economic and cultural variables, and the mortality outcome, for each of the three populations.

Infection

Infectious diseases are probably more widespread amongst Bambara children than either of the other groups because of the size and density of the villages. The isolation of the Tamasheq camps, particularly in the Gourma, means that some camps may be untouched by epidemics raging over the rest of the country.

Malaria - Delta Tamasheq are probably the most exposed to malaria because of their proximity to the riverine zone. Bambara too suffer from high mosquito populations in the wet season. Again the Gourma Tamasheq are probably least exposed because of the drier environment.

FIGURE 11.1 INTERMEDIATE DETERMINANTS OF MORTALITY - AFTER MOSLEY



Parasitic diseases are hard to evaluate. The quality of the Delta Tamasheq water supply is poor, particularly during the hot season, but this may be offset by the fact that there is plenty of water available. Bambara generally obtain most of their water from deep wells, which may be of better quality. It is likely that most children in all three groups have a heavy parasitic load including various intestinal worms and bilharzia.

Accidents

There is probably little systematic variation in the incidence of accidents between the groups.

Malnutrition

Nutrition surveys have been undertaken amongst the Bambara and the Delta Tamasheq[1] and they did not show any serious degree of malnutrition (Martin 1983, Wagenaar 1983) at the population level. The most interesting aspects of the surveys were the information on preparation, distribution and re-distribution of food. Notably, the Bambara have a series of strategies of loans, labour exchange and migration which overcome household level crises of grain supply, particularly in the hot and cultivation seasons. These strategies ensure that everyone eventually consumes about the same amount. The Tamasheq food preparation system means that Bella women and children acquire their meals from a variety of sources, and in various stages; cooked food is usually stored in Bella tents, providing a continual food supply there. In terms of quality and content, the Tamasheq milk based diet is better oriented towards the needs of young children than the Bambara millet staple. Tamasheq supplementation of breast milk with fresh or curdled goats' milk may start at a very young age, particularly for noble children. In the dry season when milk is scarce it is always the children

1. The Delta Tamasheq sample was very small and did not permit meaningful analysis by social class.

who are always served first, as there is a real fear that they will die without milk. During the weaning period a high proportion of the foods are milk-based mixed with some grain. Bambara weaning foods are watery gruels and the ordinary millet dishes of the family, of which huge quantities have to be eaten to provide the child with the necessary nutrients.

Intermediate mortality variables

Our inability to define and measure precisely the intermediate determinants of mortality, the factors involved in exposure and susceptibility, does not inhibit a qualitative evaluation of the more important components for each group.

Susceptibility

The three principal components of susceptibility are non-specific resistance, specific resistance and genetic constition; other factors such as appetite and metabolism are involved but they are largely subsumed under the principal components.

Non-specific resistance may be manifested in stress which is either physiological or psychological; the two have a synergistic relationship. Seasonal stress is an important consideration in precarious environments such as the Sahel. A symposium on this subject (Chambers, Longhurst and Pacey, 1981) demonstrates the recurring themes of economic stress, environmental stress and physical stress, all of which are exaggerated in the Sahel with its single, brief rainy season. Communities have mechanisms for alleviating and redistributing some of this stress, and the pastoral economy itself may have the effect of preventing all the different stresses peaking simultaneously[2]

2. For Sahelian cultivators there is least food, most work and most insect vectors and disease in the rainy season. Pastoralists have least food and most work in the hot season, which, from the health point of view is relatively benign.

Specific resistance: immunity to illness may be built up over the years, but in all these populations the process of acquiring immunity kills many young children. Vaccination programmes are virtually non-existent.

Genetic constitution: These populations are ethnically endogamous and the Kel Tamasheq are also class endogamous, which, with the preferences for close kin marriage, is a situation favouring the build up of different genetic constitutions. A known adaptation to the malarial zones of Africa is the sickle cell trait which protects against malaria. No research has been done on these particular groups, although for the Kel Tamasheq, the endogamous nobles with northern Berber origins from malaria free zones, are less likely to possess the sickling gene than the Bella, originally captured from villages in the malarial zones.

Kel Tamasheq, particularly the women, are more exposed to diseases linked with high intake of animal fats, such as coronary heart disease. Also, obese mothers are more likely to have low birth weight children which would substantially increase their children's susceptibility and mortality.

Exposure

Nutritional factors have been discussed above, as have the reduced exposure of pastoral populations to epidemics of infectious diseases. However, other exposure factors may vary such as animal borne diseases such as bruscellosis, and water borne diseases which may be found in the Delta. Both the physical environment and the economic mode of exploiting it are implicated in this.

Socio-economic and cultural variables

The range of the effects of socio-economic and cultural factors on the determinants of mortality is not only almost limitless, but also complex, since they can operate at different stages in the morbidity process. Let us take a simple example. Consider a pastoral society such as the Kel Tamasheq, which emphasizes beauty through extreme fatness and places great value on the efficacity of animal products. Not only does their economy to a large degree determine their diet, it also demands a nomadic way of life in the Sahelian environment. This affects the water supplies available. Nomadism inhibits integration into the national network of health and education services, and thus their access to modern clinical medicine, but at the same time it reduces their exposure to epidemic diseases. The pastoral economy may reduce seasonal stress, but the ingestion of a diet heavily dependent on animal products increases susceptibility to certain other illnesses. Treatment of sickness is heavily biased towards a utilisation of animal products which may exacerbate morbidity; for example using cow dung to seal wounds, and urine and dung in concoctions to cure diarrhoeas and stomach pains.

This example picks out, simplistically, just some of the effects of the production system alone and ignores all the social and cultural determinants. The latter operate through the belief system; the perceived efficacy of religious medicine, traditional medicine and modern medicine affects mortality at the treatment stage - or 'sick care'. But, 'health' care too is important. The mother is a crucial component of child mortality, not only through the effect of her bio-demographic characteristics on her child, but also her economic and decision making power, her knowledge and her personal ability to supervise her children. All these factors are determined by the general position of women in society, their relationships within the family, the socially acceptable networks from which they can draw both psychological and economic support. One must not, however, exaggerate the role of the mother to the exclusion of all other factors. The wealth, power, economic occupation and living accommodation of a child's family eventually trickle down to it, usually via the mediating factor of the mother who filters and transforms the wider attributes. Both the mother's behaviour and the child's position in the family operate within social constraints which dictate not only the range of acceptable behaviour but also the actions and results that are most socially rewarding for individuals, their families and kin. Obviously child-care aspects are not devoid of constraints imposed by the environment and seasonal factors such as demands for adult labour, but the relationship between a baby and its mother is largely determined by characteristics of the mother. There is a continuous development from the biological relationship with the mother at the moment of conception, to a mother-child relationship that gradually becomes more and more dependent on social circumstances, and eventually supercedes the mother when the child's well-being becomes largely dependent upon the society and cultural milieu he finds himself in. The gradual break with the mother may happen earlier or later in his life. Breast-feeding prolongs the physical and biological relationship (particularly because of the immunities the mother gives to the child), but this biological dependence also demands a social dependence because of the necessary proximity of mother and child.

Discussion

In contrast with fertility, for mortality, no single factor dominates the schema. The subsistence economies of all three populations imply the important role of the environment in terms of their susceptibility to climate and geography. Seasonal variation in fertility and mortality can demonstrate at what points and to what extent the climate may intervene in the demography, although only in interaction with the pattern of economic production. However, seasonal variation in mortality may also be linked to cause of death, itself a sensitive determinant of the pattern of mortality (Preston 1976). Thus, for each population I will proceed to examine some of the environmental factors affecting both exposure and susceptibility through an analysis of the patterns of infant and child mortality as measured through life table analysis of the birth histories, and also an examination of seasonal patterns of both fertility and mortality.

Variability in child care patterns determined largely by the mother's social position and the behaviour expected from her, will be considered as a partial explanation for the major social-class mortality differentials for the Kel Tamasheq. In this case seasonal variation and physical environmental factors are already controlled for, and although the genetic make-up of the two classes is very different it alone cannot be a sufficient cause of such substantial mortality differences.

CHAPTER 12 - LEVELS AND PATTERNS OF MORTALITY

Following on from the ideas developed in the previous chapter, a more detailed examination of mortality and some of its components is required. From the indirect estimates we obtained an idea of the overall levels of mortality for the different populations, but more precise comparisons with other populations are limited because of the different mortality patterns involved. Similarly, internal variation by cohort or birth order cannot be examined using these estimation techniques. Thus it becomes practical to use life table analysis of the birth history data, which permits more detailed perspectives on both infant and child mortality. After examining these life tables for the populations and their various sub-groups, I will discuss the data which link patterns of mortality and cause of death elsewhere in Africa, to try and place these Malian populations in a wider perspective and identify both causes of variation and important socio-economic determinants of mortality.

Different levels of mortality tend to show different age patterns because of variation in dominant causes of death and their age specific death rates. Preston (1976) has shown that this is true for the whole mortality schedule as well as for younger ages. According to his national data, as mortality improves, the largest absolute declines are for those under five years, and over sixty-five, but even within the under five group, improvements in mortality levels are likely to change the relationship between ${}_1q_0$ and ${}_4q_1$. On top of this, there are the general differences in overall patterns of mortality as summed up in the Princeton Regional Model life tables (1966).

In the previous chapter we outlined some of the reasons why Bambara might be subject to different dominant causes of death from the two Tamasheq populations. Such reasons are linked with the different economic systems, living conditions, water supplies and diet. The fact that the indirect estimates showed the existence of very different relationships between adult and child mortality for each group only tends to confirm this. For the life table analysis, though, we only have data on child mortality.

Two forms of data permit the examination of patterns of infant and child mortality: the longtitudinal survey and birth histories. The former tend to be more accurate because there is less recall bias; samples are generally small, however, and when surveys consist of annual rounds, there is still the possibility of underregistration of neonatal deaths.[1] In retrospective birth histories such as we have for Mali, there are greater problems of inaccuracy, particularly in high fertility, high mortality groups. Early deaths may be forgotten, there is a tendency for heaping on certain ages at death and for misreporting of birth dates. Nevertheless, life tables calculated from these birth history data do provide valuable information on mortality patterns, even if the finer details have to be treated with caution.

Calculation of life tables

The aim was to calculate life tables from the birth history data using as much of the data as possible. There were two main technical problems:

(i) Age at death was coded in months up to one year and in three month intervals up to two years, but the time since the birth was only coded in completed years, with 0 for children under one year.

(ii) censoring of those children who were alive at interview, but had not completed a particular interval.

The first of these problems was dealt with in one of two ways. For every woman, data were collected on the months since her last birth or abortion. Thus if a child was under two, and was her most recent birth, then his age in months was recorded. If he were not the last birth (quite rare in these populations) then his age was calculated using season of birth and the date of the interview.

1. This was found in Sine-Saloum where the proportion of children dead to women aged 20-24 was raised from .3386 to 3609 to correct for deaths missing in the first month of life (Garenne (1981).

To overcome the censoring problem the population at risk in each age interval had to be calculated. The age intervals were created so as to be the same as those recorded for age at death. Thus for any one age interval, those lost to the next interval included:

(i) those who had died during the interval
(ii) those who had been interviewed whilst in the age interval
(iii) those who were alive at the beginning of the interval and would have been interviewed during the interval, except that they died between the beginning of the interval and the interview.

The data consisted of time since birth (whether the child is now alive or dead), and if dead, age at death. The population at risk in any one interval was calculated in the following way.

For every starting age (x) of an age interval x to x +1

(a) The number of individuals who were born x to x+1 months before the interview
(b) The number of (a) who were dead before reaching age x
(c) The number of (a) who were actually alive at the beginning of the interval x to x +1 (a–b) and who did not complete the interval because of the interview
(d) The total deaths recorded where age at death was from x to x +1
(e) The number of deaths to individuals born x to x+1 months before the interview but who died between age x and the interview
(f) Total losses during the interval x to x+1 (c+d–e) The individuals in (e) are lost both because of the interview and because of death so they must not be counted twice.
(g) Total present at the beginning of the starting age x. For x=0 ie birth, this is all the live births recorded on the birth histories. For each subsequent starting age $g_{x+1}=g_x - f_x$
(h) Not all those present at the beginning of starting age x are at the risk of dying during the whole period x to x+1, because those currently x to x+1 were exposed on average to only half the interval. Thus (h) the total exposed to the risk of dying during the interval is $g-\frac{c}{2}$ where (c) is those alive at the starting age x and aged x to x+1

From this can be calculated q_x (d/h), p_x and l_x.

Since the indirect mortality estimates indicate that mortality has not changed over the last twenty years or so, and also that there is little omission of dead children by older women, all the births recorded were pooled together irrespective of their date of occurrence. Of course, even if mortality has not changed over this period, it is possible that the reporting precision diminishes with time since the event, and that pooled data will give less precise measurements than fewer, but more accurately reported recent events. However, graphs of reported ages at death show that, despite substantial heaping in most cases the severity of this does not increase particularly with the time elapsed since the event (see appendix 4). The advantages gained from the larger numbers of pooled births outweigh any disadvantages of using more distant events. This is particularly true for analysis of subgroups of the population.

However, there are three restrictions on the data which reduce their reliability for use for comparative purposes:

1. underenumeration of early neonatal deaths
2. age heaping - this is particularly marked for the Delta Tamasheq
3. age misreporting[2]

For the neonatal deaths it is possible to estimate the proportions omitted by comparing these populations with others, where neonatal mortality rates are taken from registration data or multi-round surveys. This has been done elsewhere for these data (see Hill, Randall, van den Eerenbeemt for details), the life tables were compared with the mean of the life table values obtained from the two West African populations of Ngayokheme (Senegal) and Keneba (the Gambia) using a logit transformation. In the regressions calculated to fit the data, only information from children born in the five years prior to the surveys was used, and deaths under one month were excluded. From these fitted logits the completeness of the neonatal reporting was checked by extending the proportionality of the logits to the first month of life and using the same regression constants.

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2. Retel Laurentin and Benoit (1976) note a tendency for underestimation of age at death in retrospective surveys. This boosts the level of infant mortality in relation to child mortality.

Table 12.1 shows the estimated completeness of reporting and the revised estimated neonatal $_{\frac{1}{12}}q_0$.

Table 12.1: Completeness of reporting of neonatal deaths, and corrected neonatal death rates estimated by regression (using births in preceding 5 years only)

	Estimated Completeness %	Observed neonatal death rate ‰	Estimated neonatal death rate ‰
Bambara	90.3	68	76
Delta Tamasheq	69.9	36	51
Gourma Tamasheq	89.2	54	60

Bambara report early deaths better than the other two groups, despite which substantial neonatal mortality differences are maintained after correction, particularly between the Bambara and the Delta Tamasheq. These corrections should not be interpreted too exactly but rather just as indicators of the degree of under-reporting and variation. The following life tables, calculated for the purposes of examining within population differences, will not have any adjustments made for neonatal underreporting on the assumption that reporting errors will be similar for the different, within population, categories; anyway, these neonatal deficiencies cannot be corrected too precisely.

Life Table Results

The reported l_x and q_x values for the three populations (Figure12.1) show substantial mortality differentials. If the data are taken at face value then the principal differences in the overall mortality levels for the three populations lie in the neo-natal mortality. Figures 12.2, 12.3 and 12.4 show, for each population, the l_x[3] values

3. l_x are shown rather than q_x, because the cumulative nature of l_x makes it a clearer measure in a case where the monthly q_x variations are substantial.

FIGURE 12.1 l_x AND q_x FOR THE THREE POPULATIONS

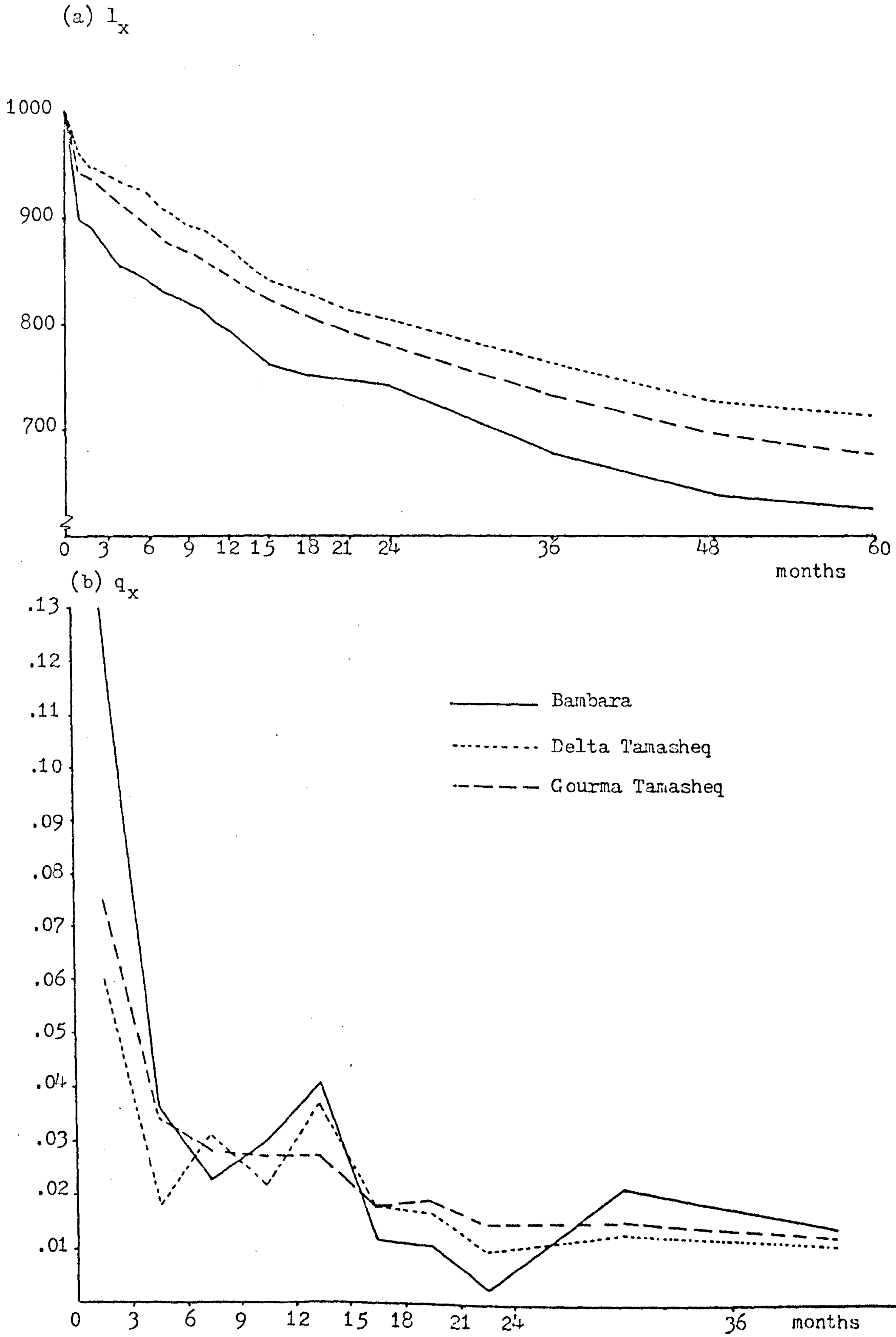


FIGURE 12.2 BAMBARA: 1_x VALUES FOR BIRTH COHORTS, SEXES AND ARRONDISSEMENTS

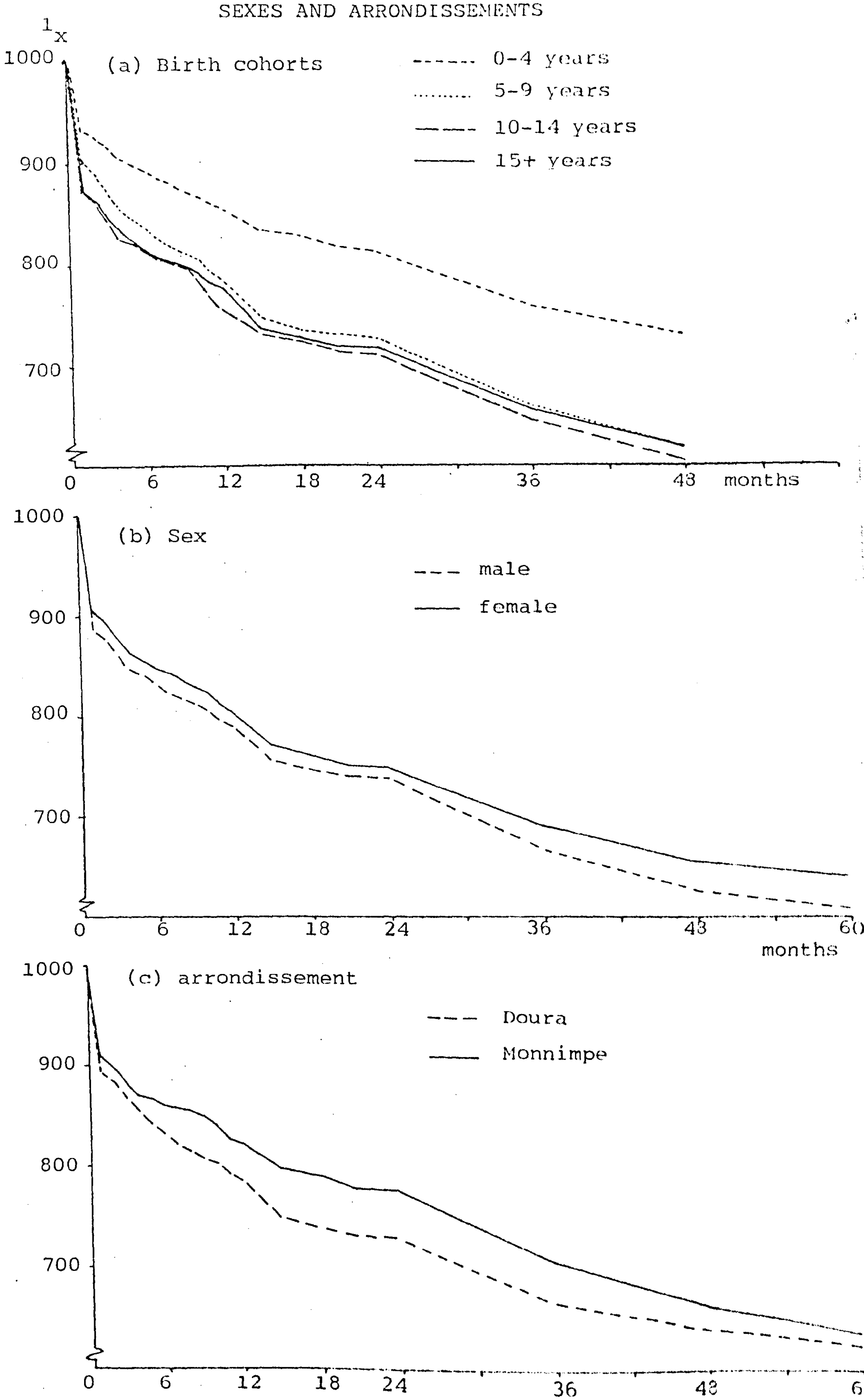
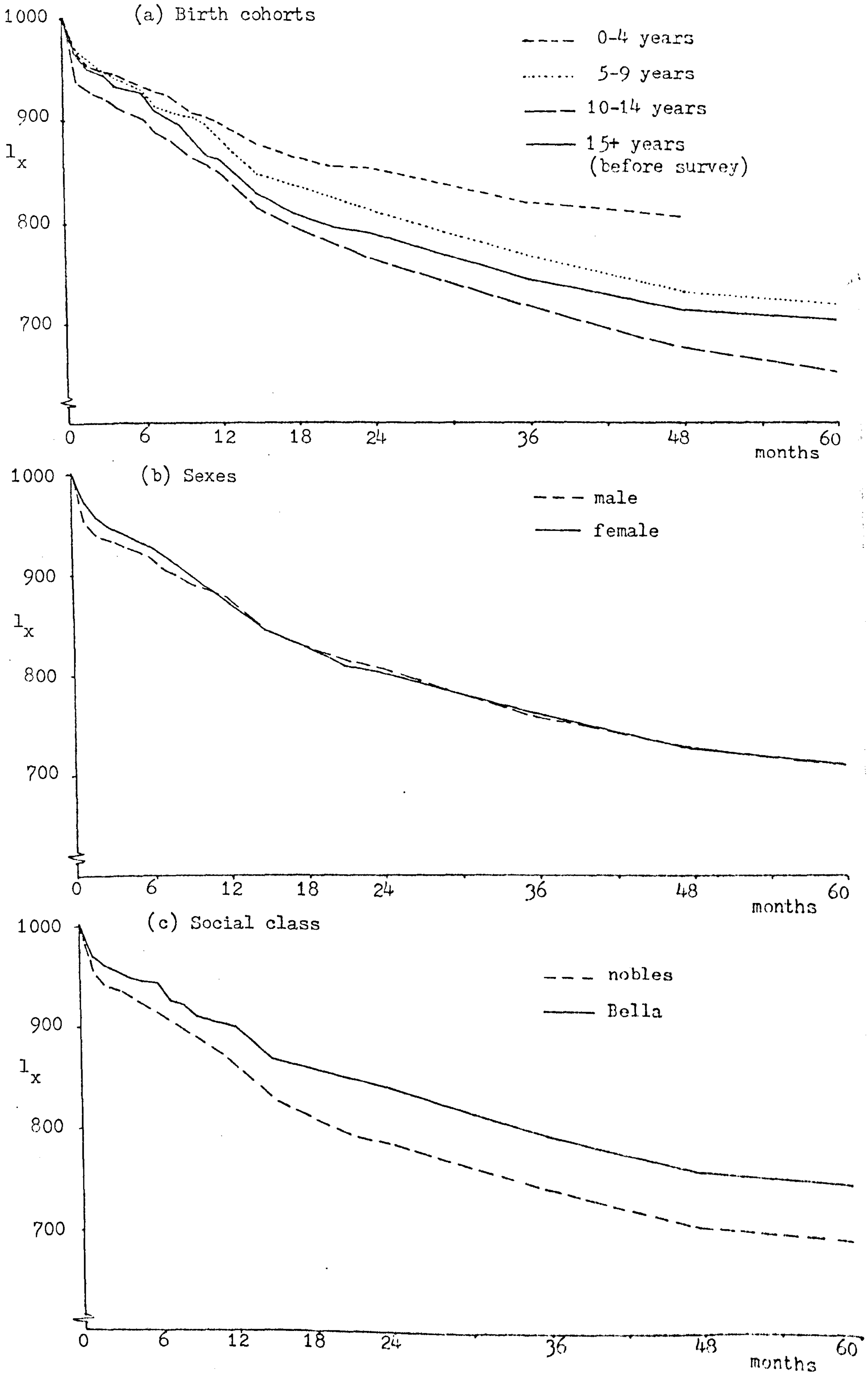


FIGURE 12.3 DELTA TAMASHEQ l_x FOR BIRTH COHORTS, SEXES AND SOCIAL CLASSES



values for (a) birth cohorts, (b) sexes and (c) arrondissements for the Bambara and social class for the Kel Tamasheq.

Cohorts

Although the Brass indirect estimates showed little evidence of recent falls in mortality, direct measures for all three populations show the most recent cohort with lower mortality at all ages up to three years old.[4] Table 12.2 shows the q_x values; all the Bambara cohorts appear to have higher third year mortality than second year. However, Bambara age misreporting at the end of the second year is much more exaggerated than for the two Tamasheq groups (see appendix 4) with virtually no deaths reported at age 21-23 months. The measure $_{18}q_{18}$ (in months) is thus probably a better comparative measure of mortality for the first months after weaning as it spans both sides of the reporting errors.

Another feature of these cohort life tables is that mortality in the oldest cohort is generally lower than for the two preceding cohorts, especially for the $_{18}q_{18}$ which is not the age group most likely to be affected by omission. It is possible that this actually reflects recent changes in living conditions as, since the early 1970s, the Sahel has suffered a series of drought ridden years, and only the 15+ cohort avoided these years at younger ages.

It seems that Bambara neonatal mortality has diminished over the last few years. This too is unlikely to be an effect of reporting errors, since one would expect omissions of dead children, particularly neonatal deaths to increase for older cohorts, rather than diminsh. There is no evidence of improving Tamasheq neonatal mortality.

Sex

Both Bambara and Gourma Tamasheq show slightly higher male than female mortality, and most of the difference occurs in the first month of

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4. This phenomenon is compatible with the Brass estimates, which are dependent on the age of the mother rather than the time since the birth, particularly if falls in infant and child mortality are occurring for older rather than younger mothers.

Table 12.2

1000 q_x VALUES FOR COHORTS BY ETHNIC GROUP (x IN MONTHS)

Bambara

Age	$_1q_0$	$_5q_1$	$_6q_6$	$_{12}q_{12}$	$_{12}q_{24}$	$_{18}q_{18}$	N*
0-4	68.5	43.2	39.8	48.8	68.2	85.9	1994
5-9	96.8	76.5	59.5	75.3	92.4	104.6	1911
10-14	126.9	71.5	66.7	59.9	97.6	110.8	1411
15+	128.3	66.4	45.0	75.7	82.7	93.4	1987

Delta Tamasheq

Age	$_1q_0$	$_5q_1$	$_6q_6$	$_{12}q_{12}$	$_{12}q_{24}$	$_{18}q_{18}$	N*
0-4	34.1	36.1	38.7	49.6	40.9	53.3	1026
5-9	33.2	39.0	50.6	81.1	53.6	83.3	874
10-14	63.5	37.2	58.1	102.8	60.4	96.2	630
15+	35.5	40.7	67.5	86.5	58.5	80.6	737

Gourma Tamasheq

Age	$_1q_0$	$_5q_1$	$_6q_6$	$_{12}q_{12}$	$_{12}q_{24}$	$_{18}q_{18}$	N*
0-4	53.9	31.2	40.9	44.8	34.5	60.9	1153
5-9	67.7	60.2	63.9	94.1	68.2	107.6	945
10-14	59.3	52.1	74.7	98.7	87.7	120.9	675
15+	52.7	62.1	45.1	73.2	56.2	85.0	1176

* N = number of individuals at age zero

life. Delta Tamasheq have higher male than female mortality in the first month, but higher female mortality for the rest of the first year compensates for this, so that by 12 months there are equal numbers of survivors. Higher male mortality was also noted by Cantrelle and Leridon in Sine (1971) where ${}_1q_0$ was .206 for males and .193 for females. The difference there was not significant, neither is it for any of the populations here.

Area

Table 12.3 shows the different q_x values for the two Bambara arrondissements.[5]

Table 12.3 Bambara $1000q_x$ by arrondissement (x in months)

	${}_1q_0$	${}_5q_1$	${}_{12}q_6$	${}_{18}q_{18}$	${}_{24}q_{36}$	${}_{60}q_0$	N
Doura	110	68	112	98	70	382	4806
Monnimpe	91	56	83	102	101	364	2497

For the first 18 months mortality is lower in Monnimpe, the wealthier zone. Then a reversal occurs with similar mortality in both areas for the second and third years followed by higher child mortality in Monnimpe.

For the Kel Tamasheq the effect of the area is seen by considering the two Tamasheq populations.

Social class

The q_x values for the social classes of both Kel Tamasheq groups are shown in table 12.4. From the indirect mortality estimates Bella have lower mortality in both areas; this result is duplicated here

5. ${}_{12}q_6$ and ${}_{18}q_{18}$ are given rather than ${}_{12}q_{12}$ and ${}_{12}q_{24}$ because of the reporting errors observed towards the end of the second year.

with lower Bella mortality at all ages. Low status illelan have intermediate levels of mortality from 6 months to three years old. Otherwise they resemble nobles more than Bella.

Table 12.4 Tamasheq: $1000q_x$ by social class and area (x in months)

	1000_1q_0	$_5q_1$	$_{12}q_6$	$_{18}q_{18}$	$_{24}q_{36}$	$_{60}q_0$	N
Delta							
nobles	45.5	42.1	113.5	86.5	66.5	310.3	1785
Bella & blacksmiths	33.2	26.3	92.5	70.7	60.5	254.1	1482
Gourma							
nobles	64.6	63.0	138.9	123.8	78.3	390.3	872
low status illelan	64.2	61.8	93.8	101.3	94.8	352.8	1313
Bella	49.2	38.2	77.5	75.5	67.3	272.9	1764

Birth order

In order to have an idea of the magnitude of bio-demographic factors involved in mortality variation, life tables were calculated by birth order for each community. (Figure 12.5) Bambara have considerable birth order mortality differentials; first births have substantially higher mortality than subsequent orders, with most of the variation occurring in neonatal mortality. Delta Tamasheq data show no birth order effects at all, and for the Gourma Tamasheq high order births appear to have lower mortality than lower order births, both of which are somewhat surprising results. The main Gourma Tamasheq differentials occur during the first year, which lends credence to suspicions that more high order, early deaths were omitted than low order ones despite the fact that high order births tend to be the more recent events. On the other hand as both Tamasheq groups show this lack of birth order effects, maybe a cultural or socio-economic explanation should be sought, rather than a retreat to data errors.

There is a slight bias in the data due to the way that it was collected. By recording all births to women aged 15 to 50, a greater proportion of first births were born sometime before the survey, and few high order births are from the older cohorts. (table12.5) Thus a birth

FIGURE 12.5 BIRTH ORDER l_x BY ETHNIC GROUP

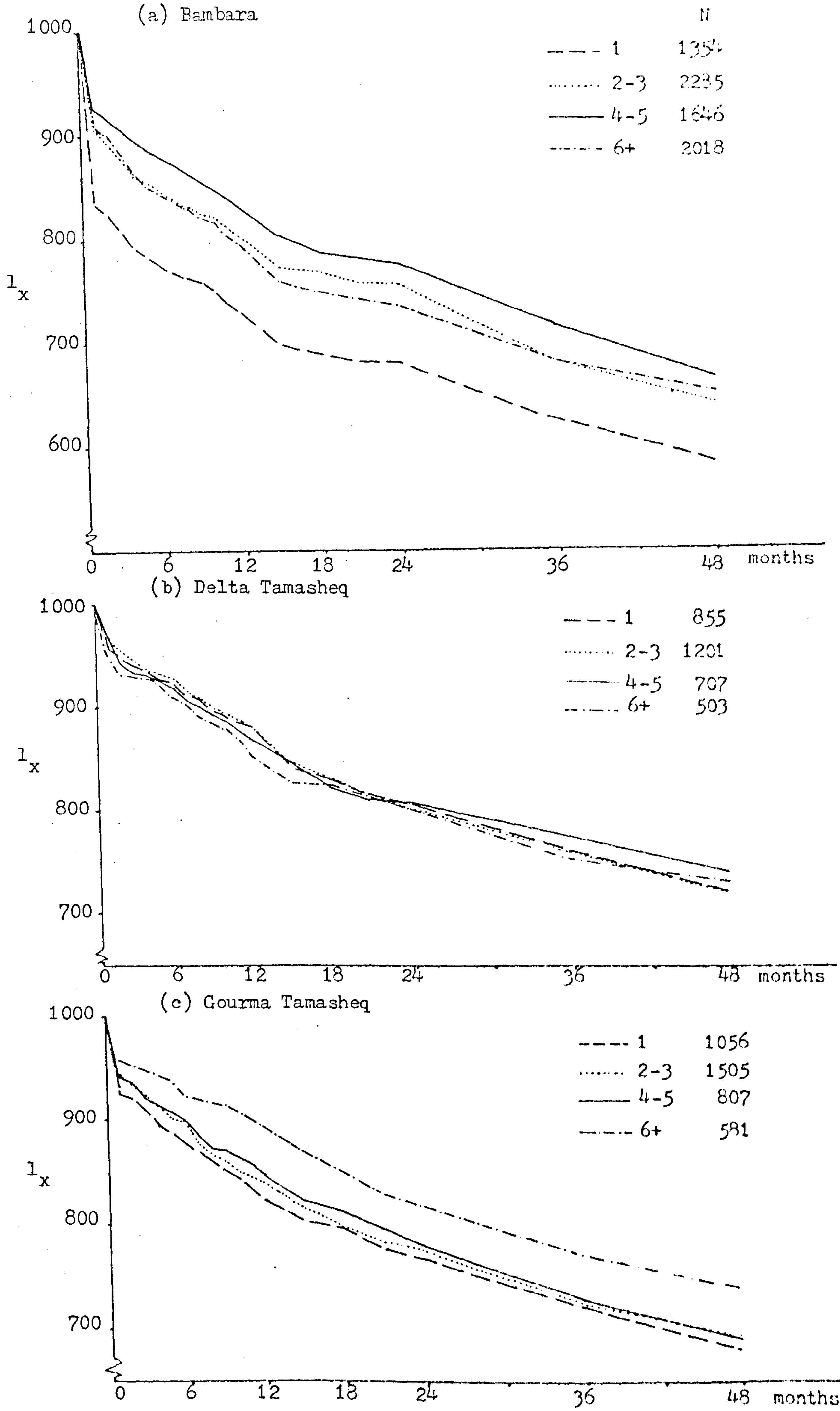

Table 12.5

PERCENTAGE OF EACH BIRTH ORDER IN EACH COHORT

(a) Bambara

cohort	1	2-3	4-5	6 birth order
0-4	15.2	26.9	20.6	37.3
5-9	16.0	26.7	23.1	34.3
10-14	15.9	30.0	26.4	27.7
15+	26.4	40.9	21.1	11.6

(b) Delta Tamasheq

cohort	1	2-3	4-5	6 birth order
0-4	22.4	31.8	24.5	21.3
5-9	22.0	37.4	22.9	17.7
10-14	26.9	36.0	22.7	14.4
15+	35.2	43.7	15.5	5.6

(c) Gourma Tamasheq

cohort	1	2-3	4-5	6 birth order
0-4	24.2	40.9	19.8	15.2
5-9	27.1	32.3	22.5	18.1
10-14	24.6	36.7	20.1	18.5
15+	30.3	40.8	19.5	9.3

order effect whereby first order births have higher mortality than other orders, combine with a cohort effect of higher past mortality will tend to exaggerate each other. On the other hand, for the high order births, more were born recently when mortality is lower, so the expected higher mortality for them may be dampened down. Even this exaggeration of first birth mortality failed to produce any significant birth order effects in the two Tamasheq groups.

Patterns of mortality

From all these life tables we see that there are both different patterns and levels of mortality by community and sub-group, but that major differences are always observed in the neonatal mortality. This is problematic as most errors are likely in this age group. Certainly the low neonatal mortality rates for the Delta Tamasheq, combined with the absence of any birth order effect, indicate systematic underreporting of neonatal deaths, particularly for first order births.[6]

A comparison of the life table mortality measures with the indirect estimates is illuminating, particularly in the light of Garenne's study (1981) which shows that for extreme patterns of mortality the Brass indirect estimates are unreliable. (see Chapter 3). We have shown elsewhere (Hill et al. op. cit.) that in fact the observed Malian mortality patterns are much less biased towards heavy second and third year mortality than the Senegal and Gambia groups.[7] The pattern of mortality is important not only in relation to the accuracy of the indirect estimations but also for the indications of cause of death. Much of the reliable data relating cause of death to mortality patterns in fact comes from the Senegambian studies. In attempting

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6. Observation confirms this. On returning to a surveyed camp where there were about 30 women, I found out that in the survey, two women had not reported their first birth on the birth history when these children had subsequently died. Two other women who had had their first births whilst I was away, and the babies had died, did not even mention that the events had occurred.

7. Using a logit transformation the life tables of these groups were compared with a composite Sene-Gambia table. The regressions gave the following alphas and betas.

	α	β	R	(correlation coefficient)
Bambara	-.494	.616	.988	
Delta Tamasheq	-.638	.669	.997	All correlation coefficients
Gourma Tamasheq	-.639	.597	.997	are significant $p<.01$ DF=9

From Hill et al. 1983 table 2

to understand the reasons for different levels of mortality in Africa, particularly amongst rural populations of apparently similar levels of economic development, and similar levels of access to medical and educational services, the patterns may prove to be very important in identifying different periods of high risk, be they seasonally or regionally defined.

Blacker (seminar CPS) has shown, for all the African countries covered by the World Fertility Survey, that the ratios ${}_1q_0 : {}_4q_1$ calculated directly from the birth history lifetables, lie on or near the line of this ratio calculated for the Princeton South model life table, with the exceptions of Lesotho which is closer to the East model, and Senegal which is way off to the right with far higher child mortality than any of the Princeton models. Senegal is closer to South than to any of the other models. Thus, to compare indirect with direct measure of mortality for the Malian groups, table 12.6 presents the values for estimates made using South model and the Brass general Standard (which was used in the indirect estimations presented earlier).

Table 12.6

COMPARISON OF DIRECT AND INDIRECT ESTIMATES OF INFANT AND CHILD MORTALITY

	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0/{}_4q_1$
(a) Bambara				
Direct	.205	.376	.215	.953
Indirect (South)	.210	.367	.198	1.057
Indirect (Gen. St.)	.242	.353	.146	1.658
(b) Delta Tamasheq				
Direct	.125	.287	.185	.675
Indirect (South)	.179	.311	.161	1.113
Indirect (Gen. St.)	.204	.303	.124	1.640
(c) Gourma Tamasheq				
Direct	.155	.326	.202	.767
Indirect (South)	.206	.365	.200	1.029
Indirect (Gen. St.)	.243	.354	.147	1.657

Note: Levels of ${}_1q_0$ and ${}_5q_0$ are taken from the mean level for the estimate from each women's age group, excluding women aged 15-19 for the Bambara and Delta Tamasheq, and excluding women aged 15-24 for the Gourma Tamasheq

From table 12.6 we see that the South pattern of mortality resembles closely the reported Bambara pattern, at least in terms of the relationship between infant and child mortality, and the estimates are similar in level to the direct measures. Using the General Standard rather than South for comparison, the estimated $_5q_0$ is similar but $_1q_0$ is too high. For the two Tamasheq populations, the direct measures show much higher child mortality in relation to infant mortality than either of the indirect estimates, though, of the latter, South is closer to the actual pattern than the General Standard. Of course, in the direct estimates, underreporting of neonatal deaths, plus the tendency for ages at death towards the end of the first year to be pushed up to 12 months[8], will alter the ratios of the direct measures in the direction of those of the estimates. The underregistration of neonatal deaths will also augment $_5q_0$ so that the apparent over-estimation of the measures is reduced. Nevertheless, one can conclude that, for the two Tamasheq populations, although the indirect estimates produce a valid estimate of $_5q_0$, mortality pattern differences mean that $_1q_0$ estimates are substantially too high, particularly using the General Standard.

Thus we have two mortality regimes represented here. For the Bambara, principal mortality stresses and problems are during the first year of life compared with the relatively lower child mortality; thus we should seek explanations linked to birth factors, the mother's physical well-being and breast-feeding and diseases particular to infants. For the Kel Tamasheq the higher risk period is after the first year, when mortality is linked more to exogenous factors such as weaning foods, infectious diseases and environmental factors.

To put all three groups into a West African context, Table 12.7 shows the directly calculated mortality measures for a series of West African populations, and in an attempt to summarize the pattern of mortality the ratios of $_1q_0$ to $_2q_1$ are also shown. This ratio avoids the problems of misreporting at the end of the second year, and also, in these long breastfeeding populations it divides the more or less totally

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8. This did not occur for the Gourma Tamasheq (see appendix 4)

Table 12.7

PROBABILITY OF DYING DURING THE FIRST THREE YEARS OF LIFE: SEVERAL WEST AFRICAN POPULATIONS

	Upper Volta[1] before 1967	Upper Volta[1] 1967-61	Bambara	Gourma Tamasheq	SW[2] Senegal Female	SW[2] Senegal Male
$_1q_0$	.245	.157	.205	.155	.187	.231
$_1q_1$	.057	.048	.066	.077	.091	.126
$_1q_2$	.047	.059	.086	.062	.087	.099
ratio $_1q_0/_2q_1$	2.43	1.51	1.40	1.16	1.10	1.08

	Mandenka[6] Senegal 1970-81	Delta Tamasheq	Gambia[3]	Sine[4] Senegal	Saloum[5] Senegal
$_1q_0$	.253	.125	.239	.205	.125
$_1q_1$	.187	.079	.079	.194	.123
$_1q_2$	.082	.054	.121	.139	.076
ratio $_1q_0/_2q_1$	1.00	.97	.93	.67	.66

(1) Retel-Laurentin & Benoit 1976*

(2) Pison 1982

(3) Calculated from McGregor et al. (undated)

(4) From Cantrelle & Leridon 1971

(5) From Cantrelle, Leridon, Livernais 1980

(6) Lecomte-Enselme 1983

* In this survey women were motivated to report abortions, still births and early neonatal deaths because the survey was linked with a medical examinatio and treatment for sterility and venereal diseases.

breastfed children from those in the more intense weaning period. From this table we see that there is no correlation of level of mortality and pattern. Rather, there is a spectrum of mortality moving from high infant mortality in relation to later mortality further east in the West African zone, moving towards much higher later mortality in the West. This confirms ideas that there may be a particular West African child mortality regime. Economy, in terms of pastoralism versus agriculture is observed to bear no relation to the mortality pattern. Both extremes consist of cultivating groups, although some of the Senegalese groups probably have a greater proportion of livestock than the Upper Volta populations. The two Tamasheq groups are the only two 'true' pastoral populations for although the Paul Bandé of South West Senegal are part of the large Peul cattle owning family, Pison says that "Chez les Peul Bandé, qui sont avant tout des agriculteurs, l'importance de l'élĕvage est moindre" (1981).

Discussion

This detailed examination of mortality has in fact provoked more complexities than it has solved. In themselves these Malian populations manifest two different mortality patterns, but when placed in the West African context we see that neither approaches the extremes. High Bambara infant mortality and high Tamasheq child mortality contravene our expectations founded on ideas about suitable weaning foods, possibilities of contagion and quality of water supply.

For the Bambara a particular surprise was that mortality in Monnimpe is only lowe than that in Doura for the first two years of life rather than throughout childhood. Monnimpe villages have more access to health care, with a nearby dispensary, education (though there was only one literate woman in the sample) and a market. The area is richer than Doura, and, according to the villagers, suffered less during the 1973-4 drought. It is possible that these factors are having an impact on mortality; certainly changes in maternal mortality (Monnimpe women have much lower mortality than Doura women, see Chapter 4) would be closer linked to children in their first two years of life than later in childhood.

Another surprising result was the cohort differences for all three groups, with apparent major improvements in mortality over the last five years. The 1973-4 Sahelian drought affected all these groups (see Caldwell 1975) to some degree and it has often been presumed to have had an effect on mortality, although Faulkingham, in a retrospective survey of a Hausa village in Niger found no evidence that death rates rose during drought years; his sample was very small (Faulkingham & Thorbahn 1975). There is little evidence from these data of a dramatic effect of the drought on mortality of children. It is possible that before the drought Bambara mortality was improving, and had the drought not happened, the 5-9 cohort would have intermediate mortality between the 0-4 and the 10+ cohorts. There has been little recent increase in the health services, either preventative or curative, reaching any of these populations, although any modern health care they do receive is curative. However, the long term MRC project in the Gambia which did provide a high standard of curative medicine to the study population had practically no impact on infant and child mortality for many years (Rowland et. al. 1977), so one would not expect the much lower quality services provided here to lead to significant changes.

High second and third year mortality is often said to be linked with nutrition and poor weaning foods[9], yet the ethnic and social class differences observed here make this improbable. Although Bambara child mortality is higher than that of the Delta Tamasheq, the pattern of mortality indicates that the stresses on Bambara children are higher in the first year (before weaning) than in the second and third years (after weaning). This contrasts with the Tamasheq pattern, and is most surprising as the Delta Tamasheq have far more access to milk products and milk than do the Bambara, and milk is considered to be an excellent weaning food. At the same time, within the Tamasheq samples, nobles have higher mortality than Bella, yet nobles have far more milk than their ex-slaves. It seems here that dietary considerations and malnutrition are not principal determinants of mortality or even important intermediate variables for these populations. As wealth and access to resources are positively rather than negatively related to Tamasheq mortality levels, both of the economy-related

9. See for example Cantrelle's (1982) analysis relating child mortality in two zones in Senegal with the food production in both areas.

factors generally held to affect a population's mortality, seem to be irrelevant as mortality determinants. Thus, we are left with pathological factors, environmental hazards, genetic resistance and child care as principal determinants and intermediate factors in child mortality.

Illness, health and cause of death

Unfortunately, these studies lack information on two subjects which would significantly increase our understanding of mortality differentials: birth weights and cause of death. However, these and other topics have been studied elsewhere, particularly in focussed medical surveys and longitudinal studies. It seems worthwhile to review some of the principal findings to see whether we can extrapolate from them to the Bambara and the Kel Tamasheq.

Cause of death must be a major clue to the different mortality patterns, and also to the apparent inconsistencies found elsewhere in levels of mortality; Keneba (the Gambia) with good medical curative services has shown little mortality improvement; in Senegal the infant mortality rate in Sine is 70% higher than that in Saloum, yet Sine has more medical services and has had more medical campaigns. Preston's (1976) regression analyses of cause of death and patterns of mortality indicated the illnesses which have the largest effects on death rates. For the under fives, these are diarrhoea and certain diseases of childhood, although later he does say that he considers diarrhoea to be less important in Africa than elsewhere in the world, because of low population density. Whether this is the case or not, much of the work on cause of death, linked with patterns of child mortality has concentrated on diarrhoea and malaria. Although the latter is an important cuase of death and morbidity in Africa, its seasonality reduces its impact. However, MacGregor et al. (1970) found that during the peak prevalence period, one third of children were clinically affected with malaria, and by the end of the rains two thirds of the children over six months had clinical malaria. In both Malumfashi (Williamson & Gilles 1978) and Akufo (Gilles 1965) in Nigeria, the crude malaria parasite rate rose to a peak, which in Akufo was at age two, with 80% crude parasite rate and in Malumfashi at ages two to four with 83% crude parasite rate. This indicates some of the burden that malaria places on the child population.

The importance of malaria as a factor in Nigerian mortality is seen by the ratio of sickle cell trait[10] in children under and over five years in Akufo. For the under fives the ratio of A:S was 4.1:1 whereas in the over fives it was 2.6:1 (Gilles op.cit.). There is no data on the sickling rate for these Malian communities, but malaria is widespread and likely to place a heavy burden on young children.

In the Gambia, MacGregor et al. (1970) found that children aged 2 to 23 months seemed to be most at risk for all illnesses, and came for most treatments, although there were different morbidity patterns according to age. For example, respiratory tract infections are most common in children 6 to 23 months; unlike for malaria, children under 3 months are also affected. Malaria never affects children under 3 months because of their passive immunity. Here, as elsewhere, children of 6 to 23 months suffered more from multiple, severe and prolonged illnesses than those older or younger. Probably the most significant observation, despite the small numbers involved, was, that for most of the registered deaths, multiple infections were involved rather than just one specific cause, and that for two out of fifteen deaths the records showed consistently poor maternal care. Another important finding was that malnutrition was secondary to illness rather than primary to it.

In many populations there is a high incidence of diarrhoeal diseases, and although they may not necessarily be a direct cause of death, in the multiple cause syndrome they probably play a strong debilitating role. In Keneba there is a very high incidence of diarrhoeal diseases at 7 to 18 months with a peak at 9 months. Similarly in Kenya, (Leewenburg et al. 1978) a two weekly population based survey showed that 5 to 6 per cent of children had diarrhoea at each round, although most diarrhoea related deaths were in the rainy season. Here diarrhoea was particularly associated with the weaning period of 7 to 18 months, which was also the age at which the growth curves of children departed from those of Western standards.

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10. Sickle cell is a genetically inherited trait which changes the shape of red blood cells in the heterozygote, and thus protects him against malaria. The homozygote sickler suffers from acute anaemia, and usually dies very young.

Despite the importance of diarrhoea and malaria in mortality, it is unlikely that any one particular disease could cause the unusual death curves and mortality levels of West African populations. One exception to this may be the role of tetanus in neonatal mortality. Work in Upper Volta (Retel Laurentin & Benoit 1976, see table 12.7 above) where cause of death data were collected retrospectively, showed that the proportions of reported causes varied substantially between villages. In one area 40.6% of deaths to children under one year were reported due to tetanus, but in other areas this cause of death was negligible. Similarly, cases of 'macerated' children, were localised in the areas with a high syphilis rate. In this small survey tetanus was cited as a major cause of infant deaths, and diarrhoea and vomitting as the principal cause of child deaths. Tetanus is related both to the environment and treatment, either of the umbilicus or wounds. If there are few tetanus spores in the ground, then whatever the cord or wound treatment, tetanus will be rare.[11] A retrospective survey of Uttar Pradesh with respondent reported causes of death (Smucker et al. 1980) showed that 60% of infant deaths occurred in the first month, and of these, 66% were due to tetanus. Here, socioeconomic status did not influence neonatal mortality directly, but tetanus mortality was positively correlated with the number of large animals owned, tetanus mortality of a previous child and land ownership. The second of these indicates the influence not only of the environment but also care practices.

Several surveys indicate a pattern of high neonatal mortality, then a fall, with mortality rising again between four and eight months (Cantrelle & Leridon 1971, Gaisie 1975, MacGregor et. al. undated). This reflects the risks of the birth process itself as well as the dangers that new born babies are subject to: prematurity, low birth weight, congenital defects. However, having survived the first month, risks do not increase again until the fourth or fifth month because of the child's immunities, acquired passively both through the placenta and also from the breastmilk. There is a general consensus of opinion

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11. In some of the Bambara villages surveyed, during a twenty month period several cases of tetanus were noted amongst both adults and children (Fulton personal communication). If tetanus really is rife in that zone, it may explain some of the similarities in the mortality patterns of the Bambara and the Upper Volta villages (see table 12.7)

that both illnesses, and malnutrition pose increased risks from six months onwards. The two are linked because sick children 'falter' (Marsden 1964 - faltering = failure to gain more than ½lb over three months). Patterns of weight gain in African children appear to be linked to these increased morbidity and nutritional risks after six months. In the Gambia, babies actually gained weight more rapidly in the first three months than English babies (Marsden & Marsden 1964), by six months they were the same weight, but then became relatively lighter. Marsden considers that poor child care may be a factor contributing to this weight loss. The same pattern was found in Machakos, Kenya, where, under 6 months 75% babies were above the 90% Harvard standard, and this dropped to 54% in the 6-11 month children and 30% in those over one year (Oomen et al.1979). Here, the researchers say that the impact of infection does not explain the stalling. Although it is conceivable that African patterns of weight gain are different from European ones, evidence from Ibadan in Nigeria shows that children of prosperous families show the same patterns of weight increase as European children (quoted in Marsden & Marsden 1964).

In some areas there are wet season peaks in mortality; not just one illness peaks then but many, and thus the whole burden on children rises. One possibility is that children can support a certain burden of parasites, malnutrition etc., but that finally one factor (not necessarily very serious in its own right) added to that burden leads to death. Although this factor could be malaria or diarrhoea or measles, the final cause of death is really only supplementary to many others. This could explain the devastating effect that measles has in these areas, where it may be the final strain on bodies already up to capacity.

Despite a number of hypotheses which emerge from other research on cause of death, and clues as to the reasons behind the observed patterns of mortality, one cannot avoid the fact that all the principal medical problems exist for all these Malian populations. Modifications of their impact through modern Western medicine are minimal, and although one may hypothesise certain links such as tetanus with animals and pastoralism, diarrhoeas with poor water supply, eventually we must concede that the lack of precise cause of death data precludes a comprehensive explanation of the variation in mortality patterns observed. The production system appears to have no obvious effect on either level or pattern of mortality. Bambara birth order effects are the only biodemographic variations to follow the expected pattern, and neither nutrition nor the environment produce the expected effects on either level or pattern of mortality. Nevertheless, the existence of substantial variation, along with our inability to explain it in simple terms of medical research elsewhere means that other approaches should be made. The possession of seasonal data on both births and deaths can help as seasonality may itself be linked both to cause of death and socio-economic factors.

CHAPTER 13 - SEASONALITY

"Don't be sure that you have a child until ewaylen has finished"
Delta Tamasheq saying

One of the original hypotheses that led to this research project was that pastoralists are demographically different from agriculturalists. The former were reputed to have lower mortality, due partly to the lack of peaks of stresses in one particular season, such as the stress experienced in the rainy and harvest seasons by cultivators. Although the demographic regimes of the two pastoral Tamasheq groups do differ from that of the Bambara, and infant and child mortality is higher for the agricultural group, whether this is due to different patterns of seasonal stress remains a moot point. The areas for which good seasonal demographic data do exist, Senegal and the Gambia, have patterns of mortality which are very different from both these groups, but which resemble those of the pastoral Tamasheq more than the agricultural Bambara. Here I will examine the evidence for different seasonal patterns of births and deaths, and discuss the findings in the context of more detailed data on seasonality from elsewhere.

Demographic seasonality is the systematic variation in the incidence of births and deaths throughout the year. Climatic variation is an important component of this not only because of its role in defining seasons, but also because of its association with a whole range of economic and cultural activities. Thus an examination of seasonal demographic variability must take into account these different forces, which themselves may operate to magnify small differences or suppress large variation caused by other factors. Different seasonal stresses do arise largely as a result of the mediation of socio-economic factors with the ecological and environmental background. However, seasonal stresses are also related to poverty, itself a powerful indicator of demographic variation. A community may have sufficient food to feed itself and a sufficient labour force to maintain its needs when these factors are considered on an annual basis, but within the year there may be periods of hardship and glut caused by seasonal change both in the environment and the agricultural cycle. The relationship of demographic events to stress is a two way affair; a demographic event may exacerbate environmental and economic problems, or may be affected by them. For example, more births, and subsequent withdrawal of female labour, may occur in the labour intensive, food deficient harvest season, caused by an increased conception rate during the season with long cold nights, low morbidity and high fecundability after post harvest improvements in nutritional intake.

The Sahel, with its short, single rainy season is particularly susceptible to substantial seasonal variation in all spheres of life. In 'Seasonal Dimensions to Rural Poverty' (ed. by Chambers, Longhurst and Pacey, 1981) research from various parts of the world shows that seasonal poverty is most concentrated in non-irrigated areas where most of the rainfall is during two or three months of the year. The Sahel is one of the prime examples of this situation, thus it seems that an examination of birth and death seasonality may be a fruitful approach to understanding the high child mortality levels observed here.

Seasonality of fertility and mortality can be considered in two ways: cause and effect. Are there seasonal fluctuations in the demographic parameters? What causes these fluctuations, and does the seasonality of one parameter influence either other demographic aspects or the general well-being of certain sections of the population? Ideally the data needed to examine seasonality should be collected over time using a registration system, or a longitudinal study established to record all the births and deaths for a fixed population. Much of the work done on demographic seasonality uses this latter type of data; the work from Sine-Saloum in Senegal (Cantrelle & Leridon, 1971), the MRC Keneba studies in the Gambia (McGregor et al. 1970), the Malumfashi Endemic Diseases Research Project in N. Nigeria (Bradley et al. 1982 a & b) and the Matlab studies in Bangladesh (Stoeckel 1972, Chen 1974) are all longitudinal studies. Cowgill (1966) collected together registration data from all parts of the world (mainly developed countries), Chang et al. (1963) looked at Hong Kong registration data and Thompson and Robbins (1973) examined adminstrative registration data from Mexico and Uganda.

Birth Seasonality

These studies identify marked seasonal patterns in births in both developed and less developed countries. Cowgill's study, which also includes data from Jordan, Korea and Chile shows for a variety of Northern hemisphere populations a higher proportion of births occur from February to July and a lower proportion from August to January. The whole pattern is completely reversed for populations in the Southern hemisphere, indicating the probable importance of temperature as a determining factor. Although she considers that the similar patterns which exist for a variety of different cultures indicate that the environmental effect of climate is more important than culture in determining birth seasonality, she also notes that a major US peak corresponds with conceptions during the Christmas holidays! Probably the most important factor to emerge from her review is the observation that illegitimacy, poverty, war and depression are all associated with an increase in seasonality of births. Most of the contributors to Chambers, Longhurst and Pacey's book (op. cit.) would agree with this statement, arguing that it is the seasonal stresses in a variety of activities that emphasise and increase poverty within already marginal populations.

Research on birth seasonality tends to look at associations with rainfall or temperature; for industrialised countries it may be that these climatic factors have direct effects on peoples' sexual behaviour which leads to fluctuations in the birth rates. However, in populations that are almost totally dependent on agriculture or pastoralism, the climate determines the annual economic cycle which is itself far more likely to modify sexual behaviour than the climate directly. Chang et al. (1963), in looking at climate and conception rates in Hong Kong, take an extreme environmental approach, correlating conception with temperature, rainfall, barometric pressure and wind. They find a close negative correlation of -.96 between conception rates and temperature in urban areas and -.95 in rural areas, with thirty per cent less conceptions in summer than in winter. From this they conclude that temperature is a major factor in variation in conception raes. This conclusion of causation from association is a pitfall that must be avoided in seasonality studies. Neither conception nor mortality has been shown to be directly affected by the temperature; there are always intermediate factors. Chen et al. (1974) have shown in Bangladesh that there is a seasonal peak in resumption of menstruation after post partum amenorrhoea, from November to March, possibly due to changes in breastfeeding practices around the harvest season when children are unable to suckle as intensely and as frequently. The numbers involved in this study are small and this seasonal trend in the number of fecundable women per month does not explain monthly variations in conception rates. The authors consider that although there may be more highly fecund women in the high conception months of months of March to May, an increase in frequency of sexual intercourse in the longer, cooler nights of January through to June could play an equal role in influencing the conception rate.

In a non-contracepting population, any seasonality in births is related to coital frequency. It has been shown by Barrett and Marshall (1969) that during the week of ovulation a woman's fecundability is .68 with intercourse every day, but this drops to .17 with intercourse every 6 days. Outside the week of ovulation the probability of conception is very low. Thus in a situation where intercourse is infrequent the conception rate will go down. Many seasonal factors such as migration,workload and festivals may affect coital frequency. Thompson and Robbins (1973) have shown a negative correlation of conception with out-migration and workload in Mexico. In Uganda, they show a positive correlation between rainfall and conception (r=.645). Here, they say, rainfall causes change in behavioural patterns with couples spending far more time indoors and in bed during the rains with an assumed higher coital frequency. Abstention for certain times of the year is not uncommon during religious fasts or during the harvest period. Nurge (1970) claims that one of the reasons for low November birth rates in a German village from 1886-1965 was abstention during Lent. This is a far more plausible explanation for the fluctuations that she describes, than her theory that pregnancies were planned for births when the work load was least.

This is both implausible and impractical, particularly when considering Barrett and Marshall's data which show that conception is by no means certain in any particular month.

Of all the work on birth seasonality, the work in the Sine area of Senegal (Cantrelle and Leridon 1971) provides the most relevant comparison for the Mali data. As it was collected longitudinally with 8456 births being recorded between December 1962 and April 1968, the data may help in interpreting the patterns of the data from Mali. The Sine data show a trough of births from February through to July and then a peak rising up through the wet season to October, (when there are up to twice as many births as in May) a trough every year in November and a smaller December-January peak. Thus there is a minimum of conceptions during the rainy season and a maximum during the quarter following the harvest. The authors consider that nutrition may exert an influence on conception rates. Another Sahelian area, Malumfashi in Northern Nigeria shows a similar pattern of births from the registrations made in 1977-78. The Malumfashi births have a plateau of high numbers of births from July to October and a peak in May (Bradley et al. 1982). It seems most likely that a whole range of factors are creating this birth seasonality. Increased nutritional intake, particularly after the high activity and low nutritional harvest period may affect fecundability. The post harvest season is the cold season with longer nights and more sleeping privacy. This fits in with other data outlined above which show maximum conceptions in the cold season.

Death Seasonality

There is quite a body of data on various aspects of seasonal variation in mortality, much of which emanates from the intensive MRC studies in the Gambia. Although the village under study, Keneba, may not be typical either of mortality levels, or even overall pattern of mortality, [1] nevertheless the biological and social mechanisms involved

1. It was chosen by the MRC in 1948 because it was "the worst of all those visited".
(Thompson, thesis 1965)

in mortality there, can be extrapolated to other populations. The general conclusion from the Keneba studies, as well as from research in Senegal, Kenya and Nigeria is that the wet season, particularly the late wet season is accompagnied by much higher infant and child mortality than other seasons. Cause of death and incidence of certain illnesses are themes very much to the forefront in these studies, but nutrition and the role of the mother are also considered to be crucial factors, both of which are much affected by the economy and social practices.

Apart from certain infectious diseases such as meningitis and measles which tend to peak during the hot season, the vast majority of diseases which lead to death in young children have increases incidence in the wet season. McGregor et al. (1970) in their village-based, prevalence studies of malaria, respiratory tract infections, diarrhoea, vomiting and skin sepsis, finds that all are more common in the wet season, and Marsden (1964) found the same at Sukuta, another Gambian village. Rowland et al. (1977), also in Keneba, found that gastroenteritis too, peaked during the wet season. Malaria, a disease normally linked with the wet season is a major cause of death in Africa; not only does it operate directly, but also indirectly through its effects on mother's health and neonatal mortality (Molineaux 1983). Diarrhoeas have been shown to peak in the rainy season elsewhere in Africa, particularly in Kenya (Leeuwenberg et al. 1978) where most deaths from diarrhoea occurred from March to July, the Kenyan rainy season.

Although actual disease vectors are generally more prevalent in the wet season, mosquitoes transmitting malaria being prime examples, research shows that the wet season also brings with it a whole host of other factors related directly or indirectly to the health of children, their morbidity and mortality. Malnutrition is rarely a direct cause of death, but the malnourished child is more vulnerable than the well nourished one. Various nutritional aspects have been noted. In Keneba, early cessation of breastfeeding is more frequent at the beginning of the wet season (Thompson thesis 1965) because mothers need to be free to work in the fields. More children born in the wet season are low birth weight (Prentice et al. 1983) which seems to be because mothers are in a state of negative energy balance at this time of year. Maternal food supplements led to a significant decrease in the proportion of low birth weight children in the wet season but not in the dry season. McGregor et al. (1968) demonstrate that children show different patterns of weight gain according to their season of birth, and that the weight gains always falter during the wet season, usually with a catch up in the dry period. Analysis of stored food in Keneba showed that the level of unacceptable pathogens was far higher in the wet than in the dry season, and that the longer food was kept, the higher the level rose (Barrell and Rowland, 1979). Demands on women's time mean that it is precisely during the wet season that food is kept the longest.

Mother's health and labour are other themes cited in relation to seasonal variation in child mortality. Mothers too are susceptible to the increased quantities of disease vectors present in the wet season, and, in many cultivating communities, increased labour demands at this time of year hinder the care of young children (Thompson 1967). Schofield (1974) examines seasonal variation in the mother-child relationship regarding nutrition, but the facts are equally applicable to mortality. In certain seasons, mothers themselves have an inadequate diet, too much work and other constraints which exacerbate the environmental and biological problems already present.

Data on death seasonality in West Africa confirm that all these wet season problems result in substantially raised levels of mortality at all ages. Cantrelle (1982) presents data from two areas in Senegal, showing that 1 to 4 year old mortality over a period of 25 years (1953-1978) is between two and three times higher in the months of September and October, months at the end of the rains, than in the cold and hot seasons. Similarly, Billewicz and McGregor (1981) show that between 1951 and 1975 in Keneba, infant mortality was twice as high from August to October than from February to July, and child mortality was nearly four times as high. In Manduar, another Gambian village, overall mortality was substantially lower but the same patterns of seasonal variability prevailed, although in both cases it was far less marked for adults and older children. In Malumfashi (Bradley et al. 1982) there were significantly more deaths in the wet season than in the dry season.

All these data conform to the idea that the wet season is the worst from several points of view, all of which culminate in increased mortality. They all cover agricultural populations similar to the Bambara, and in a principal aim of the following analysis was to see whether the Bambara conformed to the pattern. In the previous chapter we noted that the Bambara pattern of mortality differed susbstantially from the Senegambian groups. A comparison of seasonal variation may throw more light on the relationship between seasonal stress and actual mortality. At the same time the analysis will test Swift's (1981) hypothesis that the pastoral economy mitigates some of the seasonal stresses.

Seasonality data

The Mali data on seasonality come from the women's birth histories where seasons of birth and death were recorded for every child in the vernacular, so that the number of seasons is reflected by local determination. In all the communities time is perceived cyclically and not longitudinally, where each season is marked by particular behaviour, activity or stage in the transhumance. This leads us to believe that the seasonal data are very high quality. In both Tamasheq populations some interviews were repeated and almost complete consistency was shown in the reported seasons.

For each group the seasons were divided as follows.

Bambara:	samiya	- rains
	kaula	- after the rains have stopped, the harvest season
	fonene	- the cold season
	tilema	- the hot season

Delta Tamasheq:	tish wa shwa	- the intermediate season after the first rains have fallen and before the grass really starts to grow
	akassa	- the rains
	gharat	- the hot season after the rains
	gharat jiris	- a very short intermediate season of transition from hot to cold - rarely defined as a proper season
	tadjirist	- the cold season
	afoscou	- the intermediate season between cold and hot
	ewaylen	- the hot season

In the Gourma [2] the seasons are the same except that tish wa shwa is called amoukoussou. However, climatic differences mean that the seaons do have different emphases for the two groups. Amoukoussou is a season in its own right rather than just a transition as in the Delta, whereas in the Delta, afoscou is a proper season but is only a short transition period in the Gourma. This may reflect the effect that the receding flood waters have on the Delta climate, where there is still a lot of standing water during the transition from the cold to hot seasons.

The major problem with data collected by season of occurrence is that although we know approximately when any season occurs, there is no way of determing exactly how long that season is: thus an excess of births in any one season may be due either to a seasonally high birth rate or that that season is longer than any other. Another

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2. In the Gourma we found that people knew their children's seasons of birth and death well enough to state whether the child was born at the beginning middle or end of the main seasons. This was recorded so that 9 groupings were coded (1) amoukoussou (2) beginning akassa (3) mid-end akassa (4) gharat (5) gharat jiris + beginning tadjirist (6) mid-end tadjirist (7) afoscou (8) beginning ewaylen (9) mid-end ewaylen.

problem in dealing with seasons rather than fixed calender months is that seasons are not fixed but fluctuate from year to year. For example; the rainy season starts when the rains come, which in Central Mali ranges from May to July. A series of rains leads the Kel Tamasheq to say that akassa has started, but a subsequent long dry period when the grass ceases to grow may incite people to change their minds and say that it is only tish wa shwa.

For mortality the relationship between the season, the climate and the activities is more important than the placing of events by calender months which do not take into account changing and fluctuating situations. If mortality increases significantly during the rains, then a short rainy season would still show a high mortality rate for the duration of the rains, but this effect would be masked in monthly averages by lower mortality for the longer period outside the rains. The importance of the season itself, justifies the use of the season as defined by the population as the unit of time. This does not overcome the problems of calculating rates within seasons. There are two approaches to this problem. Neither effectively provide us with clear cut measures of seasonality as might be obtained from registration data, but they do throw some light on the seasonal pattern. A third way of analysing the data by ascribing a fixed length to each season proved to be too sensitive to the period chosen(see Appendix 5).

Method

It is possible to control for unknown length of seasons by considering the data comparatively, using relative proportions of events in each season. As all events within each data set have occurred over the same period in the same area, a comparison effectively controls for the fluctuations. The problem remains of dependence between births and deaths due to the nature of the age pattern of mortality, but, by using all deaths and all births for the comparisons, the different patterns observed, combined into the magnitude of this variation, do give a more accurate picture of seasonal risks.

Null hypothesis: that the proportion of abortions, still births, deaths at certain ages or all deaths in any particular season does not differ from the proportion of live births in that season.

For each season 95% confidence intervals were calculated for the proportions dead in that season to test whether the proportions of deaths in that season differed significantly from the proportion of births[3] in that season. A chi-squared test was used to test whether the overall distribution of the age-specific mortality differed significantly from the seasonal distribution of births. Thus there were two different points being considered separately, either of which could exist without the other but would usually coexist:

a. whether there was any particular season that showed significantly higher or fewer death events than births

b. whether the distribution of the events differed from the distribution of all births.

Figures 13.2, 13.4 and 13.6 show the 95% confidence intervals for the seasonal proportions of different deaths for the Bambara, Delta Tamesheq and Gourma Tamasheq respectively, compared with all births (the dotted line). Figures 13.3, 13.5 and 13.7 show similar 95% confidence intervals but this time the comparison is with the seasonal proportions of all deaths. The null hypothesis being tested here is that the proportion of deaths at any particular age in one season is the same as the proportion of all deaths in that season. Again

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3. Throughout, all births or deaths recorded on the birth histories have been pooled together respectively, under the assumption that seasonal risks have not changed over the last twenty-five years.

a chi-squared test was used to test whether the distributions offered.

In the following discussion two points must be kept in mind;

(i) a significantly higher or lower proportion of events in any one season when compared with all births or deaths, does not necessarily imply a seasonal peak or deficit for those events but may equally indicate the inverse for all births or deaths as a whole.

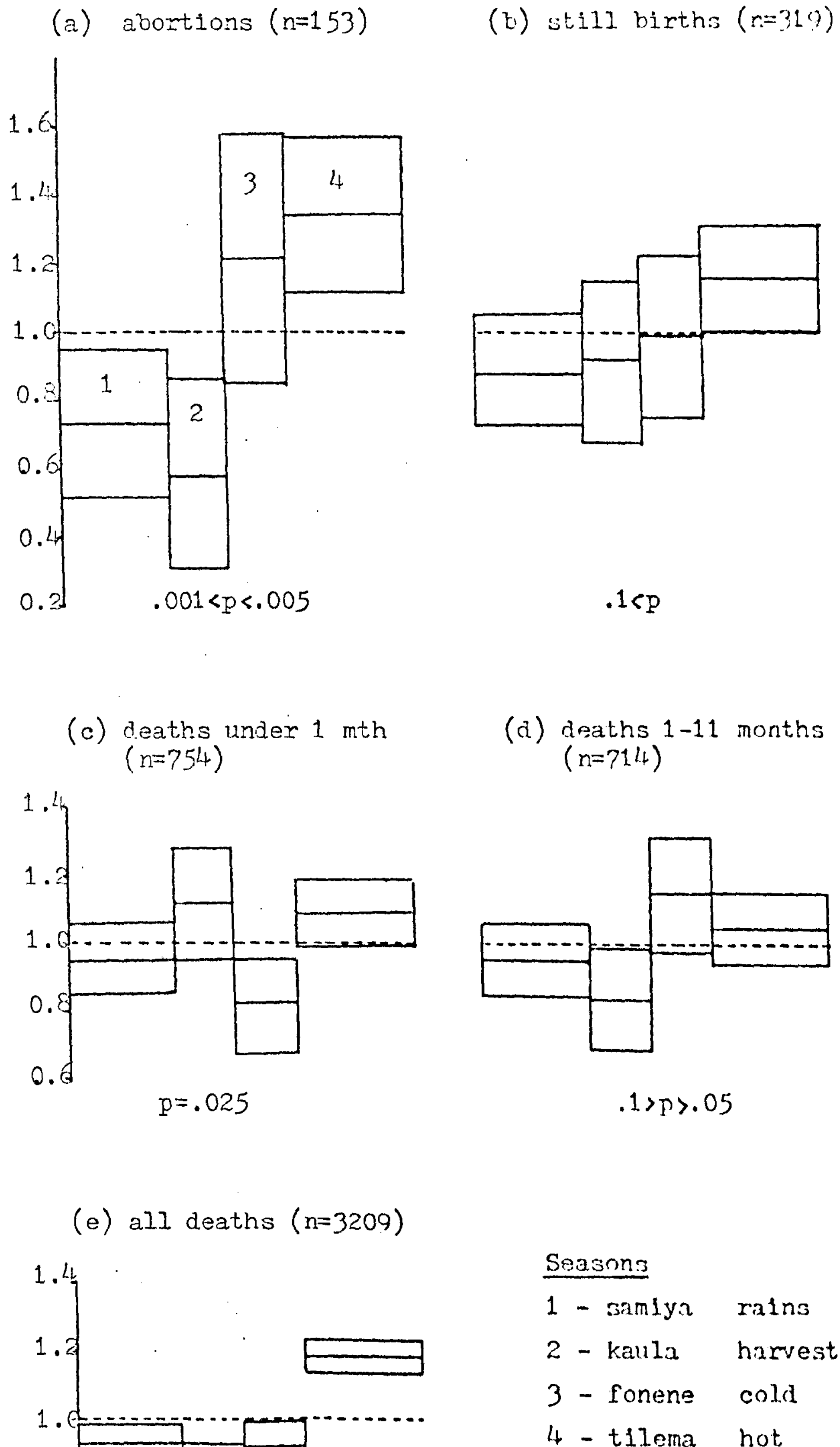
(ii) seasonality in one event (eg. births) can lead to seasonality in another (eg deaths).[4]

For all the populations the seasonal patterns of deaths under one month compared with all births are the simplest to examine. These deaths generally occur in the birth season so in comparing the two, birth seasonality is effectively controlled for and we are just looking at seasonal fluctuations in neonatal mortality.

Birth seasonality is produced by seasonal variation in conception rates. Thus, assuming that there is no seasonally related risk of abortion, for a large cohort of conceptions there would be an increased proportion of abortions over births in the seasons prior to the peak of births, and a decreased risk of abortions compared to births during the peak birth seasons, because (a) there is an excess of births, and (b) there is a comparatively smaller cohort going through the period of risk of abortion during this season.

4. This is not just restricted to neonatal mortality. McGregor points it out in relation to weight increases throughout the first two years. (McGregor et al. 1968). From his data, four birth cohorts showed different patterns of weight gain according to birth season because birth season determined the age of the child when it was exposed to certain seasonal stresses. During the first two years, possession of passively acquired immunities as well as exposure to external dangers through weaning all vary from month to month.

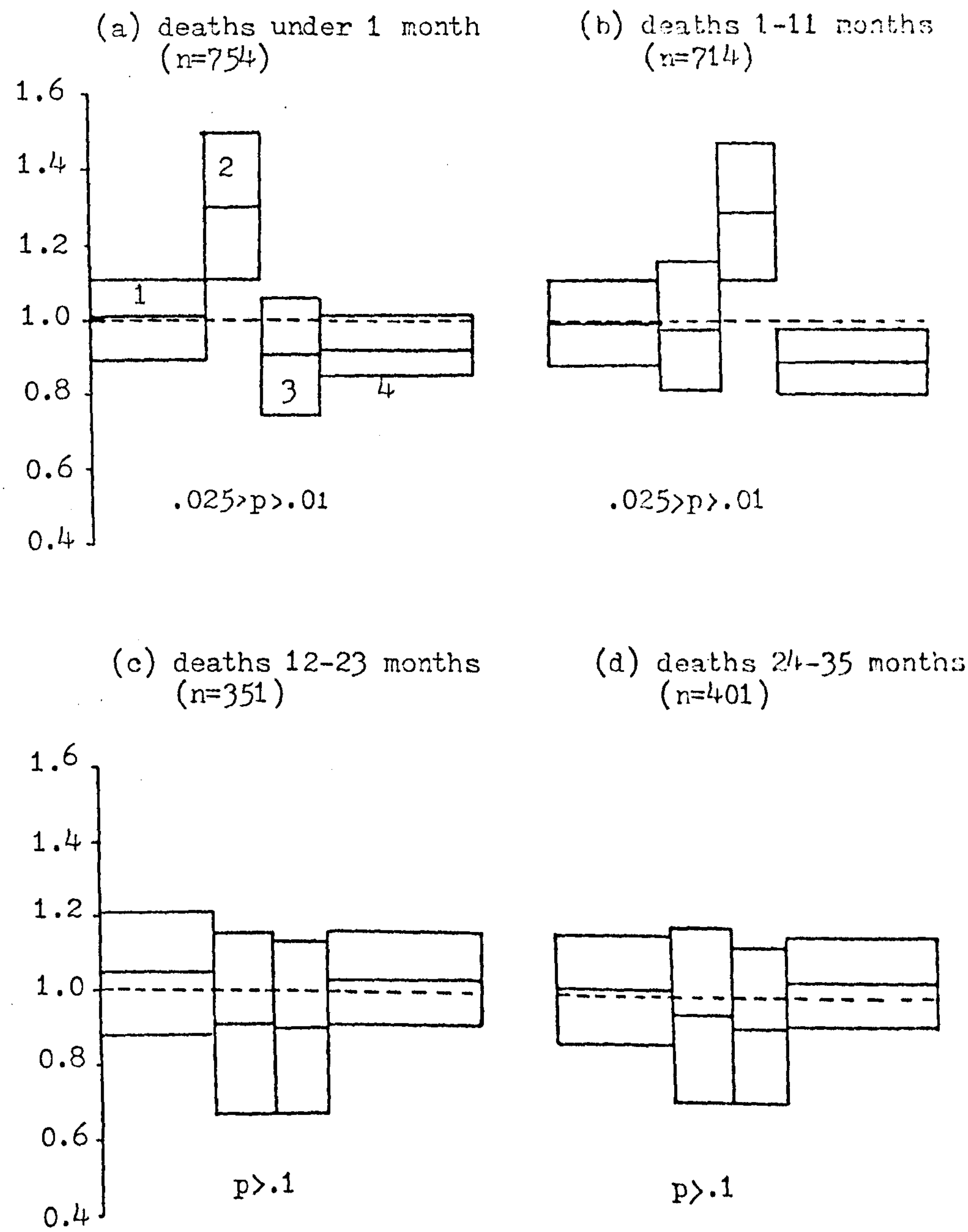
FIGURE 13.1 BAMBARA: SEASONAL DISTRIBUTION OF DEATHS COMPARED WITH ALL BIRTHS



proportion of deaths in season, with 95% confidence intervals, compared with proportion of all births in that season

p values given for χ^2 comparison of seasonal distribution of events

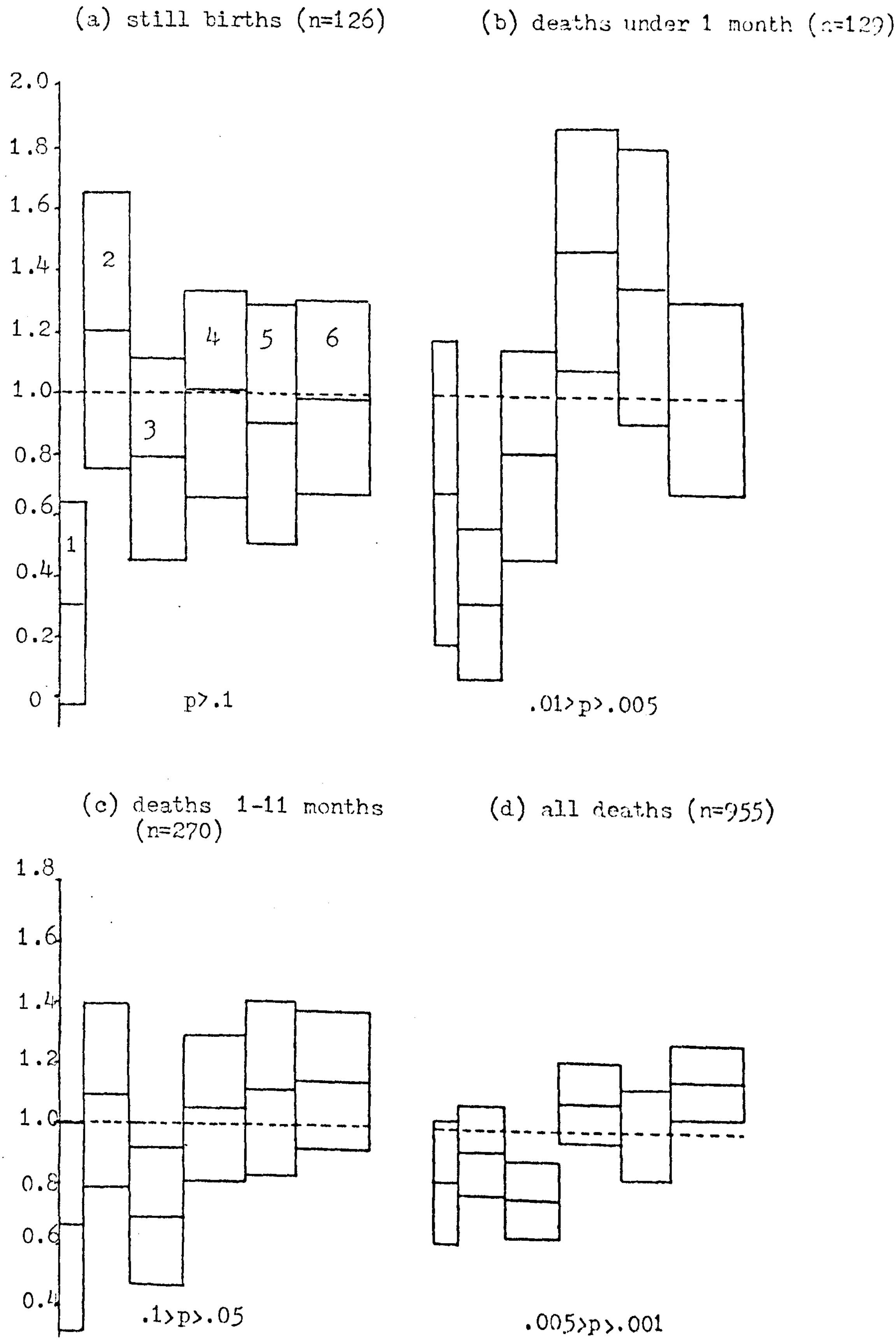
FIGURE 13.2 BAMBARA: SEASONAL DISTRIBUTION OF DEATHS AT SPECIFIC AGES COMPARED WITH ALL DEATHS



Seasons

1 - samiya wet
2 - kaula harvest
3 - fonene cold
4 - tilema hot

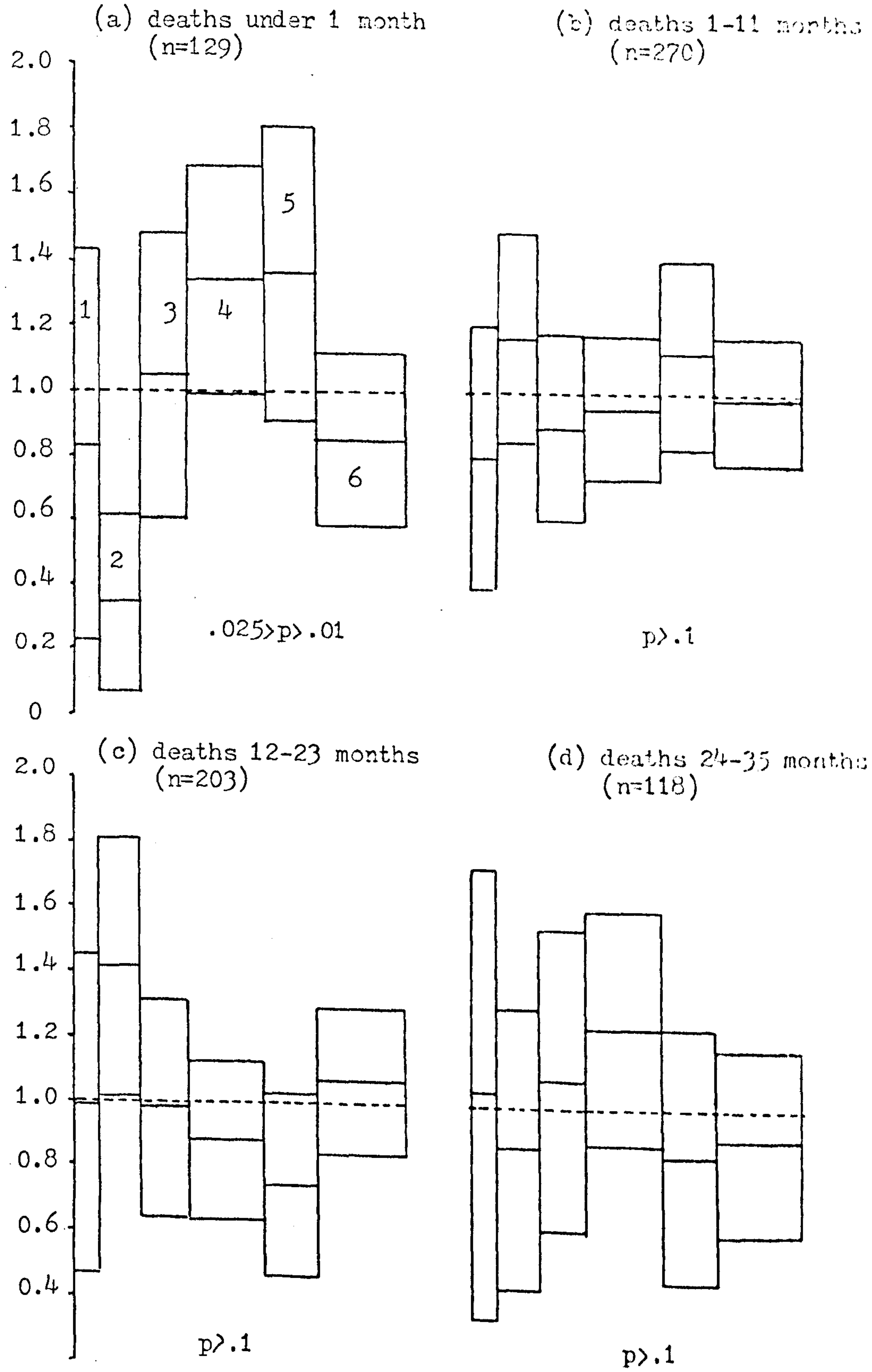
FIGURE 13.3 DELTA TAMASHEQ: SEASONAL DISTRIBUTION OF DEATHS COMPARED WITH ALL BIRTHS



Seasons

1 - tish wa shwa   transition hot-wet
2 - akassa   rains
3 - gharat   hot post-rains
4 - tadjirist   cold
5 - afoscou   transition cold-hot
6 - ewaylen   hot

FIGURE 13.4 DELTA TAMASHEQ: SEASONAL DISTRIBUTION OF DEATHS AT SPECIFIC AGES COMPARED WITH ALL DEATHS



Seasons

1 -tish wa shwa
2 -akassa
3 - gharat
4 -tadjirist
5 -afoscou
6 -ewaylen

FIGURE 13.5 GOURMA TAMASHEQ: SEASONAL DISTRIBUTION OF
COMPARED WITH ALL BIRTHS

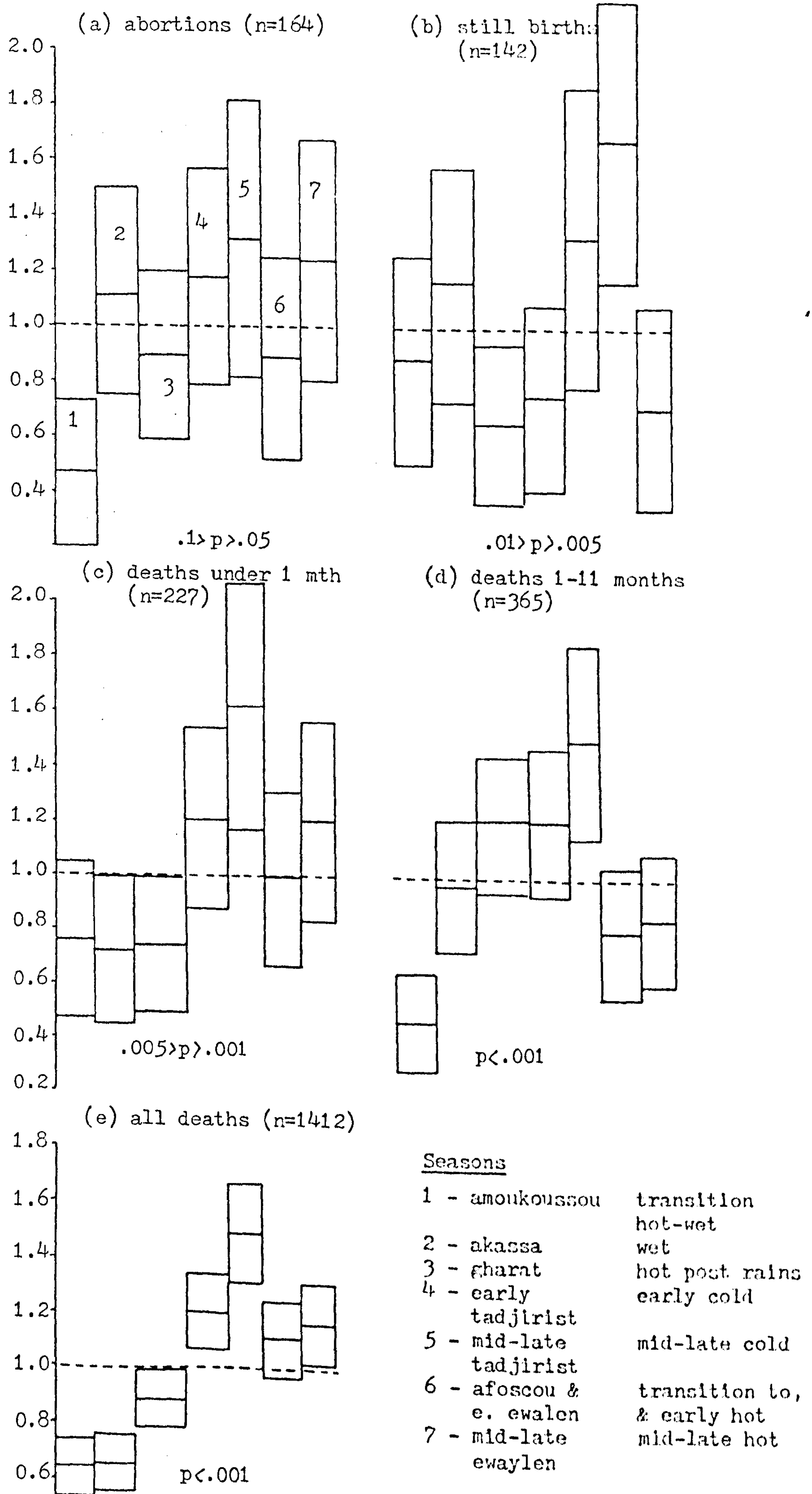
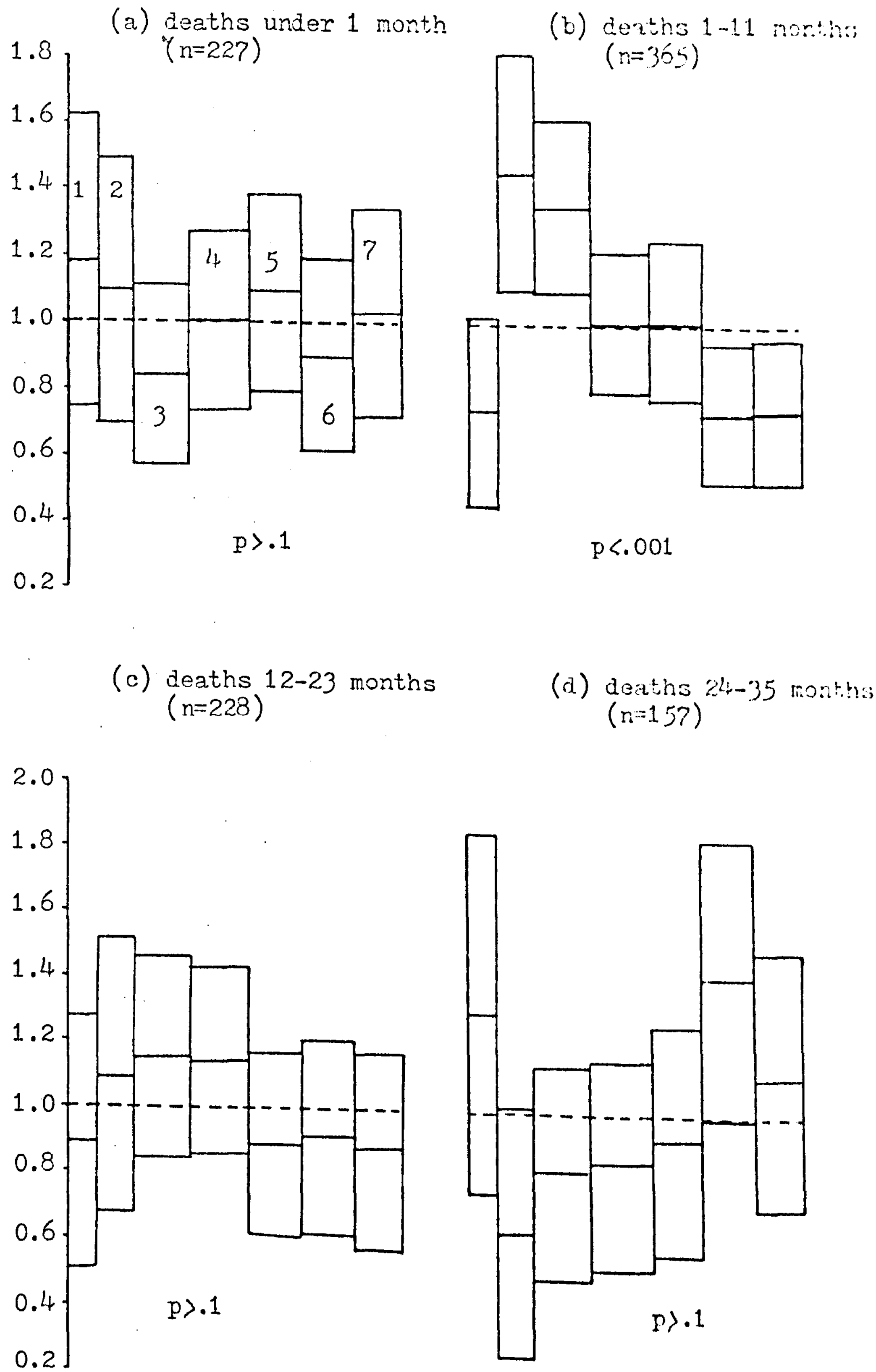


FIGURE 13.6 GOURMA TAMASHEQ: SEASONAL DISTRIBUTION OF DEATHS AT SPECIFIC AGES COMPARED WITH ALL DEATHS



Seasons

1 - amoukoussou
2 - akassa
3 - gharat
4 - e.tadjirist
5 - m-l tadjirist
6 - afoscou + e. ewaylen
7 - m-l. ewaylen

Bambara (figures 13.1, 13.2)

These comparisons indicate a pattern of birth seasonality with a peak of births in Kaula (the harvest season). Evidence for this comes from four sources:

(i) the pattern of abortions which reaches a peak in the months before kaula (13.1a).

(ii) an excess of neonatal deaths in kaula compared with the distribution of all deaths but not with the distribution of all births (13.2a, 13.1c).

(iii) an excess of deaths 1-11 months in fonene (the season following kaula) compared with all deaths. Kaula born children will still be very young and vulnerable in this season (13.2b).

(iv) there are proportionately far less deaths than births in kaula and there is no reason to think that it should be a particularly healthy season.

There is less evidence of death seasonality other than that related to birth seasonality. The highly significant differences in the distributions of all deaths and of all births indicate that the hot season is generally a high risk death season at all ages. There is no evidence that the wet season provokes excess mortality at all ages or at any particular age.

Delta Tamasheq (figures 13.3, 13.4)

There is no evidence of birth seasonality and both figures suggest that there is none. The season of high neonatal mortality is not followed by a season of high 1-11 month mortality, and the pattern of neonatal mortality is the same whether compared with birth or death seasonal distributions. This indicates a strong independent seasonality in neonatal mortality which is highest in the cold season and lowest in the wet season.

Apart from the neonatal seasonality, the Delta Tamasheq manifest no obvious increased risks in dying in certain seasons at certain ages (Figure 13.4 b,c and d). Overall there are significantly less deaths than births in gharat, and more deaths than births in the hot season.

Gourma Tamasheq (figures 13.5, 13.6)

There is no clear evidence of birth seasonality here either. However, as found for the Delta Tamasheq there is marked seasonal variation in neonatal mortality, and this follows the same pattern as in the Delta; high in the cold season and low in the wet season. This is also the general pattern of mortality overall, with proportionately less deaths than births in the rains and more in the cold period (figure 13.5e). It is interesting to note that although the Gourma Tamasheq are the population that we expected to suffer most in the hot season of the lack of both water and milk, there is no evidence that these problems are reflected by higher child mortality. In fact, the only age which has a different seasonal distribution of deaths is the post neonatal first year of life. Children of this age are particularly at risk in the wet season when proportionately more die during this age group than in this season at other ages.

Discussion

The Bambara peak of births in the harvest season resembles the pattern reported for Senegal (Cantrelle 1971) and in Malumfashi (Bradley et al. 1982) but is the opposite to that found by Lecomte-Enselme (1983) in eastern Senegal for a population from the same linguistic group as the Bambara. This peak coincides with conceptions in the cold season [5] and is compatible with conditions in this season; colder

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5. One of the interviewers noted that people in the zone often said that lots of women were pregnant at the end of fonene (the cold season).

nights with the privacy of sleeping inside, less work in preceding seasons and plenty of food.

The lack of evidence for Tamasheq birth seasonality does not prove its non-existance, but patterns of mortality are such that it cannot be deduced from this type of data; registration data would be needed. However, unlike the Bambara, Tamasheq women do not have alternating seasons of hard labour and slack periods, nuclear family sleeping arrangements in tents lead to more privacy all the year round, and although the food supply is particularly plentiful in the rains there may be less nutritional fluctuation that would affect women's fecundity. Thus an absence of marked seasonality is not surprising.

The general consensus to emerge from the review of information on death seasonality is that in West Africa, the single rainy season imposes multiple strains on agricultural populations, and that during this season, an agricultural economy with high labour demands, low food supplies coupled with increased prevalence of disease vectors is related to high mortality. Yet, for these three Malian populations there is no evidence of increased mortality in the rainy season for any of the groups, either agricultural or pastoral, save for the post-neonatal Gourma Tamasheq children. If we abandon the economy as an important explanatory factor in demographic seasonality, we are left with environmental and cultural determinants. In an attempt to evaluate the different implications of these factors, data from two other Malian populations were examined in the same way.

Environmental and socio-cultural determinants

The Delta Fulani and the Seno-Mango Fulani [6] are both Fulfulde speaking peoples, some of whom are predominantly cattle herders and others

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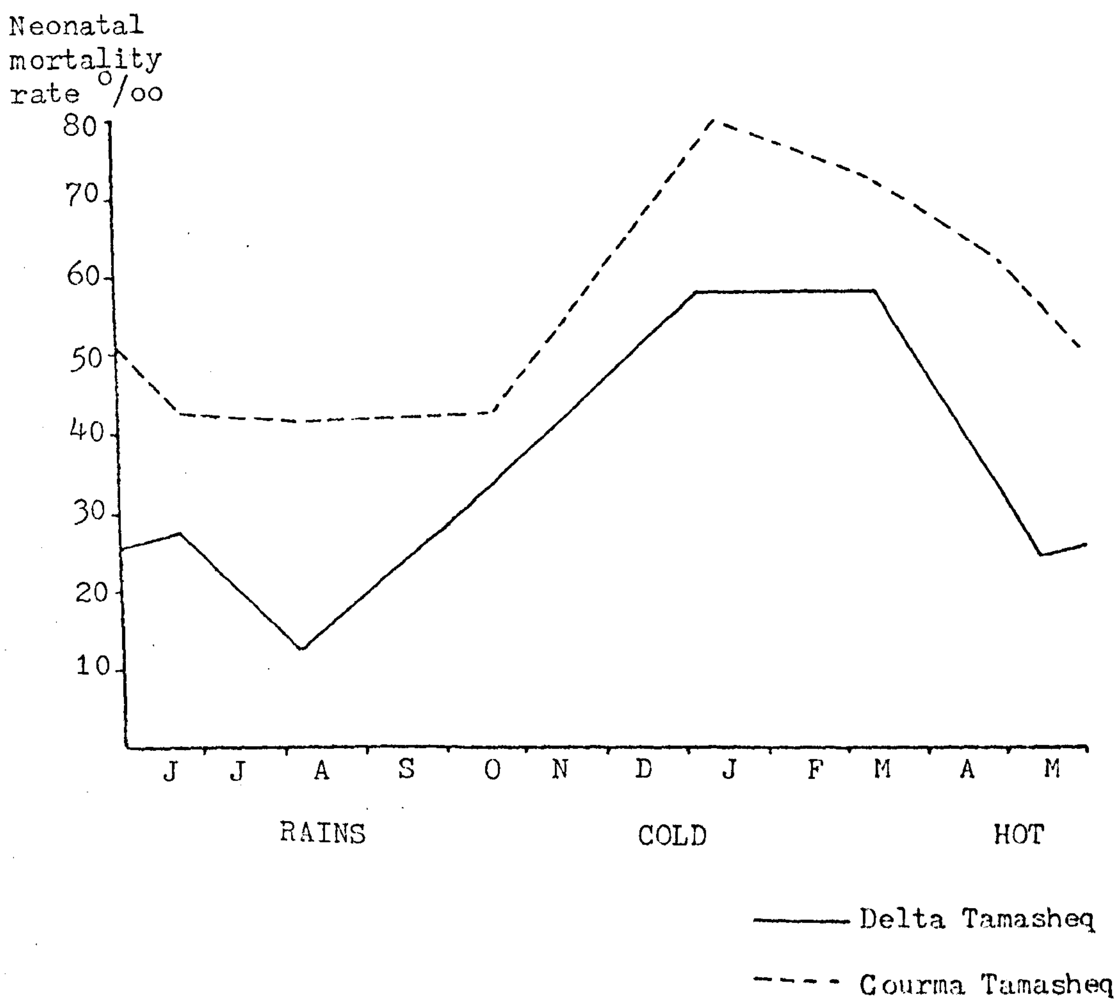
6. The data on these two populations were collected by A.G. Hill and M.L. van den Eerenbeemt in 1982 with the same methods and questionnaires used for the other three surveys.

who are millet and rice farmers. The Seno-Mango is similar to the Gourma both in environment and climate and the Fulani there are more dependent on cattle than those surveyed in the Delta. Most of the latter live in the Delta all the year round, though the cattle are taken away by herders during the rains. In this season the whole area is flooded (in a good year) and the Fulani live in crowded villages on small hillocks where the possibilities for contagion of infectious diseases are very high. The mosquitoes are very bad during the rains. Environmentally this population is closest to the Delta Tamasheq who spend all the year except the wet and post rainy season in the Delta.

Using the same methods of analysis both Fulani groups have higher proportions of deaths than births in the wet season; for the Seno-Mango Fulani this was particularly exaggerated for children aged 1-11 months. This is similar to the Gourma Tamasheq pattern. For both populations the rainy season brings a very dramatic change in both food supply (milk becomes abundant) and the physical environment. Malaria accompagnies this change, and it is children between 6-18 months in the rainy season who are the most susceptible to malaria. Why the children of these two groups should be more vulnerable to wet season mortality than the Bambara or Delta Tamasheq is unclear but it may be related to the dramatic changes in environment linked with quests for water. Delta Fulani too show excess wet season mortality, in every age group except for the neonates. This certainly indicates an environmental component since neonates are relatively unaffected by exogenous mortality factors. The Delta Fulani wet season peaks are compatible with the lack of peaks for the Delta Tamasheq as the latter leave the delta during the rains.

Socio-cultural factors seem to be the only common factor which could explain the similar patterns of neonatal mortality found for both Tamasheq populations (figure 13.7) which differ from the other populations. Neonatal mortality is very dependent on the condition of the mother before and at birth, and on birth practices. One tends to associate

FIGURE 13.7 TAMASHEQ NEONATAL MORTALITY BY SEASON OF BIRTH



the former with both maternal nutrition and labour demands on women. The Tamasheq themselves would say that the low wet season mortality is because this is the season of plenty and women are healthy and well fed living of a predominantly milk based diet. Although neonatal mortality is closely related to birth weight, improved maternal nutrition just before or after the birth are unlikely to affect the child; more curiously, the mothers' nutritional status was probably at its lowest during the last trimester of pregnancy for these wet season births and this would normally indicate higher neonatal mortality. Similarly, increasing mortality in the cold season is difficult to explain when mothers' nutritional status will have been very good for the last 4-5 months of pregnancy. In the Gambia, diet supplements to pregnant women only had a significant effect on improving birth weights in the seasons when the women had a negative energy balance (Prentice et al. 1983). Tamasheq women are probably never in a negative energy imbalance. Increased cold season neonatal mortality could be linked with the low temperature at night. Certainly colds and chest infections of older children and adults are very prevalent in this season. Alternatively, there may be more tetanus in the cold season camp sites than in the sites of the rest of the year. It is at this season that the Delta Tamasheq are camped closest to the Delta Fulani who were found to have exceptionally high levels of neo-natal mortality (Hill, Randall and van den Eerembeemt, 1983) which may be linked with the physical environment.

Thus, contrary to exceptions, none of the three populations showed excess wet season mortality (although both Fulani groups do). It is hard to understand why mortality seasonality for these three groups should be very different from that in the Gambia or Senegal, but the evidence that not only do the mortality patterns differ, but also the seasonal patterns, indicate that may be we should not look to these West African populations for comparisons.

Method 2: Seasonal life tables

Life table analysis is another way of looking at seasonal data. This follows on from McGregor's finding (undated) that in Keneba "at younger ages death was more closely associated with season than with age". Life tables were calculated for 'cohorts' of individuals born in the same season. These cohorts enter subsequent seasons at different ages, and the combined effect of age and season can be examined. Unlike the previous analysis, these are not dependent on reported season of death, but on season of birth and age at death.

Figure 13.8 shows the l_x values for each of the three populations by birth season. The Bambara data are divided into their four seasons, the two Tamasheq groups into three seasons which group together (i) akassa and gharat (ii) tadjirist and afoscou (iii) ewaylen and tish wa shwa/ amoukoussou. In terms of the proportion of children surviving to age five, the only consistent pattern is related to the cold season cohorts. Bambara children born in the cold season have most survivors whereas both Tamasheq groups show least survivors for these cohorts. However, the proportion surviving at one month shows that most of the differences lie in the neonatal mortality. Within each population none of the seasonal differences are significant over the whole life table.[7]

In response to the idea that for early mortality, season is more important for survival than age, table 13.1 shows the probability of dying by season of birth for two month intervals up to one year, three monthly intervals from one to two years and in years up to age five. Figure 13.9 represents these graphically. Along the x axis are the months of the year with the seasons marked. The y axis shows the age in months and the diagonals represent the

7. Approximate comparison with Lee-Desu statistic - available on SPSS

FIGURE 13.8 l_x BY BIRTH SEASON AND ETHNIC GROUP

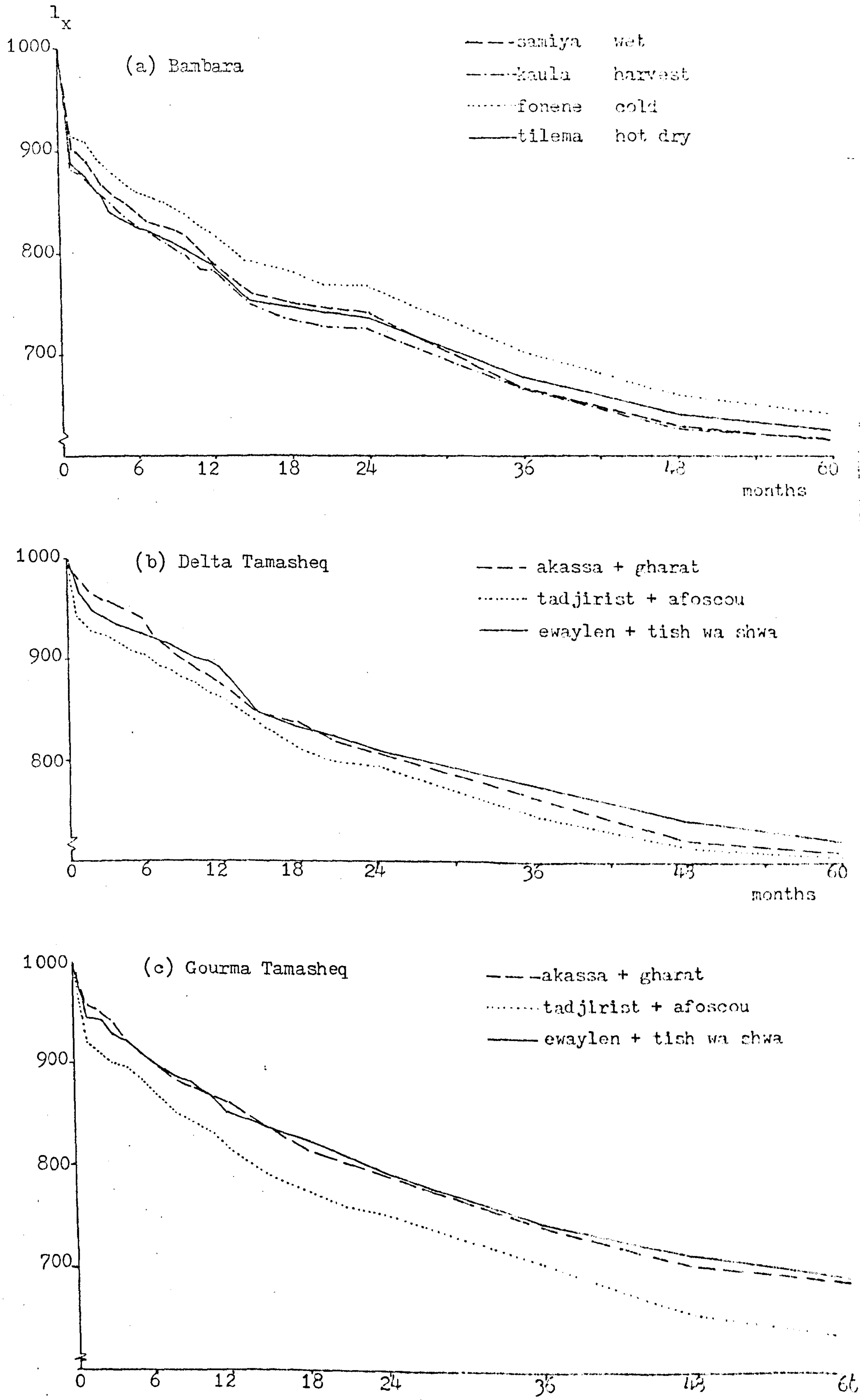


Table 13.1

PROBABILITY OF DYING (q_x) ACCORDING TO SEASON OF BIRTH

a) Bambara

age (mths.)	wet	harvest	cold	hot	all
0-1	.108	.123	.090	.125	.113
2-3	.036	.031	.032	.038	.035
4-5	.019	.020	.022	.017	.019
6-7	.018	.021	.010	.012	.015
8-9	.011	.021	.018	.015	.015
10-11	.030	.018	.021	.020	.023
12-14	.039	.044	.032	.047	.041
15-17	.014	.019	.012	.007	.012
18-20	.007	.014	.018	.010	.011
21-23	.005	.001	.002	.003	.003
24-35	.098	.077	.084	.080	.086
36-47	.059	.064	.060	.052	.058
48-60	.026	.012	.031	.025	.025
Total 5%	.368	.380	.360	.372	

b) Delta Twareg

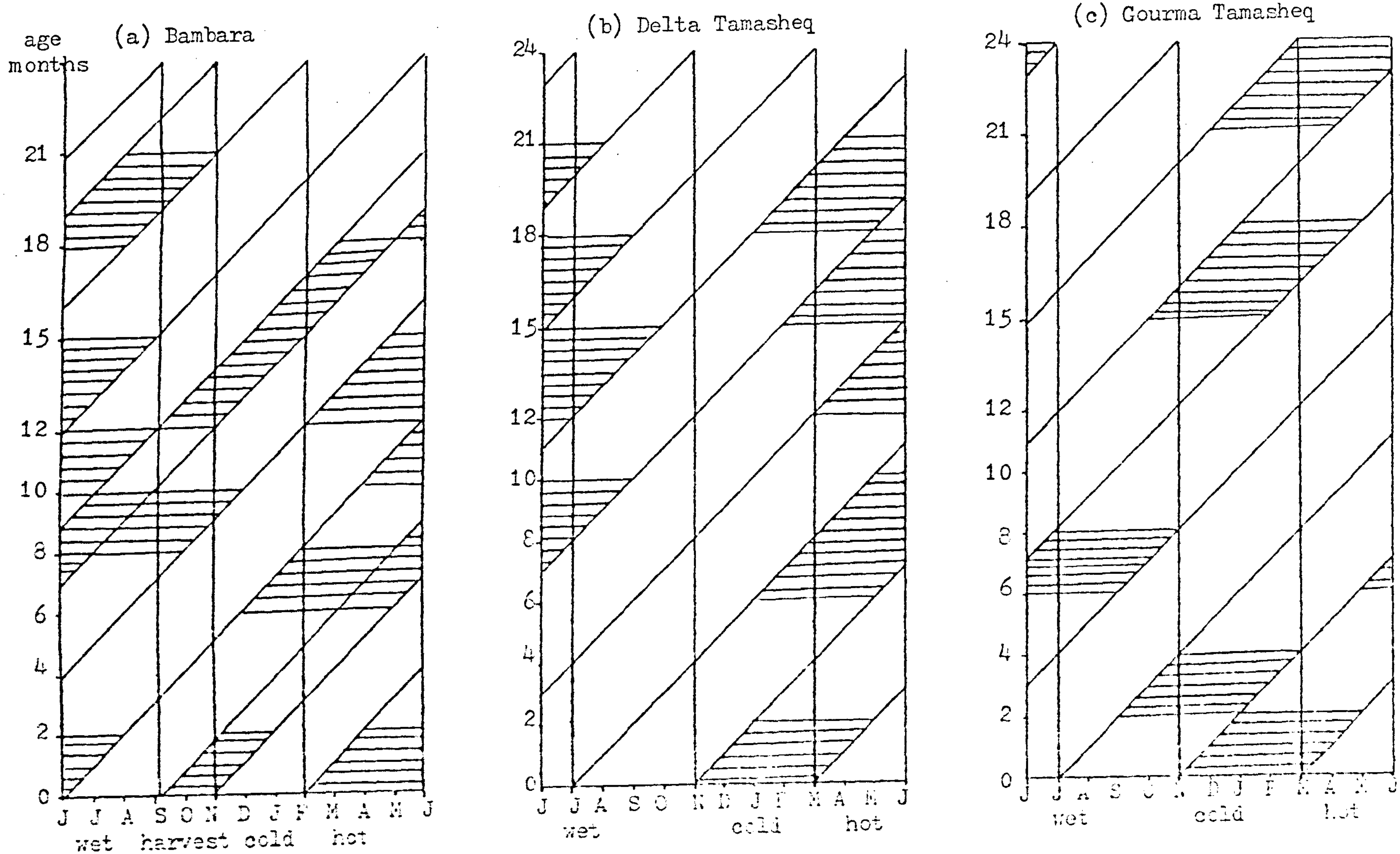
age (mths.)	wet	cold	hot	all
0-1	.034	.071	.051	.053
2-3	.016	.013	.015	.014
4-5	.011	.011	.010	.011
6-7	.031	.018	.010	.020
8-9	.021	.015	.015	.017
10-11	.019	.017	.013	.016
12-14	.032	.033	.048	.037
15-17	.011	.026	.017	.018
18-20	.023	.018	.010	.017
21-23	.013	.005	.013	.010
24-35	.055	.061	.047	.054
36-47	.053	.038	.045	.045
48-60	.019	.017	.022	.019
Total $5q_o$	.290	.294	.276	

c) Gourma Twareg

age (mths.)	wet	cold	hot	all
0-1	.048	.088	.060	.064
2-3	.031	.017	.020	.023
4-5	.024	.025	.019	.022
6-7	.021	.027	.019	.022
8-9	.012	.014	.014	.013
10-11	.010	.025	.024	.020
12-14	.030	.032	.021	.027
15-17	.026	.018	.011	.018
18-20	.016	.021	.022	.020
21-23	.016	.008	.019	.015
24-35	.062	.063	.061	.062
36-47	.046	.067	.040	.049
48-60	.027	.033	.033	.031
Total $5q_o$	.312	.363	.308	

FIGURE 13.9 SEASONAL BIRTH COHORTS: PROGRESSION THROUGH SEASONS IN FIRST TWO YEARS OF LIFE

(shaded blocks - cohort with highest probability of dying at that age)



passage of cohorts through their first two years. Columns thus represent the seasons. For each age interval the cohort with highest mortality is shaded in to show the cohort and seasonal effect (where the differences is less than .004 no cohort is shaded. In certain cases for the Bambara, the two highest mortality cohorts are shaded).

In contrast with earlier results this method of analysis does indicate increased stress at the end of the hot season and the beginning of the rains. For the Bambara both harvest and cold seasons appear to be relatively benign for all age groups. A concentration of mortality in the cohort currently passing through the late hot and early wet seasons occurs for the Delta Tamasheq after six months. At this age passive immunity has been lost and the child is in the dangerous process of actively acquiring immunity (Bray & Anderson 1979). It is also after six months that the child is less dependent on its mother's breast milk and more dependent on weaning foods. For the Delta Tamasheq these are poorest at the end of the hot season when milk production is lowest. Gourma Tamasheq variation is different. High cold season mortality continues up to four months but then there is no particular stressful season, although during the post neonatal period in the first year the only group to show mortality variation is the 6-8 months cohort in the rainy season.

Using this method, which is dependent on different data from the previous methods, a different seasonal pattern of mortality is indicated which, for the Bambara and Delta Tamasheq is more consistant with the Senegambian results. In the life table analysis, the increased proportion of 1-11 month deaths in the cold season for Bambara children does not emerge, neither does the Gourma increased proportion of deaths in the wet season.

Perception of seasonal risks

It is important to consider the communities' own perception of season and seasonal risks. Although the Bambara think of the wet season as tough because of malaria and because food is short (Duncan Fulton personal communication), these stresses are partly compensated for by hot season management of food (Martin 1983). The heavy consumers, such as young men, go off to find work elsewhere, there is much visiting and families with little grain may disperse amongst kin and into the towns until the cultivation season begins.

Delta Tamasheq perception of season in relation to health varies according to social class. Noble women say that the two hot seasons, ewaylen and gharat, are the worst for child health and that the serious diseases in these seasons are diarrhoeas and vomitting. Bella say that the worst season is akassa, and fevers are the most dangerous ilnness. As yet there are no data to prove whether these perceptions reflect actual real differences. It is likely that nobles do not perceive akassa as a bad season because it is the time of plenty with most milk, and that this aspect dominates their general attitudes to the season.

Conclusions

Although all these populations live in areas with substantial climatic variation and a very short rainy season, there is no conclusive evidence for the seasonal concentration of births and deaths found elsewhere in West Africa. The apparent lack of seasonal variation in mortality for the two Tamasheq groups may be considered evidence for the hypothesis that, for pastoral populations, stresses are spread over several seasons leading to lower mortality, but the results are not conclusive. Evidence that socio-cultural factors are more important then the environment emergres from the unexplained patterns of Tamasheq neo-natal mortality, as well as the different seasonal mortality between Tamasheq and Fulani groups from the same areas.

From this analysis it cannot be concluded that the different patterns of mortality observed for the Bambara and Kel Tamasheq groups arise largely out of different patterns of seasonal stress. However, other aspects of seasonal stress described elsewhere may help us to identify some of the determinants of mortality differentials. Much of the increased rainy season stress on children has been related to increased physical and economic constraints on their mothers, which supplemented the increased physical problems to which the children were already exposed. These constraints on mothers were seen by Schofield (1974) to be related to their work input, nutritional status at birth, diet and time available for preparation and feeding children. This may be where Bambara differ significantly from the Keneba situation.

Unlike Keneba, where rice cultivation obliges women to leave young children for much of the day, Bambara cultivation is more flexible. Women take babies to the fields and can always take time off to feed them and would be condemned for not doing so. It is at the beginning of the cold season when the grain is threshed and the women earn their income for the year that young children are most likely to suffer from maternal neglect because of labour demands on women. But already this is a season of less physical stress.

Constraints on mothers need not only occur on a seasonal basis, and they are not necessarily economic and time constraints. In the next chapter I will examine in detail the case of the Delta Tamasheq where there are substantial social class mortality differentials despite childrens' exposure to the same physical environment.

CHAPTER 14 - PATTERNS OF CHILD CARE

"There's no difference in the number of children illelan and iklan have; it's just that the illelan lose far more of their children"

Roki - a Tamasheq women, February 1982

Although we know that different levels and patterns of mortality exist, the absence of simple measures of variation in the intermediate factors inhibits a comprehensive explanation of them, although such variation is there. Neither nutrition nor seasonal stress, which are both related to mortality elsewhere, show consistent associations with the mortality differentials observed here. The intrusion of socio-economic determinants at several stages of the mortality process (see Chapter 11) suggests that an examination of the relationship between socio-cultural factors, behaviour and mortality may be more productive than attempting to evaluate the intermediate variables.[1]

Obviously such analysis is most effective after certain other confounding factors have been controlled for; here for the Tamasheq populations such conditions are largely fulfilled. For both the groups clear internal mortality differentials exist by social class, where physical environment, mobility, water supply, disease vectors and dependence on pastoral economy are the same. Even availability of external amenities varies less within each Tamasheq population that between culturally and linguistically distinct groups.

Although, overall, Delta Tamasheq have lower infant and child mortality than the Bambara and Gourma Tamasheq noble child mortality is as

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1. The information on which this chapter is based came from the period of residence which lasted from late June until September and thus covered the end of the dry season and the rains. Two shorter periods were spent in camps in the late cold season, and, as the demographic surveys were undertaken in the hot season observations have been made for most of the year except after the rains and the beginning of the cold season.

high as that of the Bambara children; it is only the very low level of Bella mortality that reduces the total population measures. Not only is the degree of variation surprising, but also the direction of the differences. We had expected that noble children whose parents are generally rich, powerful, can afford some modern medical care and own milk cows, would have lower mortality than Bella who are poor, low-status, economically dependent on the nobles and have less milk for their children because they rarely own animals. The unexpected results which emerged are evidence of the importance of social relations and ideology on mortality. For the Kel Tamasheq the very same factors which symbolise wealth and power are those which cause the noble children to suffer higher mortality, along with the fact that the mixed and unstable origins of the Bella have impeded the development of a coherent and comprehensive view of sickness and health which, in the case of the nobles appears to have a detrimental efect on their childrens' health.

Maternal Care

Several authors have focussed upon maternal care as an important consideration in infant and child mortality. In the Gambia, Marsden (1964) talks about defects of maternal care which are due to ignorance rather than deliberate neglect. Gilles on Nigeria (1965) considers that high mortality and impaired growth in African children result not only from malnutrition and disease, but also low standards of child care. Spence et al.(1954) in their study of 1000 Newcastle upon Tyne families say:

> "In the study of these families and in attempting to correlate their environments with the health of the children there emerged one dominant factor - the capacity of the mother. If she failed, her children suffered." (p.120)

None of these authors really identify how child care can affect mortality, they only state that it does. Susan Scrimshaw takes the slightly different perspective of mortality as a response to fertility. At the behavioural level of the mother, Scrimshaw considers that the more children a mother has, the more she will tend to underinvest in the care she gives to each individual child. She says:

> "Most often 'underinvestment' (of care) is part of an unconscious set of behaviours that nonetheless reflect a family's or culture's 'population policy'."

We will see below that Kel Tamasheq nobles' 'population policy' is oriented more towards the wellbeing of the existing adults than towards the survival of children. It is not competition between different children that leads to variation in child care, but a conflict of interests of the mothers who are the nominal guardians of the children.

Schofield's analysis of seasonal variation in nutrition also refers to the role of the mother in the nutrition and health process. Here, constraints on the mother's time mean that "in all these groups the quality and quantity of child care will vary inversley with female labour participation" (Schofield 1974). Although her argument depends on seasonal variation in demands on the mother, social class variation in such demands is equally tenable. From this argument we would expect Bella mortality to be higher than that of nobles because of the patterns of labour and greater time constraints on Bella women.

It is probably due to the fact that lower social status groups, and poorer members of the population undergo more and severer constraints both on the mothers and the families in general that social class and wealth are generally expected to be negatively correlated with child survival.[2] Both indices, which are quantifiable, are frequently

2. There are other, intensive studies which have shown positive correlations like the Tamasheq results. In the Gambia (Thompson 1965) families defined as wealthy by their possession of tin roofs and other material goods, actually had the worst environmental conditions for both women and children, with most overcrowding and more children of low nutritional status.

used to explain demographic variation at the population level, yet evidence of how they operate is lacking. The frequency with which they appear in reports may well be related to the ease with which they are collected; questions on both are inevitably part of censuses and large demographic sample surveys. Their expected negative correlations with mortality levels is due to their manipulation of intermediate mortality factors in directions that reduce mortality. In certain cases however, social class or wealth may change the intermediate factors in different,unconventional ways, and the original relationship no longer holds. Here we have an example of the utility of Mosley's schema (see Chapter II) and its ability to contain apparently contradictory results. Since we are unable to quantify exactly the different effects of the intermediate variables the processes by which social class may affect mortality must be explained; here we have recourse to the concept of child care as outlined above, and the way social class determines the care a child receives and the relationship between the child and its mother.

Class and Child Care

The Tamasheq class system operates in a manner similar to that of a caste system but without the concepts of pollution. Tamasheq classes are endogamous with no class mobility, but despite this, the nobles feel it incumbent upon themselves to enhance their prestige and power vis à vis each other, Bella and blacksmiths, and this becomes evident in certain forms of their behaviour. Wealth and power are intertwined, as personal or religious power renders a Tamasheq men potentially wealthy even if he has few animals himself, because of obligations and respect that accrue to him and which are manifested in the form of loans and gifts. Animals and Bella are the two principal forms of wealth and the two become symbolised in fat, force-fed, noble women. To have a very fat wife or daughter indicates that a man has firstly, enough surplus milk and butter (and therefore cows) to allow her to be force-fed, and secondly, enough Bella so that she need do no domestic labour. Not only is a very fat woman unable physically to do hard domestic work; if she were to do it she would not be so fat. Thus in the domain of child care, although the noble women breastfeed their children for an average of 18 months, much of the actual care and supervision of the child is done by Bella nursemaids aged between about 7 and 16, who carry the babies around for most of the day, taking them to their mothers for feeding[3]. Although generally the nursemaids look after their charges to the best of their ability, many of them are scarcely more than children themselves, and are unaware of the young child's needs or incapable of fulfilling them. At the same time the mother is probably less aware of any problems her child may have, because whenever it is troublesome the nursemaid is called to look after it. Noble children are rarely washed, because when their mothers go to wash they leave the child with the nursemaid, and when the nursemaids go to wash or get water they generally leave the child behind. On the occasions when the child is with its mother, it is rare that there is food and water available in the tent.

This contrasts strongly with the relationship between a Bella woman and her young child from whom she is rarely separated. When she is working, the child is either tied to her back or in a cradle nearby. The child goes with her when she goes to get water both for herself and her mistress and thus is washed quite frequently. Bella women generally have water and usually have food in their tents, a child there will not go thirsty even in the dry season when dehydration is a risk. The contrast between the two classes was seen very clearly during a weighing programme; Bella children could only be weighed by their mothers because they were unused to being picked up by strangers, whereas noble babies did not mind who

3. In Keneba in the Gambia, nursemaids are also used, but there it is because the mothers have too much agricultural work to do to be able look after their children (see Thompson 1965, 1967). This contrasts with noble Tamasheq women who use nursemaids so they need do nothing.

picked them up or what was done with them because they were so used to being passed around.

These different childcare patterns are purely a function of status and prestige. A noble woman enhances her status the less she does, and thus to have a Bella to look after her child shows (a) that she owns Bella, and (b) that she does not need to work. The care that she does give her child tends to be desultory because she is not used to exerting herself and may in some cases be too obese to do so effectively.

Class and Beliefs

The differences in care by social class extend to the whole medical belief system. Like many other societies, both Islamic and non-Islamic, (see Greenwoood 1981), the Kel Tamasheq classify diseases, foods and bodily states into hot and cold.

For a hot illness cold foods are eaten and vice versa. This classification has nothing to do with physical temperature, so that fevers, for example, are not necessarily hot. Although some diseases are pre-classified hot or cold, today in the Delta these are rare, and generally it is decided whether an illness is hot or cold by its response or lack of response to treatment. Thus if someone vomits after being given water to drink, the disease has been shown to be cold because water is cold. If a treatment is too excessive then the whole character of the illness may change from cold to hot, or the reverse.

For the present discussion the most relevant factor in the hot-cold dichotomy is that both fresh milk and water are cold whereas curdled milk is hot. Vomiting, particularly after drinking, is a cold illness, and water and fresh milk are subsequently denied. For young children who frequently suffer from diarrhoea and vomiting, this could have very severe consequences in such a hot climate, because of rapid dehydration, as some people are very insistent about this denial of water.[4]

Case

> Leila's son Mohammed, aged 6, was ill with dysentery, and when he drank water he vomited, so she knew it was a cold disease and she stopped him from drinking water although he kept crying out with thirst. Finally she did give him a very small amount of water to drink, but after three days of illness the child died on the way to the dispensary. Even now, she wonders if it was the water that she gave him that killed him.

The whole hot and cold ideology is far more developed amongst the nobles for whom it is part of their traditional culture, than it is amongst the Bella, who, captured by the Tamasheq in recent centuries, come from a variety of ethnic and cultural backgrounds and have not totally adopted the belief system of their masters. Although Bella are aware of the hot-cold classification, they do not generally know themselves whether a disease is hot or cold, nor are they able to classify foods. Their whole approach to illness is much more pragmatic; if a sick person is thirsty he is given water, if hungry, food. Thus a vomiting Bella child will not be systematically denied milk or water. It is possible that, in an area where dysentery and diarrhoeas are rife that this care factor alone could create mortality differentials, since although original exposure to diarrhoea and sickness is probably not related to child care, the severity of the attack and its outcome may be so.

The whole attitude of nobles to the health of their children and their powers of intervention is summed up in the approach to a particular illness called fad. This word actually means 'thirst' where thirst is not a symptom but a cause of the illness. The

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4. People with a cold disease may drink curdled milk, which is "hot", but they do not drink extra to compensate for fluid loss.

noble women say that in the hot seasons their children get very thirsty but that they themselves are too tired and lethargic because of the heat to ensure that the children get enough to drink, and that consequently the children fall ill with diarrhoea.[5] It is interesting to note that although the noble mothers do blame themselves and their lethargy for this illness, and consider <u>fad</u> to be a killer, they are not sufficiently motivated to change their behaviour patterns. Bella, on the other hand, say that although their children do suffer from <u>fad</u> it is not a serious illness and does not kill.

Constraints on Mothers

Dugdale (1980) explains a rapid fall in infant mortality amongst Australian Aborigines by a change in the attitude of mothers whilst the health facilities and actual living conditions remained more or less stable. He considers that mothers learnt gradually how and when to use preventative services, and that social attitudes changed from 20 years ago when mothers of unhealthy children were not censored or condemned, to new standards of child care to which mothers are forced to conform. For the Kel Tamasheq we have a different but parallel situation, although there are no amenities to be used, just variation in general child care within the means available. It is socially acceptable for one group of women not to take the best possible care of their children, because the social norms allow, even encourage, their lethargy; prestige is maximised in preference to child survival. Prestige is acquired by being seen to do as little work as possible, to have others to work for you, and also by being so fat that work is impossible. Not only can Bella never attain the social status which demands that type of behaviour, but society perceives them as workers and a working role is expected from them. At the same time they have not developed the perception and classification of illness that the nobles have

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5. <u>Fad</u> is usually a hot illness (it is caused by a lack of cold water to drink). One of the recommended cures is to hold the child in the water for much of the day. As the child has diarrhoea, and this is the same water drunk by the rest of the camp, it is hardly surprising that many children fall ill at the same time.

been developing over centuries; Bella life which exists on a more practical and pragmatic level, in fact emerges as far better as regards child health and mortality.

Different constraints operating upon mothers may be considered valid justifications for variations in infant and child mortality. Time, finance, education, other children, are examples of such constraints and a situation may be envisaged where a mother has to choose between staying at home and caring for her sick child or going to the market or the fields to earn money to feed the rest of the family (Thompson 1967).

> "What a mother does is one thing; why she does it is another. Every mother has her priorities and although we may not agree with her course of action, it seems likely that she has weighed the pros and cons as well as she can when she makes a decision about infant feeding, so that the resulting action is the one that is most likely to fulfil her priorities".
>
> Dugdale (1980)

In the case of the Tamasheq noble woman her priorities appear to be her own prestige and status rather than the welfare of her child, and this is confirmed when she admits that her child is sick because she didn't give him water. What is exceptional about the noble Tamasheq women is that there are virtually no economic constraints upon them in comparison with Bella women. Unlike Bella women, noble women have no other work to do, noble families are richer and more able to mobilise cash through sale of animals than Bella. Labour demands in the noble family are not excessive and there is always someone free who could take a sick child to the dispensary. The constraints that do operate are cultural constraints which inhibit the women from looking after their own children, washing them, ensuring that they have water to drink; and these cultural constraints are couched in a value system which states that the less a woman does the more she enhances her own prestige and value as a symbol of wealth, but also, the more she enhances the status of her husband. Bella with no status to maintain, and no possibility of upward social mobility, who are used to activity and work, achieve better standards of child care and lower levels of child mortality in spite of, or probably because of their economic and social disadvantages.

Conclusions

This thesis was undertaken to test the hypothesis that nomadic pastoralists are demographically different from sedentary cultivators. A methodological aim was also incorporated; to show that the explanatory qualities of quantitative data have limitations which can be overcome if these data are combined with intensive studies based on research methodology closer to that of anthropologists. The success of the methodological aims can be judged largely through the conclusions about the demography of pastoralists, some of which could not have been reached through analysis of survey data alone.

The data show that pastoral Kel Tamasheq are demographically different from sedentary Bambara cultivators. An important component of this difference is represented by lower fertility - a feature mentioned by most authors who have theorised about the demography of pastoral populations. The Kel Tamasheq also have different levels and patterns of mortality from the Bambara. Since each pastoral population also has its own specific mortality pattern as does each social class, neither pastoral nomadism alone nor the environment are the dominant determinants of the patterns of mortality.

Their marriage pattern reduces Tamasheq fertility more than any other factor. This reduction is not due to either late age at first marriage or to a large proportion of women remaining single, both of which are aspects which could be interpreted as effects of the limited reproduction of the resources available in a pastoral economy. Instead, it is specific Tamasheq socio-cultural aspects of marriage producing significant periods of "non-exposure" amongst ever-married women which are important; the power of the kinship system and the allegiance of women to their kin: the conflict in the roles of men and women which leads to marriage breakdown: the existence of a servile population. The lack of time that Tamasheq women spend married is due neither to economic contraints nor to a conscious desire to reduce fertility. The role of the pastoral economy is a negligable determinant of low fertility, but the fact that this economic system does not require rapid and frequent human reproduction for its continuation and survival permits the current marriage pattern to persist without destroying the society's economic base.

The theory that pastoral nomads have lower mortality than sedentary populations because they are less subject to intense seasonal stress was not upheld. Although Kel Tamasheq, overall, have lower infant and child mortality than the Bambara, their adult mortality is far higher. The substantial variations in mortality by social class preclude any common factor such as pastoralism, from being a major deteminant. At this point the recourse to more intensive, observational studies provided important insights into causes of the observed differentials; particularly the role of the mother-child relationship. The demographic data had provided the clue to its importance through the association of high maternal mortality with high child mortality, but only actual observations of behaviour could explain the mechanisms of what was happening.

Generalisations from these results to all nomadic populations cannot be made because all the important determinants identified are culture-specific. The two most important factors are the noble-Bella relationship and the necessity for acquiring and maintaining prestige. Although both of these coexist here within a pastoral economy, they could equally well be found in an agricultural community.

Although the original hypothesis has not been refuted, because the pastoral Tamasheq are demographically different from the Bambara, the additional use of the intensive studies is vindicated by the insight they provide in showing that the differences are incidental to the pastoral economy and not an integral part of it. The use of these methods cannot replace the demographers' need for good, quantitative data on populations, but they do provide a valuable supplement for understanding and interpreting these data, and for explaining the apparent anomalies.

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APPENDIX 1 - QUESTIONNAIRES

Q7

ENQUETE SUR L'ECONOMIE RURALE

ETUDE FAMILIALE — MALI 1981-2

A REMPLIR AU BUREAU

DATE			VILLAGE/ CAMP			HOUSEHOLD		COMMUNITY
1	2	3	4	5	6	7	8	9

ARRONDISSEMENT	
VILLAGE/ ENDROIT	
NOM DU CHEF	

DATE	
GWA/ GALLÉ/ TENTE No.	
FEUILLE No.	

						RESIDENCE					SITUATION MATRIMONIALE AGE 15 ANS OU PLUS				FECONDITÉ POUR CHAQUE FEMME AGÉE DE 15 A 50 ANS				DERNIÈRE NAISSANCE				
	NOM ET PRENOM RESIDENTS HABITUELS et VISITEURS	LIEN DE PARENTE	SEXE M ou F	TAMACHEK IMUSHAR, INESELMAN, IMRAD, INHADEN ou BELLA / FULANI FULBÉ ou RIMAÏBÉ	AGE Quel âge a-t-il /elle ?	Reside-t-il/elle habituellement chez vous ? 1=OUI 2=NON	A-t-il/elle dormi chez vous hier soir ? 1=OUI 2=NON	Sait-il/elle lire et écrire ? 1=OUI 2=NON	PÈRE en vie ? 1=OUI 2=NON	MÈRE en vie ? 1=OUI 2=NON	Actuellement marié/e veuf/ve, divorcé/e, celibataire ? M,V,D,C	Combien de fois s'est-il/elle marié/e ?	AGE au premier mariage ?	PREMIER/E époux/se en vie? 1=OUI 2=NON	Nombre d'enfants mis au monde ET ENCORE EN VIE. N'oubliez pas enfants absents ou mariés M	F	Combien d'enfants a-t-elle eu, qui sont morts par la suite? M	F	Sexe M ou F	Encore en vie? 1=OUI 2=NON	SAISON de NAISSANCE	Nombre d'années depuis la naissance	Cocher ici pour chaque femme âgée de 15 à 50
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
0																							

SI UNE AUTRE FEUILLE EST NÉCESSAIRE, COCHER ICI ☐

NOM DE L'ENQUÊTER ____________

NOM DU CONTRÔLEUR ____________

FICHE VERIFIÉE ☐

Q8. ENQUETE SUR L'ECONOMIE RURALE - ETUDE FAMILIALE MALI 1981-2

FICHE INDIVIDUELLE

VILLAGE/ ENDROIT		
CHEF DU VILLAGE/ CAMPEMENT		
No. de GWA/ GALLE/ TENTE		
No. de LIGNE DE LA FEMME		

NOM DU CHEF de GWA/GALLE/TENTE ____________________

NOM ET PRENOM ____________________

A DEMANDER A CHAQUE FEMME AGÉE DE 15 á 50 ANS QUI EST INSCRITE SUR LA FICHE COLLECTIVE

Pourriez-vous me raconter toutes les naissances que vous avez mises au monde, y compris les mort-nés, des enfants qui sont morts par la suite, et des enfants qui n'habitent plus chez vous: commencez par votre premier enfant, suivi par le deuxième et continuez jusqu'au dernier

RANG	NOM ET PRENOM Si pas nommé, inscrire "bébé"	SEXE M ou F	NOMBRE D'ANNÉES DEPUIS LA NAISSANCE	SAISON DE NAISSANCE	ENCORE EN VIE? OUI ou NON	SI DÉCÉDÉ SAISON DU DÉCÈS	SI DÉCÉDÉ AGE AU DÉCÈS (A=Ans/M=Mois MN=Mort-né)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

1. Il y a combien de mois sont passés depuis la naissance la plus récente ? ____________ mois

2. Allaitez-vous encore cet enfant chaque jour? 1 OUI 2 NON

3. Quel âge avez-vous? ______ ans.

4. Avez-vous déja été mariée? 1 OUI 2 NON PASSER à 12

5. La première fois que vous vous êtes mariée, quel âge aviez-vous? ______ ans.

6. Combien d'années sont passés depuis que vous vous êtes mariée pour la première fois? ______ années

7. Combien de fois vous êtes-vous mariée? ______ fois

8. Votre conjoint, est-il encore en vie? 1 OUI 2 NON PASSER à 12

9. Votre conjoint a-t-il actuellement d'autres épouses? 1 OUI 2 NON

10. Votre conjoint habite-t-il actuellement avec vous? 1 OUI PASSER à 12 2 NON

11. Cette fois-ci, combien de semaines a-t-il étè absent?

______ semaines

12. Êtes vous enciente en ce moment? 1 OUI TERMINER ICI 2 NON /NSP

13. Vos règles, est-ce qu'elles vous sont venues le mois dernier? 1 OUI 2 NON

DATE	|		81

NOM DE L'ENQUÊTRICE ______

NOM DU CONTRÔLEUR ______

VERIFIÉ [ ]

Q8. ENQUETE SUR L'ECONOMIE RURALE - ETUDE FAMILIALE MALI 1981-2

FICHE INDIVIDUELLE - CODING SHEET

IDENTIFICATION

VILLAGE/CAMP (1 2 3)	HOUSEHOLD NUMBER (4 5)	COMMUNITY/ CLASS (6 7)	WOMANS LINE No. (8 9)

BIRTH HISTORY

SEX : M = 1 F = 2

SEASON : SAMIYA = 2
KOWLA = 3
FONÉNÉ/NENETUMA = 5
TILEMA = 7
TICH-WAH-CHAWA = 1
AKASSA = 2
GARAT = 3
GARAT DJIRIS = 4
DAOJIRISTE = 5
AFOSCOU = 6
EWELEN = 7

AGE AT DEATH

MORT-NÉ = 01
0-1 SEMAINE = 02
1-4 SEMAINES = 03
1 MOIS = 04
2 MOIS = 05
3 MOIS = 06
4 MOIS = 07
5 MOIS = 08
6 MOIS = 09
7 MOIS = 10
8 MOIS = 11
9 MOIS = 12
10 MOIS = 13
11 MOIS = 14
12-14 MOIS = 15
15-17 MOIS = 16
18-20 MOIS = 17
21-23 MOIS = 18
2 ANS = 19
3 ANS = 20
4 ANS = 21
5-9 ANS = 22
10-14 ANS = 23
15+ ANS = 24

OUI = 1
NON = 2

Cols	BIRTH ORDER	SEX	YEARS SINCE BIRTH	BIRTH SEASON	ALIVE	DEATH SEASON	AGE AT DEATH
10–19	0 1						
20–29	0 2						
30–39	0 3						
40–49	0 4						
50–59	0 5						
60–69	0 6						
70–79	0 7						

NEW CARD : DUPLICATE IDENTIFICATION COLS 1-9

Cols	BIRTH ORDER	SEX	YEARS SINCE BIRTH	BIRTH SEASON	ALIVE	DEATH SEASON	AGE AT DEATH
10–19	0 8						
20–29	0 9						
30–39	1 0						
40–49	1 1						
50–59	1 2						
60–69	1 3						
70–79	1 4						

NEW CARD : DUPLICATE IDENTIFICATION COLS 1-9

MONTHS BREAST FEEDING (10 11)	(12)	AGE (13 14)	EVER MARRIED (15)	AGE 1st MARRIAGE (16 17)	DURATION MARRIAGE (18 19)

No. MARRIAGES (20)	HUSBAND ALIVE (21)	POLY GAMOUS (22)	HUSBAND AT HOME (23)	WEEKS AWAY (24 25)	PREGNANT (26)	MENSTRUATING (27)	DATE (28 30)

APPENDIX 2

Events used for Dating and Aging

(a) Bambara

1908	Peul revolt at Boumoti (Macina)
1913	"Garadie" - The great drought
1916	Bobo revolt
1918	"Tiebatie" - mobilisation of men for first world war by French
1923	"Badji folo" First flood of river
1926	"Badji Filana" Second flood of river
1929	First plague of locusts
1935	Gwawile - forced movement of people to cultivate in "Office du Niger" zone
1938	Beginning of construction of barrage at Markala
1938	Well dug at Markala village near Monnimpe
1939	"Mobilise" - mobilisation of soldiers - given sandals made out of car tyres
1947	End of construction of barrage at Markala
1949	Prophetisé - wandering prophets proselytising (?cargo cult?)
1960	Independence
1966	"Badji Sabana" Third flood of river
1968	Coup d'Etat
1973-4	Drought
Dec 1976	Census

(b) Gourma Tamasheq

1913	First great drought
1916	"Iseranbayer" battle between Tamasheq and French
1932	"Awatay wan iteran n'iknass" - year with many comets in the sky - "star wars"
1944	"Ameghin tafouk wan tadjirist" - eclipse of the sun in the cold season
*1945	"Kunener" - arrival of French administrator who enforced many charges end built roads
*1947	School at Djebok

APPENDIX 2 (contd)

1958	"Gariloga" Year of food shortage
1959	"Ameghintafouk wan gharat" - eclipse of the sun in October/Nov.
1960	Independence
*1961	School moved from Doro - Dorey
1962	New money
*1963	School moved Dorey - In Tillit
*1966	"Adjina wan Tadjirist" - rains in the cold season (in one zone)
1968	Coup d'Etat
1971	Cholera epidemic
1973-4	Great drought
Dec. 1976	Census

* not relevant for all the areas

APPENDIX 3

Bambara Villages

(1) Doura arrondissement

		Numbers enumerated in village
1	Bale	151
2	Djakoro (hamlet of 1)	127
3	Sagala-Ni	337
4	Sanga (hamlet of 3)	59
5	Tioba	281
6	Kossabougou	294
7	Soflebougou	67
8	Nababougou (hamlet of 7)	74
9	Bani	406
10	Mamarila (hamelt of 9)	36
11	Nanzana (hamlet of 9)	59
12	Faya (hamlet of 9)	136
13	Sagala-Ba	793
14	Sasa (hamlet of 13)	31
15	Ngalamena (hamlet of 13)	57
16	Nieou (hamlet of 13)	53
17	Donkene (hamlet of 13)	24
18	Yembougou (hamlet of 13)	86
19	Toima	528
20	Sonango	273
21	Toundouroubala (hamlet of 20)	49
22	Donfing (hamlet of 20)	16
23	Fonona (hamlet of 20)	43
24	Diessourouna (hamlet of 20 and 35)	145
25	Gavantou	206
26	Diebougou	671
27	Dofinena	192
28	Dlaba	95
29	Samango	167
30	Banangeroni (hamlet of 28)	37

APPENDIX 3 (contd)

31	Nenebougou (hamlet of 29)	28
32	Trokena (hamlet from various places)	63
33	Niagandola (hamlet of 29)	25
34	Niaro (hamlet from various villages)	123
35	Dalonguebougou	534
36	Noumoubougou (hamlet of 28)	80
37	Misribougou	236
38	Markabougou	346

(2) Monnimpe arrondissement

39	Nianzana	85
40	Nbiebougou (hamlet of 39)	61
41	Doli (hamlet of 39)	42
42	Nanabougou	319
43	Bashikoni (hamlet of monnimpebougou)	95
44	Karangabougou	243
45	Neguena (hamlet of 44)	104
46	Fanzerela (mixed hamlet)	62
47	Tollessouma (hamlet of 48)	80
48	Markala	1678
49	Sougouba	318
50	Barkabougou	172

APPENDIX 4

Quality of reporting of age at death in the birth histories

Commentary on the graphs

The aim of drawing these graphs was to see whether heaping on certain ages at death (namely 6 months, 12 months, 18 months, 24 months etc.) decreases for more recent cohorts fo births, and also to look at the patterns of this heaping.

For each cohort of births (born 0-4, 5-9, 10-14 and 15+ years before the survey) in each population the graphs show the percentage of deaths reported at each age of the total deaths reported between ages 1 month and 59 months. Deaths under one month were excluded because of the enormous variation. For the 0-4 cohorts the truncation was not controlled for, so there will be less deaths than expected at older ages, but the monthly/three monthly oscillations still exist. For ages at death of 12-23 months the percentages were divided by three, and for those at 2 to 4 years they were divided by twelve to control for the different time periods.

Gourma Tamasheq

(i) No heaping on age at death of 6 months.

(ii) Some heaping on age at death of 10 months.

(iii) The most recent cohort (0-4) is more uneven than the two earlier cohorts, but that may just be because of smaller numbers.

(iv) There is no evidence that reporting is any more heaped for the 5-9 and 10-14 cohorts than for more recent groups. The 15+ cohort is rather more heaped but not very severely.

(v) The most severe heaping appears in all four cohorts during the second year; there is a high percentage of deaths reported at ages 12-14 months and this percentage descends rapidly for each three monthly interval until three years when it rises again.

Delta Tamasheq

(i) Under age 12 months the heaping is quite severe for all cohorts though the patterns change. For the recent cohorts there is little heaping on 6 months but heavy heaping on 4 and 8 months. For older cohorts there is more heaping on 6 months but none on 4 months and less on 8 months.

(ii) For the oldest and youngest cohorts there is a descent in the number of deaths reported during the second year and then a peak for the third year, but this does not occur for the central two cohorts.

(iii) There is no obvious increase in heaping for the older cohorts.

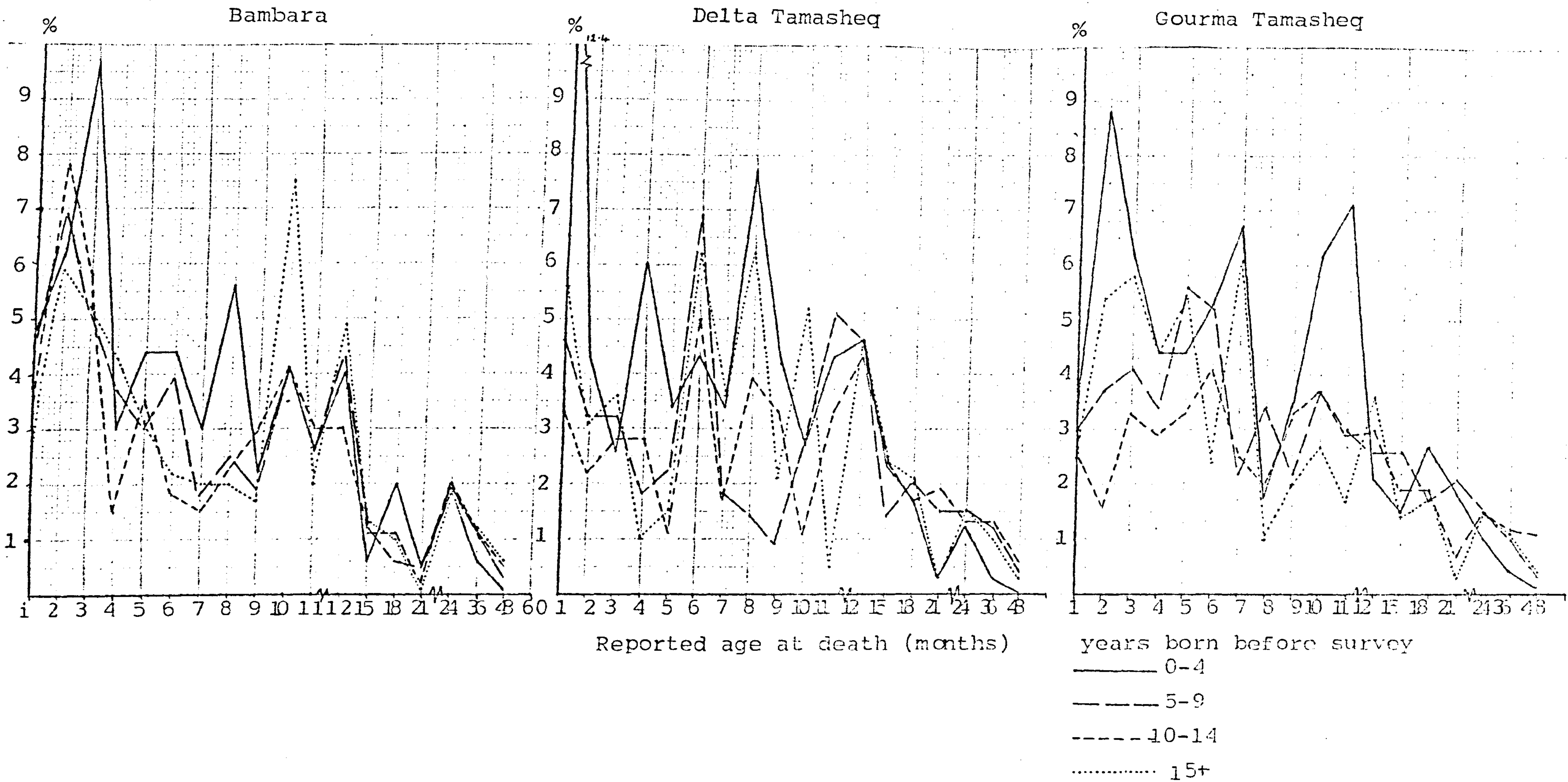
Bambara

(i) There is substantial heaping on 2 months, 10 months and 12 months for all cohorts which is often most severe for the most recent group.

(ii) Overall the heaping is worst for the 10-14 cohort rather than for earlier or later groups but except for at 10 months it does not differ much from the other cohorts.

(iii) For all cohorts there is very severe heaping in the second year with many deaths reported for 12-14 months (15-17 for 0-4 cohort) and then diminishing to almost zero for 21-23 months, rising sharply at three years.

APPENDIX 4 AGE AT DEATH REPORTING



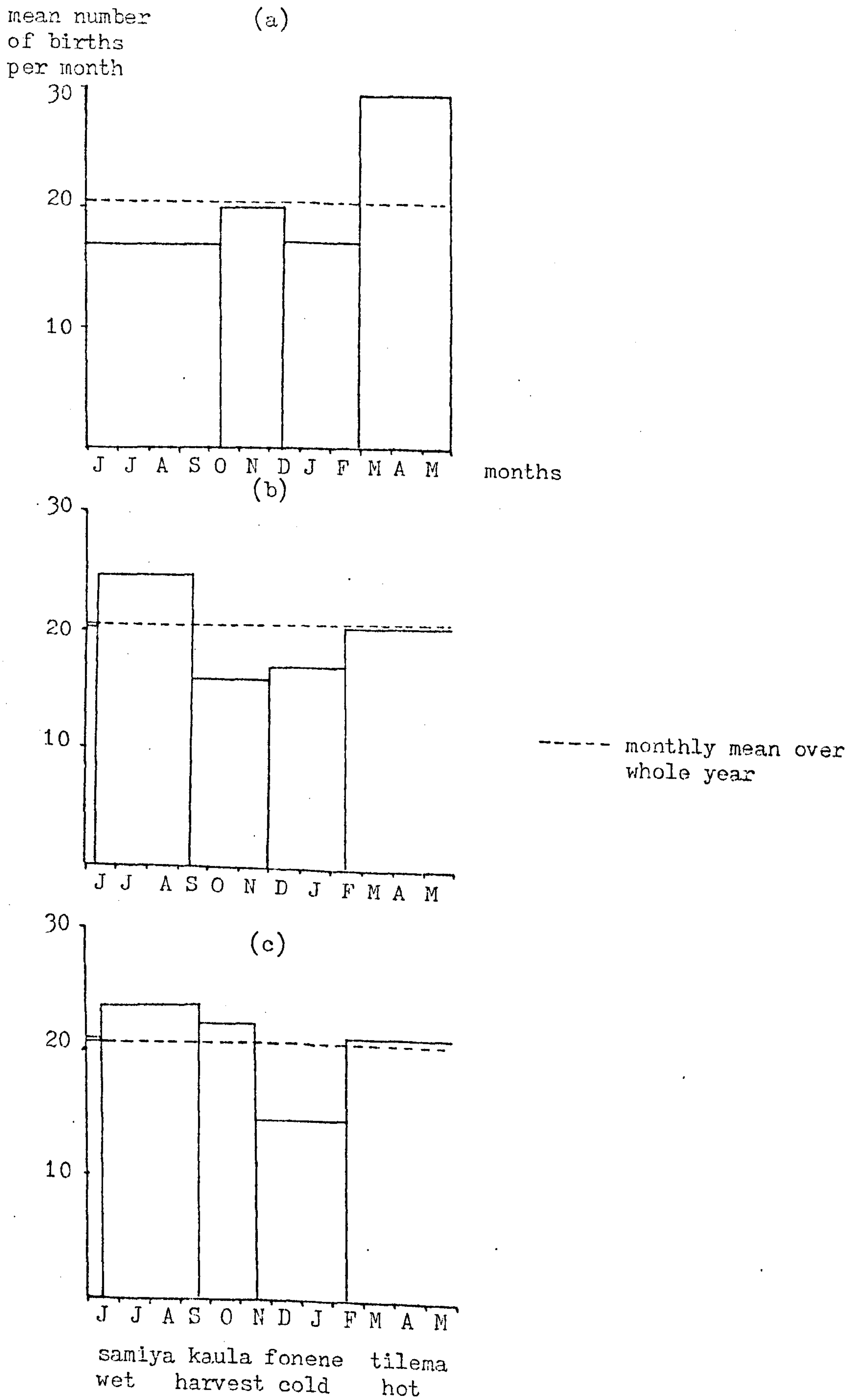
APPENDIX 5

Seasonality - method using fixed length seasons

A period of time is ascribed to each season from information acquired in the field, and the birth rate per unit time is calculated. This method is highly sensitive to the period of time chosen, and is thus limited in its applicability.

For the Bambara, I consulted three people independently on when they thought that the four seasons began and finished in an average year. One (A) was a literate Bambara who had some experience in the zone and had been one of the survey interviewers. The other two were an economist (B) and an anthropologist (C) who had lived and studied two of the survey villages for two years. Although all three individuals placed the seasons at around the same time, each estimate differed slightly and thus indicated different peaks and troughs of births. (see figure A.5) A's distribution (1a) has a peak of births in the hot season and two troughs, one in the wet and one in the cold. B (1b) shows a birth peak in the wet season with a particular trough in the harvest, and C (1c) has a high wet season birth rate which remains high throughout the harvest season with a big cold season trough. Not only do these estimates differ from each other, but they also show a substantially different seasonal pattern of births from those registered in Sine in Senegal, Malumfashi in Nigeria, and Keneba in the Gambia. Yet it seems improbable that the intermediate factors determining birth seasonality would be very different between these three populations and Sahelian Bambara millet cultivators. It should be noted that the different patterns in 1b and 1c result from only one two-week and one half-week difference in definition of season. The sensitivity of this method to the periods chosen meant that I did not attempt to use it with the more numerous Tamasheq seasons, as it is obvious that with a little juggling any seasonal peak in births can be obtained.

FIGURE 5A BAMBARA BIRTH SEASONALITY



APPENDIX 6 GLOSSARY OF TAMASHEQ WORDS

afoscou	transition season from cold to hot
akassa	rainy season
alfaqi	learned religious specialist
amoukoussou	transition season from hot to rains (Gourma)
azeli	goods and animals brought by the woman at marriage
ebattegh	kin related entirely through the female line
ewaylen	hot season
fad	thirst, diarrhoea and vomiting in the hot season provoked by thirst
gharat	hot post-rains season
iklan	slaves, Bella, now ex-slaves or servants
illelan	"free" Tamasheq
imghad	vassals
imushar	warriors
inesleman	Muslims,members of the religious social class
inhaden	blacksmiths
tadjirist	cold season
taggalt	bridewealth
tajone	young bull given by prospective bridegroom to his bride's <u>ebattegh</u>
terjit	gifts obtained without obligation for repayment - often used to make up <u>taggalt</u>
tish wa shwa	transition season from hot to rains (Delta)
towsit	lineage group, fraction - nowadays used as the tax paying unit