The Early Socio-Demographic Impact of the HIV-1 Epidemic in Rural Zimbabwe

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ABSTRACT

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Honde View: scenic view of the Honde Valley, Manicaland, Zimbabwe, 1995

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Abstract

Theoretical work indicates that HIV-1 epidemics in sub-Saharan Africa will cause major demographic changes. The current study assesses the extent to which these changes can already be seen in two rural areas of Manicaland, Zimbabwe and investigates the determinants of the epidemic and its demographic impact. The study utilizes demographic survey methods and qualitative sociological techniques. Data analysis is conducted using statistical packages and is guided by insights generated from mathematical models of the epidemiology and demographic impact of HIV-1 infections.

HIV-1 prevalence is high in both areas. Among women, HIV-1 infection is associated with age and marital status. Indirect evidence indicates that religion, education, migration and socio-economic characteristics of husband may also be important determinants. Each of these factors influences the pattern of sexual behaviour. Rates of sexual partner change are heterogeneous for women but appear more homogeneous for men. Mixing patterns are dis-assortative: men form partnerships with women with high and low rates of partner change.

Mortality has undergone a recent upturn, almost certainly associated with HIV-1 infections. Adults aged 20-45 years and men, in particular, are most affected at this (early) stage of the epidemic. Religion is an important local determinant of demographic patterns, whose influence on mortality appears to be changing vua its effect on sexual behaviour and the spread of HIV-1. Orphanhood has increased, but, as yet, there is little change in population structure. Fertility has declined since the late 1970s. It is too early in the AIDS epidemic to see an impact of HIV-1 at the population level. However, some signs of behaviour changes which affect the proximate determinants of fertility were detected. These changes may accelerate the decline in birth rates, especially at younger ages.

New demographic projections for Zimbabwe are developed, based on observed trends in HIV-1 infection and fertility, and underlying behaviour patterns. These indicate substantial further increases in mortality, particularly among women and young children, greatly reduced population growth, relative shortages of young children and older adults, and further increases in orphanhood. Families and communities will require support in facing this slowly unfolding disaster.

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CHAPTER 1

Introduction

Pocket-chart voting session at Ngorima Health Clinic, Dzingire, Rusitu Valley, 1994.

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Introduction

1.1 Background

HIV-1 has emerged as a major new health and social problem since the early 1980s. Its implications in sub-Saharan African settings are now recognized as extending well beyond the purely medical domain. Following the early lead set in Uganda, many governments have established multi-sectoral strategies. Internationally, the World Health Organization's Global Programme on AIDS has recently given way to a broader-based United Nations AIDS body.

In demographic terms, the consequences of the HIV-1 and AIDS epidemics extend to early childhood and adult mortality, fertility and migration. Population growth, the age and sex structure of populations and other demographic features, such as levels of orphanhood and widowhood, are all likely to be affected. The demographic changes which result will be key factors in determining the broader social and economic impact of the epidemics at national and local level and the ability of the societies affected to cope with this impact.

One aspect of the socio-demographic impact of HIV-1 epidemics in sub-Saharan Africa which is of particular interest to demographers is the potential effect on fertility and family planning programmes. Increases in mortality due to HIV-1 will reduce the rapid rates of population growth seen in many parts of the region in recent years. Epidemics will therefore limit and possibly remove one of the principal motivating forces behind many family planning programmes. Furthermore, it will be argued here that the presence of an HIV-1 epidemic will affect birth rates and demand for family planning services through behavioural and biological changes. The nature of the relationship is likely to be complex, so that the net effect in any given population could be an increase or a decline in fertility, depending on local socio-economic conditions. Thus, the decline in population growth resulting from increased mortality may be restricted or accelerated by changes in fertility.

Family planning programmes are increasingly justified in terms of human rights and infant and maternal health arguments. Regardless of their overall impact on population growth, family planning programmes are seen as helpful, in that they offer couples and women, in particular, the ability to control the timing and ultimate numbers of their births. Social pressures brought about or intensified by HIV-1 epidemics may alter previously prevailing attitudes. There may be changes in preferences for particular methods of contraception or combinations of methods. There may also be changes in attitudes towards preferred numbers of children and the timing of births within a lifetime or a union. Customs in regard to sexual behaviour may change.

More generally, there is a clear need to develop appropriate and effective responses to the HIV-1 epidemic, both in terms of prevention of further infections and coping with the socio-economic impact. There is a need to understand the key determinants of the timing, speed, shape and size of HIV-1 and AIDS epidemics and the means by which these can be influenced. The nature and scope of the demographic and socio-economic consequences of HIV-1 epidemics must also be understood. One thing which has been clear for some time is that the AIDS pandemic is severe in terms of lethality of the infection yet slow to unfold. Moreover, the pattern of viral spread is heterogeneous both within and between countries. As such, it has no satisfactory precedents. At the current time, the pandemic remains in its early stages, even in those areas where it first took hold. Thus, there is currently little empirical evidence regarding long-term impact.

Against this background, mathematical models that combine demographic and epidemiological processes have been developed, with a view to improving understanding of the issues and providing some indications of the future demographic impact. These include models which are based on current understanding of the biological and behavioural processes involved in the spread of HIV-1 infection and the development of related disease. A number of simulations have been undertaken which indicate that extremely severe demographic changes can result, under epidemiological conditions consistent with the best data currently available for populations in sub-Saharan Africa. Simulations run using alternative models often provide varying results, largely because of differences between the structures of these models [1]. However, almost all the published simulation results, which reflect the high levels of HIV-1 seroprevalence recorded in eastern and southern Africa in recent years, point to significant demographic changes over the coming decades.

The current study is a comparative case-study of two rural populations in eastern Zimbabwe with contrasting early experiences of the epidemic. The broad aim of the study was to collect site-specific data on what were understood to be the key socio-demographic and epidemiological determinants and impact indicators of HIV-1 epidemics. It was envisaged that analysis of these data, with reference to the structure and predictions of mathematical models, would lead to an improved understanding of the early spread and impact of an epidemic and of its likely future course. Emphasis was placed on investigating the early impact of the HIV-1 epidemic on family planning and fertility. This is an aspect which is particularly poorly understood but will be crucial in determining the long-term demographic consequences of HIV-1 and AIDS in sub-Saharan settings.

The remainder of this introduction begins with a brief review of the literature describing previous theoretical and empirical studies of the demographic impact of HIV-1 and AIDS in sub-Saharan Africa (section 1.2). The theoretical framework used in the study is outlined next (section 1.3) and then the specific objectives and research approach are summarized (section 1.4).

1.2 Demographic Impact of HIV-1 in Africa - Literature Review

1.2.1 Introduction

This section reviews the literature on the demographic impact of HIV-1 epidemics in sub-Saharan Africa. The literature on other subjects of close relevance to the study - eg: *shona* culture and the development of the HIV-1 epidemic in Zimbabwe - will be considered in later chapters. The current section begins with a review of theoretical work, with particular emphasis on the development of mathematical models. The available published data on patterns of spread of HIV-1 and AIDS in sub-Saharan Africa are noted and the results from empirically-based studies of demographic impact are reviewed.

1.2.2 Theoretical Studies

<u>The Role of Mathematical Models</u>

Mathematical models can have a number of uses in improving understanding of HIV-1 and AIDS epidemics and in the planning of response and coping strategies. It has been suggested [2] that these may include:

i Provision of caricatures of the epidemic that shape discussion on the determinants of observed patterns;

ii Acting as templates with which to estimate epidemiological parameters;

iii Serving as guides to the information needed to improve understanding further; and

iv Providing a framework for planning health-care provision and programmes of control.

Several years on, it can be seen that models have indeed been applied in each of these ways. The sensitivity of epidemiological and demographic outcomes to behavioural factors has been demonstrated vividly in model simulations [3, 4], in ways which have provided added impetus to interventions and research in this area [5-8]. Simple models have been used to estimate key parameters such as the incubation period between HIV-1 infection and the development of AIDS [9, 10] and the epidemiological effects of multiple strains [11-13]. Mathematical model-based epidemiological and demographic projections have been used widely, not only in assessing the viability of alternative models of health-care provision, but also in considering the broader socio-economic consequences of epidemics [14-17].

Different Types of Mathematical Model

As was noted earlier, when used in a predictive mode, different mathematical models of HIV-1 have been shown to generate very different epidemiological and demographic outcomes for the same populations. In one exercise sponsored by the United Nations and the World Health Organization in 1989, six models were used to simulate the HIV-1 epidemic and resulting demographic consequences under three pre-specified sets of key input parameter settings. Under the intermediate settings, twenty-five years into the epidemic, the various models projected HIV prevalence levels ranging between 2.8 per cent and 39.5 per cent. Even where epidemics of similar size were projected, there was considerable variation in the estimated demographic impact [18]. The different results were attributed in part to incomplete specification of the input parameters, which varied between the models, but also to differences in the design and structure of the models used. The exercise therefore highlighted the importance of assumptions which may be implicit as well as explicit in the design of models.

Palloni and Glicklich have suggested that mathematical models of the demographic impact of HIV and AIDS can be grouped into four principal categories [19]. Namely:

i Simple extrapolation models: models which fit a mathematical distribution to numbers of AIDS cases over time and infer future AIDS incidence from this distribution [20, 21];

ii Models with postulated incubation periods: models which use back-calculation to estimate past HIV incidence from reported numbers of AIDS cases, by assuming a mathematical function for the incubation period between infection and AIDS [20];

iii Models with postulated incubation periods and modes of transmission: AIDS incidence and mortality are projected from a given time trend in HIV prevalence [22]. In some cases the AIDS projections are linked to models of broader demographic impact [23, 24]; and iv Models with behavioural assumptions: as in (iii) except that the trend in HIV prevalence is modelled with reference to epidemiological factors. eg: behavioural and biological determinants of HIV transmission [25-32].

Most of the models in categories (i) and (ii) and some of those in category (iii) [33, 34] are intended primarily for making short-term projections. Those in the final category generally provide a medium to long-term perspective. However, their prime purpose is not prediction but to sharpen understanding of the factors that determine observed patterns. As such they require assumptions regarding behavioural and other responses to the epidemic. Other distinctions can be drawn. For example, between deterministic models [32, 35] and models which are stochastic in structure [36]. Some models focus on the epidemiological determinants of HIV/AIDS incidence and prevalence [37, 38]. Others - as in (iii) - limit attention to the relationship between levels of HIV prevalence and demographic impact [24]. In some cases, this is investigated by applying stable population theory and relational models of HIV-1 incidence [39, 40].

Determinants of HIV-1 and AIDS Epidemics and their Demographic Impact

The assumptions of any model simulation, whether they be explicit - ie: associated with specified parameter settings - or simply implicit in the underlying model design, influence the projected results. Where a model in category (iv) is used, the assumptions refer back to the underlying demographic and epidemiological processes which determine the spread of an epidemic. Comparison of the results of simulations run under alternative parameter settings can provide clues as to the nature and degree of influence of the different factors involved. Where it is believed that interventions can bring about changes in these factors, models can be used to assess their likely impact, given the necessary assumptions regarding their effectiveness and timing of introduction during the course of an epidemic [41].

Model simulations have be used to illustrate the significance of behavioural factors in determining the course of an HIV-1 epidemic [3, 4, 37, 42-44]. The degree of heterogeneity in rates of sexual partner acquisition and patterns of mixing between high and low activity groups and between different age, spatial and social groups have all been demonstrated to be important, as well as the overall rate of partner acquisition and the distribution of concurrent partnerships. Differences in mixing within and between villages have been shown to offer a possible answer to the apparent paradox between molecular evidence, which suggests HIV has been present in human populations for over a century, and epidemiological evidence, which indicates that noticeable levels have only been reached recently [45]. Saturation effects, whereby HIV-1 prevalence levels peak among higher-risk groups who then begin to die at a faster rate than new infections appear in low-risk groups, can result in declines in population prevalence, even in the absence of behaviour change [29]. It has also been shown that highly assortative mixing patterns can account for considerable instability in population level, HIV-1 prevalence curves, during the early stages of an epidemic [42], a phenomenon which has been observed in Thailand [46].

Biological factors have also been shown to be important. If infectiousness varies during the incubation period for AIDS, as is currently believed to be the case [47, 48], temporal patterns in epidemic curves become more complex [49]. Simple models have been used to demonstrate the non-linear relationship between numbers of exposures per partnership and the risk of heterosexual transmission [50, 51]. Rates of "vertical" transmission have been found to vary between populations [52]. Breastfeeding appears to be a risk factor for transmission [53-55], while delivery by caesarean section is associated with a reduced risk of infection [55]. As might be expected, model simulations show a more severe demographic impact with increasing risk of perinatal infection [28].

Behavioural and biological factors can operate in conjunction. For example, conducive behaviour patterns - which may include absence of male circumcision [56-60] - can lead to the spread of other sexually transmitted diseases, which appear to facilitate sexual transmission of HIV-1 infection [61, 62]. Bulatao and Bos have shown that, if sexually transmitted diseases are assumed to increase the probability of sexual transmission of HIV by a factor of ten, then HIV prevalence among females could reach a level of about 13 per cent in half the time required for the same increase in a population without STDs [2, 19]. High prevalence of concurrent partnerships can lead to faster epidemics if there is indeed a concentration in infectiousness in the period following initial infection [44, 63]

A range of socio-cultural and environmental factors are believed to influence the more immediate behavioural and biological determinants of HIV-1 and AIDS epidemics. The mechanisms of interaction between the underlying and intermediate determinants are poorly understood and have rarely been incorporated into mathematical models. The social context is believed to be fundamental in determining the pattern of spread of HIV-1 infection in any population [7]. This context includes beliefs in respect to sickness and healing and norms regarding appropriate sexual behaviour, by gender, marital status and so on [64-67]. In many circumstances, the position of women in society puts them at high risk of infection [68]. Cultural norms permitting men to have multiple partners limit women's ability to control their own risk reduction [69]. The influences of colonialism, westernization, urbanization, monetarization and other aspects of socio-economic development have been stressed. These and other factors - eg: wars [70] - have brought about changes in culture and increased migration and displacement. Traditional controls over sexual activity have been eroded as a consequence. Monetarization of economies, greater diversity in income levels, the recent recession in many African countries and the low status of women have led to increased prostitution [71-73]. Environmental factors may also be important; for example, in explaining the different disease profile and more rapid disease progression, which appear to occur in African as compared to Western populations [10, 74, 75].

It has already been noted that the demographic impact of any given epidemic curve can vary. There is some evidence that the length of the incubation period for AIDS and the period of survival after diagnosis differ between populations, even between similar aged individuals [9, 10, 76, 77]. Mathematical model simulations have illustrated how a shorter survival period after infection can result in more acute but ultimately less severe demographic consequences [78]. The demographic impact of any given pattern of epidemic is also sensitive to the relative age patterns of HIV-1 incidence and fertility [40, 79]. Other factors which may be important include indirect effects on mortality - eg: through reduced childcare and breastfeeding [80], disruption of health services [81] and secondary epidemics of tuberculosis [82].

Impact of Alternative Prevention Strategies

Mathematical models have been used to examine the potential impact of preventive and control interventions. It has been shown that frequent condom use and/or reductions in rates of sexual partner acquisition amongst high activity men and women can significantly reduce or even prevent a widely disseminated epidemic, in circumstances where mixing is predominantly assortative - ie: like with like [29, 83].

The relative effectiveness of alternative intervention strategies has been explored. In one example, it was shown that, given certain assumptions regarding success in implementation, detecting HIV positive people in a community and persuading them not to have unsafe sex is likely to be more effective in reducing the epidemic than ubiquitous condom promotion [38].

The timing of interventions during the course of an epidemic has been demonstrated to be critical. Changes introduced early on in the course of an epidemic generally have a disproportionately greater effect than similar changes introduced later [84]. Strategies which combine different control measures - eg: sexually transmitted disease control with campaigns to reduce rates of partner change - have been predicted to be effective [41], although the outcome in many circumstances may be less than would be expected on the basis of simply summing the benefits accruing from each type of intervention used in isolation [83].

Interventions which seek to extend the survival time of individuals infected with HIV-1 could have disadvantages as well as benefits. The consequences depend on the pattern of infectiousness, which may vary within the survival period from infection [49]. If the average level of infectiousness is constant, longer survival is associated with larger epidemics. The demographic impact is less acute in the short-term but is ultimately greater [78].

Nature of Demographic Consequences

The nature and extent of the demographic consequences of HIV-1 and AIDS epidemics will reflect a number of factors, including the size of the epidemics, the length of the incubation period and the underlying demographic profile of the population. Calculations based on a broad range of models point towards substantial increases in adult and early childhood mortality [1, 24, 25, 28, 39, 85-87], even in some populations where death rates from other causes continue to decline [15]. AIDS mortality was first taken into account in the United Nations "World Population Prospects" report in the 1992 revision. Projections were made for the fifteen African countries believed to have the highest levels of HIV prevalence. Overall, life expectancy was projected to increase from 47.7 years to 51.2 years between 1975-80 and 2000-05. However, this increase constitutes roughly one third of that which was envisaged in the absence of AIDS. In two countries - Uganda and Zambia - absolute reductions in life expectancy were projected for this period when AIDS was taken into account [88].

Where increases in mortality do occur, significant escalations in orphanhood [86, 89-91] and widowhood [40, 90] have been predicted. Changes in the dependency ratio are expected to be modest [15, 28, 35], but there are likely to be reductions in the mean age of the working population and shifts in sex ratios [91].

Early projections, based on simple mathematical models of the transmission dynamics of HIV, indicated that AIDS was capable of changing population growth rates from positive to negative, over timescales of a few decades [28]. This suggestion proved to be controversial [35, 92, 93]. Nevertheless, more sophisticated models, which incorporate age-structure and behaviour patterns which are consistent with empirical data, show that negative population growth could occur in the worst-afflicted areas [52].

<u>Site-Specific Applications of Mathematical Models</u>

Population projections which incorporate the effects of HIV-1 and AIDS have been attempted for a number of countries. However, few detailed results have been published, possibly because of the limited availability of population-specific data on the input parameters required to apply the more complex models. The United Nations projections for fifteen African countries have been mentioned [88]. Results from a number of model simulations are also known to have been published for populations in South Africa [17, 94-96] and Zimbabwe [14, 21]. Generally speaking, these projections have been developed for use in assessing the socio-economic impact of the epidemic. Typically, models which would fall into Palloni's categories (i)-(iii) are used, although Brophy's projections were developed using the World Bank model [32]. The EPIMODEL and DEMPROJ models have been applied in a number of countries. DEMPROJ is perhaps most famous for its role in changing the President of Uganda's mind on the necessity of condom promotion as a means of slowing the epidemic [23, 97]

Plausibility of Behaviour Change in Response to HIV-1 Epidemics

In most model simulations, modest or no behaviour change is assumed, due to the lack of clear evidence for changes having taken place. One of the reasons for this, which will be discussed shortly, is a scarcity of reliable, validated data on sexual behaviour change [98]. Leading commentators still differ on the prospects for behaviour change in response to the HIV-1 epidemic.

Caldwell has suggested that AIDS information and awareness campaigns will have great difficulty increasing the use of condoms outside the most commercial forms of sex in sub-Saharan African settings. Extra-marital sex may decline, but only in the long term [65]. This line of thinking, together with cost effectiveness considerations, has led to an increased emphasis in recent years on more focused prevention initiatives and especially on those which are targeted at men and women engaged in commercial sex work [99, 100].

Others suggest that conceptual models, such as the "AIDS Risk Reduction Model", might be of value in improving understanding of ways in which appropriate behaviour change can be achieved [101]. In these models, factors including knowledge of disease transmission, belief in the severity of the disease, perceived risk of becoming infected, peer support for safer behaviour, belief in one's ability to avoid the disease and skills in communication and enacting safer behaviour are associated with reduction in high-risk behaviour. It is argued that interventions which enhance perception of personal risk, encourage male sexual partners to reduce risky behaviour and increase familiarity with condoms have the potential to bring about the necessary behaviour changes [101]. Prevention initiatives which incorporate some or all of these strategies include peer-group education programmes among commercial sex workers and their clients, child-to-child education programmes, workplace-based initiatives and the development of counselling and testing services [100, 102-104].

HIV-1 and Fertility Change

Several commentators have suggested that the HIV-1 epidemic might give rise to changes in fertility [14, 65, 105], but there is, as yet, no consensus as to the direction these changes will take [15]. The epidemic will influence the crude birth rate, through adjustments to the age-structure of the population resulting from changes in mortality rates [29].

More fundamentally, there may be changes in the proximate determinants of fertility, which give rise to shifts in age-specific fertility rates [106]. HIV-1 may cause reduced fecundity among infected individuals [107]. Changes in attitudes and social norms may occur, which result in new patterns of behaviour, which intentionally and/or unintentionally affect the proximate determinants of fertility. For example, Caldwell has hypothesized that: "greater economic nucleation of the conjugal family consequent upon increasing sexual and emotional binding of the married couple will probably also encourage fertility decline even in conditions where governments are apprehensive of rising mortality". In contrast, Ankrah suggests that: "women may have more pregnancies to offset the perceived threat of infant mortality and ensure the survival of at least some offspring" - Maxine Ankrah cited by PANOS [108].

Other changes may be unconscious. For example, increased condom use to prevent HIV-1 infection could result in reduced fertility [108]. Earlier marriage to reduce the probability of having an infected spouse could have a similar effect [15]. An in-depth review of the possible mechanisms through which an HIV-1 epidemic might influence fertility rates via the proximate determinants is given in Appendix A. A summary of these mechanisms and their hypothesized impact on fertility is provided in Table 1.1.

Table 1.1 Hypothesized mechanisms for interaction between the HIV-1 and AIDS epidemics and the proximate determinants of fertility in sub-Saharan African settings

Proximate determinant of fertility	Possible mechanism for interaction	Hypothesized effect on fertility
Marriage: Exposure to Sexual Relations		
	Delayed onset of sexual relations	- ve
	Reduction in pre-marital sexual relations	- ve
	Delayed marriage - possibly resulting in increased non-marriage	- ve
	Reduced polygyny	+ ve
	Increased divorce	- ve
	Increased widowhood	- ve
	Reduced remarriage	- ve
Contraception and Abortion		
	***Reduced* desired family size due to fear of passing on infection or leaving orphans**	- ve
	***Increased* desired family size to ensure survival of preferred minimum and increasing "replacement effect" due to HIV-1 related child mortality**	+ ve
	Increased condom use to protect against HIV-1/STDs	- ve
	Switching of family planning method from pill to condom	+ ve
	Increased abortion to avoid bearing an infected child or potential orphan	- ve
Breastfeeding and Post-Partum Abstinence		
	Reduction in breastfeeding due to concerns re: vertical transmission of HIV-1 infection	+ ve
	Reduction in post-partum abstinence to avoid regular partners having other relationships and contracting HIV-1 infection	+ ve
	Reductions in breastfeeding and post-partum abstinence due to increase in infant mortality (natural "replacement effect")	+ ve
Pathological Sterility		
	HIV-1 induced sterility (primary and secondary)	- ve
	Reduction in existing STDs due to greater condom use and increased access and resort to treatment	+ ve
Natural Fecundity		
	Increase in spontaneous abortions and stillbirths	- ve
	Reduced coital frequency due to increased morbidity	- ve
	Reduction in spousal separation due to HIV-1 control interventions by employers	+ ve
	Reduced nutrition, deteriorating health and decreased spermatozoa	- ve

Note: Mechanisms shown in bold will be tested using data from the current study.

Source: Adapted from Gregson (1994) [106 & Appendix A].

1.2.3 Empirical Studies

Patterns and Determinants of the Spread of HIV-1 Infection in sub-Saharan Africa

The HIV-1 epidemic appears to have taken off earliest in central areas of Africa and has subsequently been spreading to the east, south and west [109]. By the end of the 1980s, there were some signs of a slowdown in the rate of increase in HIV-1 prevalence in central African countries [15, 110, 111]. The rate of spread of epidemics in their early years has varied between and within countries and there have also been differences in the levels of prevalence at which epidemics have appeared to stabilize [110, 112]. By and large, the epidemics spread most rapidly in towns, but the urban-rural differential in HIV-1 prevalence levels is now narrowing in many countries [113].

Different types of study have been employed in the search for patterns of spread of HIV-1 infection and factors which may influence the chances of an individual's becoming infected. These have included ecological studies [58, 70], site-specific epidemiological surveys [114, 115] and qualitative sociological investigations [66, 105].

The strengths of associations between socio-economic variables and risk of HIV-1 infection vary between populations. Factors found to be associated with increased risk include higher levels of education, formal employment, urban residence, non-marriage, religion and migration [114-118]. The spatial spread of HIV-1 and AIDS in Uganda during the 1980s has been correlated with ethnic patterns of recruitment by the Ugandan National Liberation Army [70].

Heterosexual activity is believed to have accounted for roughly 93 per cent of cumulative HIV-1 infections in sub-Saharan Africa. Contaminated blood transfusions and blood products account for most of the others - 4 per cent [15]. High rates of sexual partner change and sex for payment or gift have been found to be associated with increased risk of infection [114, 115]. Current or past infection with other sexually transmitted diseases (STDs) is often associated with increased chances of HIV-1 infection [119]. Until recently, questions remained as to whether this association was causal [120]. However, a new study has shown that improved case management of STDs can reduce the incidence of new HIV-1 infections [61, 62]. Absence of circumcision has been recorded as a risk factor in clinical and ecological studies [58, 59, 121]. However, no association was found in an epidemiological study in Mwanza, Tanzania [115] and the possibility of a causal link remains controversial [57, 59, 60, 122, 123]. Use of condoms has been found to be protective in Western studies [48]. However, the African evidence is mixed, almost certainly because of difficulties in establishing consistency of use and problems of confounding between condom use and propensity towards other forms of high-risk behaviour.

Information about the incubation and survival periods for AIDS and levels of infectiousness within these periods in African contexts is limited [52]. Recent epidemiological evidence suggests that the lengths of these periods, in the absence of treatment, may be shorter than in Western settings - perhaps by a factor of 50 per cent [10, 77, 124]. There is also evidence that vertical transmission rates are higher [52, 125], with breastfeeding being one factor associated with increased risk [53, 54].

Impact of the HIV-1 and AIDS Epidemics on Mortality

Data on the impact of HIV-1 and AIDS on mortality trends in sub-Saharan Africa is limited. This is due, in part, to the relatively long incubation and survival periods, but principally to the scarcity of reliable data on mortality and especially, cause-specific mortality. The greatest impact is expected to be on adult mortality, where data availability is in particularly short supply [126].

One of the first reports of increases in mortality, possibly associated with AIDS, came from a study in Abidjan, Cote D'Ivoire (1983-88), where HIV-2 was initially the principal form of infection [127, 128]. The connection with AIDS was confirmed in a subsequent study of the causes of death of adult cadavers in Abidjan's two largest morgues [129]. AIDS was found to be the leading cause of death in adult men. Among women, AIDS was the second leading cause, after deaths related to pregnancy and abortion. Subsequent reports indicate that HIV-1 has also become the leading cause of death among adults in urban and rural districts of

Tanzania [130]. For example, in the rural district of Hai, 26 per cent of male deaths and 35 per cent of female deaths in the age range 15-59 years, between 1992 and 1994, were attributed to HIV-1 related diseases.

A small number of other studies have examined the contribution of HIV-1 to current levels of mortality. A study in Kigali, Rwanda found that HIV-related diseases accounted for 90 per cent of deaths among childbearing urban women, at a time when HIV prevalence was approximately 30 per cent [131]. In Kinshasa, Zaire, 42 per cent of adult deaths in a hospital setting were attributed to AIDS [132]. HIV prevalence at this time was estimated at between 3 and 7 per cent.

Two studies carried out in south western Uganda, between 1988 and 1990, revealed severe excess adult mortality among individuals with HIV-1 infection. In Masaka District, mortality was found to be 115.9 per thousand years of exposure among adults infected with HIV-1 as against 7.7 per thousand among those who were not infected, in an area where HIV-1 seroprevalence among adults was relatively low; 8.2 per cent [77, 133]. Eighty per cent of deaths between the ages of 25 and 45 years were found to be HIV-1 related [77], a finding which is consistent with results from mathematical model simulations [85]. In Rakai District, mortality among HIV-1 infected and non-infected adults was 118.4 and 12.4 per thousand person-years, respectively [124]. HIV-1 seroprevalence among adults was estimated at 21.2 per cent.

There is also evidence that HIV-1 epidemics have caused increases in infant and early childhood mortality [77, 124]. In Zaire, 21 per cent of infants of infected mothers died within the first year of life. In contrast, only 3.8 per cent of the infants of uninfected women died [134]. In Zambia, 42 of 109 (39 per cent) infants of seropositive women were diagnosed as having AIDS within the first two years of life. Of these, 19 (44 per cent) had died before the age of 2 [135]. There was no control group in this study.

Increases in levels of orphanhood have been reported, which are believed to be attributable to HIV-1 associated mortality [136]. The first such study was undertaken by Hunter and colleagues in Uganda [137]. In Rakai District in 1989, where HIV-1 prevalence among adult women was 23.6 per cent [138], 12.6 per cent of children aged under 18 years old had lost either their mother or father. The father had died in 87 per cent of these cases and the mother in 47 per cent of cases - Hunter as cited by Barnett and Blaikie [139]. On the basis of these figures, maternal orphanhood among children aged under 15 years has been estimated at approximately 6 per cent. This represents an increase over the level expected in the absence of AIDS, but a more modest one than has been projected in mathematical model simulations. Possible explanations for this include under-enumeration of orphans, excess mortality among orphaned children and reduced fertility among infected women [78].

Severe shortages of adults and particularly adult males have been observed in areas of high HIV-1 prevalence [139, 140]. Labour migration and out-migration to escape infection may be factors [141]. However, comparison of age-structures in AIDS-affected and non-affected villages indicates that AIDS is probably the most significant factor. This interpretation is consistent with the finding that the deficit among males is concentrated at older ages than that in females, which reflects results from demographic projections [91]. Similar age-structures have been recorded in other areas which have experienced severe AIDS epidemics [130, 142].

To date, there has been one study which has investigated the impact of an HIV-1 epidemic on population growth rates. This is the study in the Rakai District of Uganda. The demographic impact was examined at three levels: (i) trading centres (35 per cent adult prevalence); (ii) intermediate trading villages (23 per cent); and (iii) rural villages (12 per cent). The HIV-1 epidemic was found to have reduced the rate of natural population increase from an estimated 4.24 to 1.12 per cent, 2.96 to 1.48 per cent, and 2.53 to 1.76 per cent, respectively [124]. There was a particularly high representation of women of childbearing age within the trading centre populations and the crude birth rate was very high as a consequence (52.9 per thousand).

Impact of the HIV-1 Epidemic on Sexual Behaviour

The literature on sexual behaviour and its social context in sub-Saharan Africa is extensive

[143] and rapidly expanding [6, 144]. A full review of this literature is beyond the scope of this chapter. However, a brief review is provided in view of the central importance of the topic in determining the demographic impact of HIV-1 epidemics. The following discussion highlights some of the key issues regarding the current state of availability of data on patterns of sexual behaviour and the early impact of AIDS and associated prevention campaigns.

Collection of data on sexual behaviour in sub-Saharan Africa is not straightforward. Some aspects of behaviour of relevance to the spread of HIV-1 infection are subject to taboos in traditional culture, so that respondents may be reluctant to provide information which contravenes normative behaviour [145]. This is particularly the case for women in many societies, who are expected to remain celibate prior to marriage and to be monogamous thereafter. The position becomes even more difficult in the era of AIDS, where respondents may feel embarrassment at revealing behaviour which they have been told is risky in relation to HIV-1 infection.

Qualitative information about sexual behaviour patterns can be obtained using small-scale sociological techniques, such as focus group discussions, in-depth interviews, use of diaries of sexual contacts and key informant interviews [6]. However, quantification of these patterns is more difficult. Conventional sociological methods are unlikely to be able to generate sufficiently large sample sizes [145]. Self-completion questionnaires of the type used in larger-scale studies in the West [8] are rarely viable in sub-Saharan Africa, given the low levels of education which persist in many areas. Where structured interviews are employed, factors including the length of the questionnaire and the age, sex and background of the interviewer may influence the reliability of responses [146]. Recall bias is a further potential difficulty in both self-completion and enumerated surveys [146, 147]. Nonetheless, early assessments of the reliability and validity of survey data suggest that useful results can be obtained, where high standards of design and execution are maintained [148]. Approaches which combine the use of quantitative and qualitative methods are now recommended [146, 148].

Specific examples of research which has attempted to quantify sexual behaviour patterns include a study in Tanzania [149] and a series of surveys conducted under the auspices of the World Health Organization's Global Programme on AIDS [144, 150]. Questions on behaviour have also been incorporated into a number of Knowledge, Attitudes, Beliefs and Practises (KABP) surveys [151-153]. Some of the assumptions implicit in these studies are now recognized as being open to question and the need to place statistical results in their local social context is emphasized [143, 150, 154]. For example, it has been observed that broad generalizations about multiple-partner sexual networking in particular regions can be misleading [154] and that early age at first sexual intercourse is not necessarily a risk factor for HIV-1 infection, if, for example, the first partner is or becomes a spouse [150].

Longitudinal surveys of rates of sexual partner change, types of sexual activity and frequency of practise of 'safe-sex' methods have provided evidence of behaviour change in response to AIDS in Western countries [2, 155, 156]. Behaviour change has also been reported in some surveys in sub-Saharan Africa. For example, in the 1994 Zimbabwe Demographic and Health Survey, 62 per cent of men and 21 per cent of women reported changes in behaviour to avoid AIDS [157]. However, the reliability and substance of some of these reports is open to question in view of the considerations discussed above. In other studies, indirect evidence, including trends in the incidence of HIV-1 among teenagers and the incidence of other sexually transmitted diseases, have been used to assess behaviour change [111, 113, 158].

A small number of studies have begun to examine the determinants of sexual behaviour and of changes in sexual behaviour in the AIDS context. Recent analysis of data from the WHO/GPA surveys shows that gender, marital status, age, level of education and alcohol consumption can each be associated with sexual behaviour patterns. However, the strengths of these associations vary greatly between locations [154]. In a recent study in Senegal, men and women exhibited contrasting behaviour patterns and perceptions towards AIDS. Material needs were paramount for women, whereas perception of a real threat lead men to adopt protective behaviours. Widowed and divorced women and male seasonal migrants were reported to be particularly exposed to HIV infection [159].

It is widely believed that knowledge about HIV-1 and AIDS is usually insufficient, in itself, to bring about behaviour change. In the West, there have been reports of sex education in schools leading to later onset of sexual relations [160]. More generally, personal acquaintance with someone who has AIDS appears to be a particularly powerful motivating factor for behaviour change [42]. However, the existing evidence for this in sub-Saharan African societies appears to be mixed. In south-west Uganda, little evidence of behaviour change has been found, despite the more advanced state of the AIDS epidemic and high levels of knowledge about HIV-1 and AIDS [161]. However, in Rwanda, women who perceived themselves to be at risk of AIDS were more likely to report behaviour change [131]. In Zimbabwe, peer-group education programmes appear to have some effect - reports of behaviour change among high-risk groups are substantiated by reductions in the incidence of STD cases [158].

Impact of the HIV-1 and AIDS Epidemics on Fertility

The two studies in south-west Uganda have recorded reduced fertility among women with HIV-1 infection. In Rakai District, infected women were 80 per cent as likely to have had a birth in the intersurvey period as uninfected women - 95 per cent confidence interval: 60-100 per cent. Similarly, the age-adjusted prevalence of pregnancy at the time of the 1990 survey was reduced among HIV-1 infected women (Relative risk: 70 per cent; 95 per cent confidence interval: 50-100 per cent) [124]. In Masaka, comparison of age-specific birth rates suggests a reduction in fertility of approximately 15 per cent among infected women [162]. Similar findings have been reported in Kinshasa, Zaire. A more rapid decline in fertility with age was observed among HIV-1 infected women. For women aged under 30 years, the ratio of fertility among infected women to that among uninfected women was 77 per cent - among women aged 40 years or above, the ratio was 32 per cent [163]. Questions remain as to the validity of attributing these differentials to HIV-1 infection. For example, in the Rakai study, women with HIV-1 infection were reported to be more educated, on average, that uninfected women [114]. Given that more educated women generally have lower fertility, the observed results may be due to confounding. If it is the case that fertility is lower among women with HIV-1 infection, questions arise regarding the mechanisms which underpin this relationship.

In a study in Zaire, 238 HIV-1 seropositive women were matched by age with seronegative controls and followed for three years post-partum. The infected women had a statistically significant lower fertility rate. Those in the more advanced stages of disease (ARC/AIDS) had lower fertility than asymptomatic women. Possible reasons for these findings, suggested by the authors included: (i) confounding with other STD infections; (ii) the impact of family planning advice given in the study; (iii) reduction in sexual activity; (iv) death of sexual partners; and (v) reductions in natural fecundity [107]. The data presented indicated that additional contraceptive use did not account for all of the observed differentials: reported condom use was higher among infected women, but pill use was lower. In a Ugandan study, amenorrhoea was noted as a symptom of AIDS reported by a number of women [164], which may indicate that a direct link exists between HIV-1 infection and sub-fecundity.

Anecdotal evidence of changes in attitudes and behaviour towards childbearing has been reported - Ankrah cited by PANOS [108]. In addition, some of the changes reported as actions taken to avoid AIDS - eg: increased condom use - may have led to unintended adjustments in fertility. A review of the limited evidence currently available regarding these changes and their impact on the proximate determinants of fertility is given in Appendix A.

1.3 Theoretical Framework

1.3.1 Intermediate Determinants of HIV-1 Epidemics in sub-Saharan Africa

On the basis of current understanding, as outlined above, it is possible to construct a theoretical framework for use in studying the determinants and impact of HIV-1 epidemics in sub-Saharan African contexts. As with fertility, the factors influencing HIV-1 prevalence trends can be distinguished between those which have a direct and an indirect impact - Figure 1.1. Direct determinants - known in fertility theory as "intermediate" or "proximate" determinants [165, 166] - are primarily biological and behavioural factors - Figure 1.2. Indirect determinants are essentially socio-economic in nature.

Figure 1.1 Socio-economic and intermediate determinants of HIV-1 and AIDS epidemics

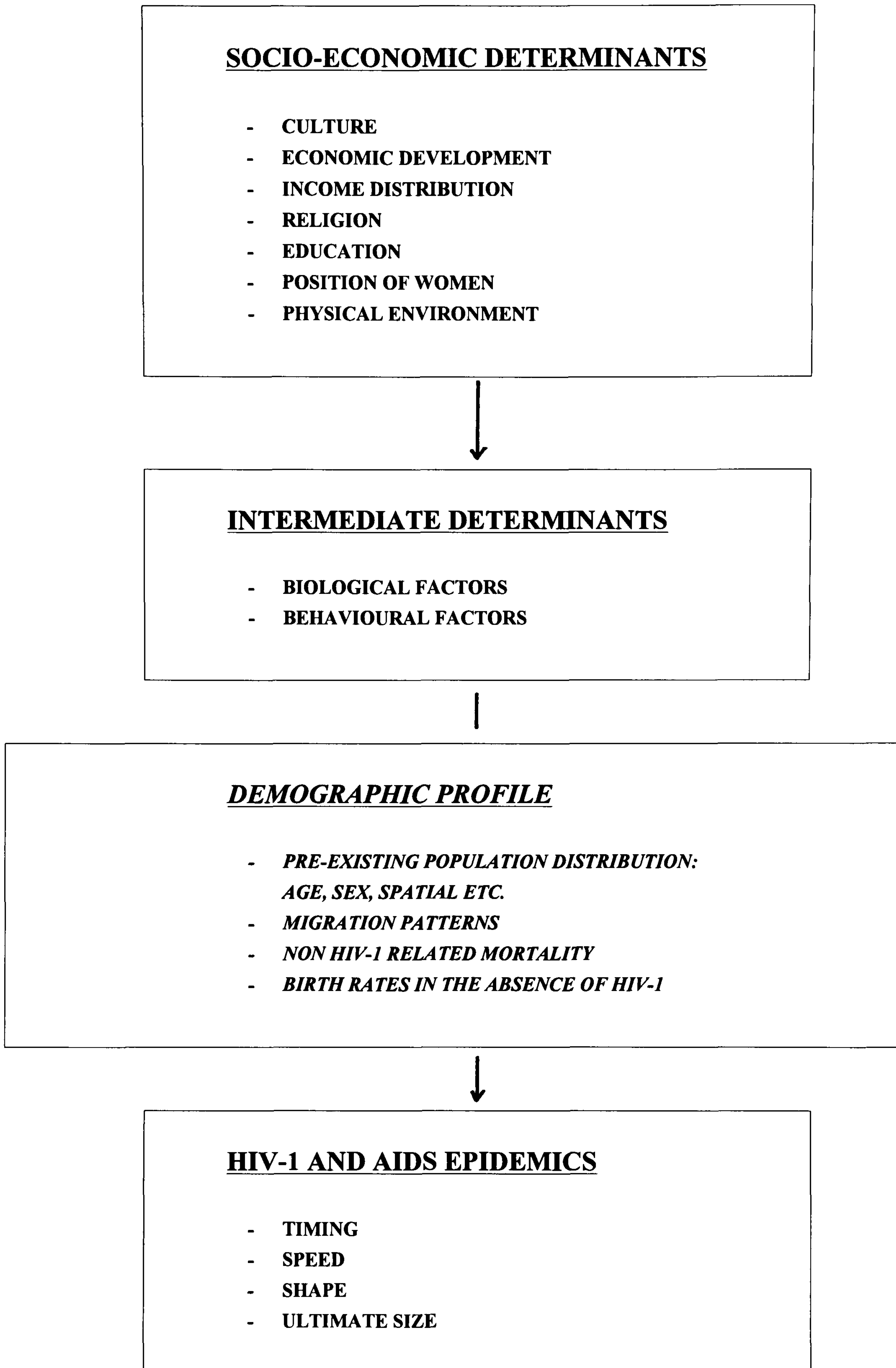


Figure 1.2 Intermediate determinants of HIV-1 and AIDS epidemics

BIOLOGICAL FACTORS

- TRANSMISSION RATES VIA HETEROSEXUAL AND HOMOSEXUAL INTERCOURSE
- CO-FACTORS IN SEXUAL TRANSMISSION (EG: OTHER STDS)
- RISK OF TRANSMISSION FROM INFECTED MOTHER TO INFANT
- VERTICAL TRANSMISSION RATE AND CO-FACTORS (EG: BREASTFEEDING)
- LENGTH OF AIDS INCUBATION PERIOD
- LENGTH OF SURVIVAL PERIOD AFTER AIDS DEVELOPS
- CO-FACTORS IN INCUBATION & SURVIVAL PERIODS (EG: NUTRITION; TREATMENT)
- PATTERN OF INFECTIOUSNESS DURING INCUBATION AND SURVIVAL PERIODS

BEHAVIOURAL FACTORS

- RATES OF SEXUAL PARTNER CHANGE
- HETEROGENEITY IN SEXUAL PARTNER CHANGE RATES
- PATTERN OF MIXING BETWEEN PERSONS WITH HIGH AND LOW RATES OF PARTNER CHANGE
- PATTERN OF MIXING BETWEEN PERSONS LIVING IN DIFFERENT SPATIAL AND SOCIAL GROUPINGS (EG: MIGRANTS/NON-MIGRANTS)
- COITAL FREQUENCY
- RATES AND PATTERNS OF CONDOM USE
- USE OF CONTAMINATED BLOOD PRODUCTS OR SHARP INSTRUMENTS
- DIAGNOSTIC AND TREATMENT SERVICES (EG: RE: STDS AND OPPORTUNISTIC INFECTIONS)
- BREASTFEEDING PRACTISES
- MALE CIRCUMCISION (?)

A change or difference in one or more of the intermediate determinants has a direct bearing on the timing, speed, shape and/or ultimate size of the epidemic in any given population. Furthermore, at least one of these factors *must* be changed if the pattern of epidemic is to be altered. Relationships may exist between the individual factors listed. For example, high rates of new partner acquisition may be present in a population, but if condoms are always used with non-regular partners, there is little potential for an epidemic. So long as this relationship holds, any changes in patterns of extra-marital union formation are unlikely to influence the course of an epidemic. It is important, therefore, that individual factors are not seen as operating in isolation.

The intermediate determinants also explain much of the variation in patterns of epidemic, which is seen between and within populations. However, different patterns of epidemic can be seen in populations which are identical in terms of the intermediate determinants. This is because there may be differences in the underlying structure or demographic profile of the populations. In this case, the effects of the intermediate determinants of HIV-1 epidemics can be seen as being filtered through the underlying structure. Important aspects of the demographic structure of a population include its distribution at the onset of the epidemic and local migration patterns - Figure 1.2. If a high proportion of a population is initially concentrated among high-risk age-groups, for example, the epidemic is likely to take off more quickly than if this were not the case. If labour migration is extensive, there is greater potential for an epidemic to spread rapidly into and within a previously unaffected population.

It may be worth re-iterating here, in passing, that mathematical models of the spread of HIV-1 infection implicitly contain or require estimates for the intermediate determinants of epidemics and key aspects of the underlying demographic profile of the population. Thus differences in the structure of models used and in parameter settings applied will result in differences in the profiles of the epidemics projected.

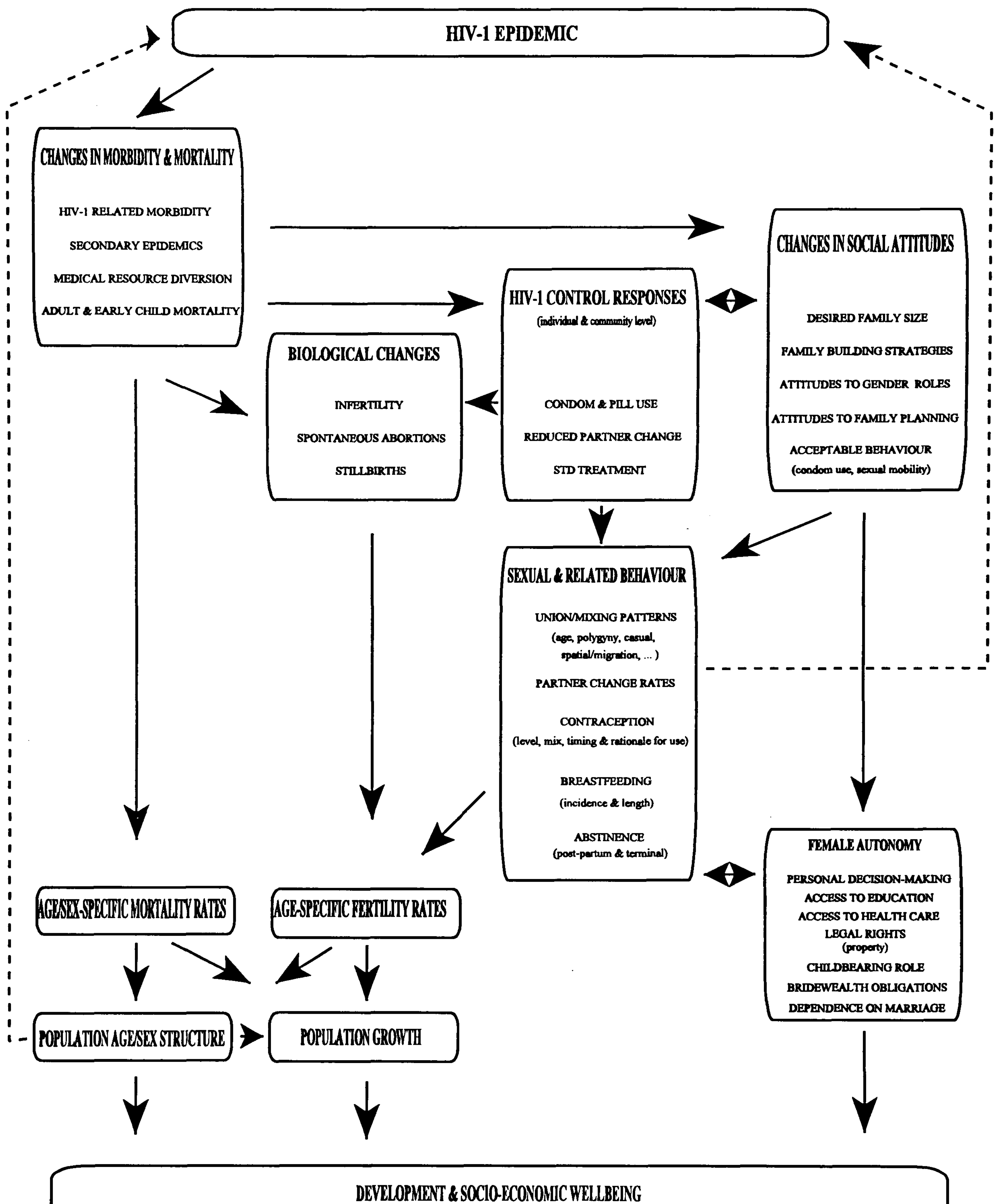
The intermediate determinants are critical in influencing patterns of epidemics within and between populations. However, these factors are themselves the product of a number of underlying socio-economic determinants. Levels of condom use in a population are influenced by social attitudes towards their use. Similarly, patterns of extra-marital sexual activity among males and females are strongly influenced by cultural norms and the balance of economic factors. The physical environment may determine the range and mix of HIV strains and opportunistic infections which are present; these could result in variation in intermediate determinants such as infectiousness levels and speed of disease progression. Socio-economic factors will determine the relationships between individual intermediate determinants. For example, the types of partnerships in which condoms are used. Whereas, it is clearly essential to bring about changes in the intermediate determinants in order to slow an epidemic, it is equally clear that this will rarely, if ever, be achieved unless the underlying socio-economic situation is understood and influenced. Even if an effective vaccine is developed, it will only actually become effective at a population level in poor countries, if it can be offered at a realistic cost and in a manner which is culturally acceptable.

1.3.2 HIV-1 as a Determinant of Demographic Change

The theoretical and a growing body of empirical evidence demonstrates that HIV-1 epidemics will have a profound impact on the demography of many sub-Saharan populations. However, understanding of the processes through which this impact will result is incomplete. An initial outline framework for examining these processes is set out in Figure 1.3. In summary, an HIV-1 epidemic exerts an upward pressure on morbidity and mortality. This has a direct impact on mortality rates, population structure and population growth. There may also be an indirect effect if biological changes occur which affect fecundity.

At the same time, the epidemic triggers responses at the individual and community levels. Changes in social attitudes and cultural norms may result which lead to behaviour change. From a female perspective, these may be positive and negative. For example, reductions in access to education, due to increased emphasis on the female role as carer for the sick, would be negative and could result in an upward pressure on fertility, through earlier marriage and reduced contraception. On the other hand, the new situation may encourage women to challenge male domination in the sphere of sexual behaviour and family planning [68]. This could lead to lower rates of partner change and/or an increase in contraceptive use. In either

Figure 1.3 HIV-1 as a determinant of socio-demographic change



case, changes in attitudes and behaviour to avoid HIV-1 and AIDS may lead to changes in the proximate determinants of fertility - Table 1.1 (see also Appendix A).

Finally, any changes in attitudes and behaviour are likely to affect the future course of the HIV-1 epidemic via the intermediate determinants described above - a feedback process which will determine the long-term demographic impact of the epidemic.

1.4 Study Objectives and Approach

With the current state of understanding of the determinants and demographic consequences of HIV-1 epidemics and the above theoretical framework in mind, the study objectives were established as follows:

i To describe and contrast the recent patterns and trends in HIV-1 prevalence and of demographic change in two rural areas of Zimbabwe;

ii To investigate the socio-economic and intermediate determinants of sexual behaviour, HIV-1 infection and demographic change;

iii In particular, to examine the early impact of the HIV-1 epidemic on trends and patterns in the proximate determinants of fertility;

iv To use the empirical results and insights gained from the study to validate and develop existing theoretical models of the determinants and demographic impact of HIV-1 epidemics in sub-Saharan Africa;

v To generate estimates for the future demographic impact of the HIV-1 epidemic in Zimbabwe for use in health and socio-economic development planning.

The research approach entailed the design, conduct and analysis of an empirical study in the

Honde and Rusitu valley areas of Manicaland in eastern Zimbabwe. The empirical study was designed against the background of earlier work on mathematical modelling and these models were used to guide data collection and analysis, together with other standard statistical techniques (Chapter 3-7). A detailed account of the data collection methods used is given in the next chapter.

CHAPTER 2

Data Collection Methods: Rationale, Design, Conduct and Data Quality

HIV-1 and Fertility Survey interview, Mandiopera Village, Honde Valley, 1994

2

Data Collection Methods: Rationale, Design, Conduct and Data Quality

2.1 Aims of Chapter

The aims of this chapter are:

i. To describe and justify the methods of fieldwork employed in the study;

ii. To describe how these methods were implemented and provide details of the practical problems which arose and how these were dealt with; and

iii. To summarize the results of a data evaluation exercise which was carried out on the results of the statistical surveys.

2.2 Organization of Chapter

A combination of primary and secondary data collection methods was employed. This combination will be summarized and justified in the light of a brief review of common problems experienced in collecting demographic and sociological data in developing countries (section 2.3). Sections 2.4-2.7 review the specific aims, design and conduct of each of the principal data collection methods. The penultimate section (2.8) outlines the data processing procedures which were followed, while the final section (2.9) summarizes the particular aspects of the data which were found to be affected by mis-reporting and other errors arising during data collection and data processing (Appendix C). The implications of these biases for the interpretation and analysis of the data will be considered again in Chapters 4-6, where the methods of data analysis will also be described. A number of lessons learned during data collection, which may be of relevance to future studies, are also summarized in Section 2.9.

2.3 Selection of Data Collection Methods

2.3.1 General Issues in Data Collection in Rural Manicaland

Numerous problems surround the collection of reliable social, demographic and epidemiological data in sub-Saharan African settings [66, 167-170]. The nature of these problems is generally similar to those encountered in western countries. However, the extent of the difficulties and of their potential impact on the quality of survey data can be much greater. Zimbabwe, which has a relatively well developed economy, education system and transport and communications infrastructure, suffers less from these problems than most other sub-Saharan countries. However, many possible pitfalls remain.

Despite considerable extensions to the education system since Independence in 1980, significant numbers of women in Manicaland, particularly those over the age of 30 living in rural areas, have received little or no education (see Chapter 3). Thus, self-completion questionnaires cannot yet be used in rural areas. This is unfortunate as they might otherwise assist in guaranteeing anonymity and confidentiality, and, thereby, help to reduce the extent of biases such as non-reporting of behaviour which conflicts with cultural norms or the interviewee's perception of behaviour or views which would be approved of by the interviewer - eg: where sensitive personal information is sought. Furthermore, knowledge of dates and ages is liable to be imprecise, particularly amongst older, less educated members of study communities, where age-exaggeration associated with status attached to old age may also be a factor. An absence of well educated women in the survey areas meant that most of the interviewers had to be recruited elsewhere. Female interviewers are generally preferred to males in fertility and family planning surveys [171, 172].

While *Shona* is the principal language spoken in Manicaland, the pre-dominant dialect, *manyika,* differs from that spoken in Harare, for example, and there are important local variations in vocabulary and pronunciation. Local differences also exist in cultural norms, beliefs and concepts. Therefore there was potential for misunderstandings between the interviewers and respondents, and problems were sometimes experienced in finding appropriate wordings for survey questions developed in English, which would avoid misinterpretation. For example, in the mortality questions in the household questionnaire, it was found during the preliminary focus group discussions that confusion arose if the literal *Shona* translation for "how many younger brothers (or sisters) do you have who are still alive?" was used. This was because cousins are also frequently referred to as brothers (sisters). To overcome this, it was necessary to reword the questions into the form "how many younger siblings of the same (or opposite) sex do you have who are still alive?". Differences in age, sex and level of education may also hamper relationships between interviewers and interviewees and lead to biased responses to some questions. The interviewers themselves, if not properly trained and motivated, could be a source of errors in the data. For instance, where questionnaires are designed with skips to allow for potentially non-applicable questions, data errors may arise - eg: through rounding up or down of ages or dates to avoid questions which only apply to certain age-groups or time periods.

Perhaps, even more so than in other areas of sub-Saharan Africa, rural populations in Zimbabwe can be extremely transitory, due to high levels of labour and student migration and the good internal transport systems. This means that, at any time, large numbers of visitors may be found in a study area and there can be extensive absenteeism - even among women and children. These patterns of migration may be seasonal, so that the timing of the survey date will influence the numbers and characteristics of individuals seen, particularly if surveys are carried out on a *de facto* basis. Where a *de jure* basis is used, difficulties can be experienced in determining the residential status of polygynous males or adults who maintain households in both urban and rural areas. Small households are more liable to be overlooked entirely, due to temporary absence of residents. These problems raise the prospect of incomplete coverage in statistical surveys and risks of selection biases in the data obtained. Coverage can be eroded further if a good rapport is not established between the research team and the local populations or the purpose of the study is not appreciated by targeted respondents, so that levels of non-response become high.

Quite apart from the HIV-1 epidemic, the populations studied have been subject to a number of important influences in recent years which are likely to have affected their general outlook, and views and practises in regard to fertility, in particular. These factors include increased western style education since Independence, severe drought (most recently in 1992), economic development which slowed towards the end of the 1980s and was followed by the introduction of a World Bank sponsored Economic Structural Adjustment Programme (ESAP), increased access to modern media and the growing influence of new indigenous religious sects. Against this background, the impact of the HIV-1 epidemic may be difficult to assess, particularly if too much reliance is placed on information obtained using a pre-determined and fully-structured questionnaire.

It has been noted that Zimbabwe has a relatively well developed internal infrastructure. Nevertheless, in remote rural areas, roads remain poor and many villages are difficult to reach. Technical equipment, including vehicles, computer and office equipment - such as those which facilitate the conduct of survey fieldwork - is scarce and maintenance expertise can be equally hard to come by. Electricity and telephone communications are just beginning to reach these rural areas. Partly, because of these factors, the demographic infrastructure also remains weak, with maps of census enumeration areas being poorly defined and lists of households being out-of-date or erroneous in many instances. Despite the fact that a Census [173] had been conducted less than two years prior to the current fieldwork, Central Statistical Office listings of households, by enumeration area, were found to be out-of-date, principally because of the high levels of internal migration.

These issues were considered during the design and feasibility stages of the study and were taken into account in the selection of methods (see section 2.3.2). An attempt was made to minimize the impact of the potential problems identified. However, it was not realistic to suppose that these could be eliminated completely. Indeed, a number of errors and biases did come to light, both during the enumeration and subsequent data evaluation. Others no doubt remain undiscovered. Those that were noted are recorded and discussed later in this chapter and in Appendix C.

2.3.2 Overview and Rationale for Data Sources and Data Collection Methods Utilized

The principal fieldwork phase of the study ran from November 1993 to June 1994. Some preliminary feasibility work was carried out earlier in 1993 and supplementary data was collected in March and April 1995. The various forms of data obtained are summarized in Table 2.1.

The World Fertility Survey (WFS) and Demographic and Health Surveys (DHS) conducted in sub-Saharan Africa and elsewhere in the 1970s and since the mid-1980s, respectively, have demonstrated that reliable data can be obtained on patterns and trends in fertility and in its proximate determinants in developing country settings [174, 175]. Some of the more recent surveys - Botswana, 1988; Zimbabwe 1988 and 1994 - also collected useful data on knowledge, attitudes and behaviour in regard to AIDS. It was therefore decided to attempt a statistical survey of the two study populations, using the methods developed in these earlier survey programmes as a model. A particular benefit of this approach was the potential it offered for comparative analysis of results from standard questions as a means for assessing data quality and the relevance of study findings to other populations in Zimbabwe.

Two important differences existed between the aims of the study and those of the WFS and DHS surveys. Individual WFS and DHS surveys sought to examine fertility at the national level and obtained a nationally representative sample of the study population as a basis for their inquiries. The results, therefore, reflected the predominant socio-economic characteristics of the population at a national level. The current study was concerned with making a detailed comparison of demographic patterns between two specific rural areas. The primary aim was to identify populations with contrasting patterns of HIV-1 spread and mortality impact - but similar socio-economic backgrounds - in order to assess the early impact of the HIV-1 epidemic upon fertility and its proximate determinants - a detailed description of the criteria applied and the procedure followed in selecting the sites for the study is given in Appendix B. This being the case, it was especially important to obtain a clear understanding of the particular socio-cultural contexts within which the observed fertility changes and patterns of spread of HIV-1 infection were taking place in each study population. In this way, the extent

Table 2.1 Data collected and utilized in the study

Reference	Data Source	Data Obtained	Applications of the Data
Primary Sources			
(i)	Focus group, pocket-chart voting and key informant interviews	Background data on the local culture and socio-economic characteristics	Questionnaire design and interpretation of statistical data (ii-iv) Description of the socio-economic characteristics of the study areas and populations (Chapter 3)
(ii)	Blood tests and anonymous, linked questionnaires	Background data on local levels and patterns of HIV-1 prevalence	Study of the relationship between HIV-1 prevalence and mortality trends (Chapter 4)
(iii)	Household interviews (two rounds: 1994 and 1995)	Demographic and socio-economic characteristics of the study populations Childcare arrangements and prevalence of orphanhood	Socio-demographic profile of study populations (Chapter 3) Study of relationship between HIV-1 prevalence and mortality trends (Chapter 4)
(iv)	Interviews with women of childbearing age	Knowledge, awareness and experience of HIV-1 infection and AIDS; fertility histories and associated practices	Assessment of knowledge, awareness and experience of HIV-1 and study of its impact on fertility and the proximate determinants of fertility (Chapters 5 & 6)
Secondary Sources			
(v)	Vital registration data from District Registry Offices	Numbers of births and deaths registered annually, since 1982, by district	Study of relationship between HIV-1 prevalence and mortality trends (Chapter 4)
(vi)	Central Statistical Office reports from the 1982 and 1992 Censuses	National, provincial and district level data on recent birth, death and population growth rates and on demographic structure and household distribution	Survey design, (site selection and mapping) (Chapter 2) Comparative analysis and assessment of data quality in the Manicaland Survey (Chapters 2, 5 & 6)
(vii)	Central Statistical Office reports from the 1988 and 1994 Demographic and Health Surveys	National level trends in fertility and early age mortality	Comparative analysis and assessment of data quality in the Manicaland Survey (Chapters 2, 5 & 6)
(viii)	Annual and quarterly AIDS surveillance reports from the National AIDS Co-ordination Programme	Data on HIV-1 prevalence among ANC and STD clinic patients in Zimbabwe, including Manicaland	Site selection and description of the HIV-1 and AIDS epidemics in Zimbabwe (Chapter 3)

to which the populations chosen were indeed similar in socio-economic terms, could be assessed. In addition, there was an opportunity, to a degree not present in a national level sample survey, to ensure in advance, by the use of more in-depth sociological research methods, that the nature and phraseology of the questions used were appropriate and relevant to the study populations, and to develop a locally-specific event calender for use in assessing ages and dates. Similar research methods could also be applied to generate qualitative data, which could be used in the interpretation of the statistical information collected in the survey [176]. Finally, the local focus permitted an attempt at a complete census of the populations concerned. If achieved, this would eliminate sampling biases, as well as limiting the socio-economic heterogeneity present within the study populations and simplifying the logistics of data collection.

Similar information was required on trends and patterns in fertility and its proximate determinants to that collected in the earlier surveys. However, the more intense focus on the HIV-1 epidemic and possible behavioural responses to it in the current study meant that a greater emphasis needed to be placed on the collection of data on sexual behaviour. Some such data has been collected in DHS surveys. For example, data on age at first sexual union and on coital frequency has been sought, because these are factors which influence fertility at a population level. Furthermore, more recently, where modules designed to elicit data on HIV-1 infection and AIDS have been incorporated into DHS survey questionnaires - eg: in the 1988 and 1994 Zimbabwe DHS [157, 177] - additional questions on sexual behaviour have been included. However, given the strong cultural taboos on practices such as pre- and extra-marital sex, among women in some populations in sub-Saharan Africa [178, p48, 179, p72], which could result in biased responses to questions on this subject, and the importance of the topic in relation to improving understanding of the spread of HIV-1 infection, it was felt that corroborative information should be sought.

Sociological studies, comprising focus group discussions, pocket-chart voting and key informant interviews, were therefore incorporated into the study design. Two rounds of such studies were envisaged. The first would be to guide the framing of the questions used in the household and individual interviews, by exploring relevant behavioural practises and terms used for some of the concepts to be investigated. The second round would be used to collect qualitative data on survey topics, for which, either it was felt that unreliable responses might be given, or where, once preliminary results were available, superficially counter-intuitive or otherwise unexpected findings had been obtained. Similar techniques, combined with personal observations, were used to obtain background information on relevant features of the local societies and economies - eg: key individuals in the traditional and party hierarchies and foci of recent economic development, such as the jam making factory in Rusitu and the milk marketing co-operative near Hauna, were interviewed.

Ideally, blood samples would have been obtained from all the women interviewed in the survey, and analyzed for the presence of HIV-1 infection. This would have made it possible to assess the effects of the epidemic on infected and uninfected women, separately. However, following World Health Organization guidelines [180, pp529-536], national policy in Zimbabwe is to use sentinel systems as the basis for surveillance of the spread of HIV-1 infection. For ethical reasons, screening for HIV-1 infection in the general population was not permitted at the time the study was initiated [181, pp220-229, 182, pp749-763]. While this constraint limited the scope of the study, it was felt that it would not undermine the central objective. The principal aim was to determine whether attitudinal and behavioural changes could be observed, which would affect the proximate determinants of fertility at the population level. Since it was envisaged that very few people with HIV-1 infection would actually be aware of their condition, at least until they developed symptoms - and indeed the symptomatic period of AIDS appears to be very short, probably less than six months in most cases - the attitudes and behaviour of these people could be expected to be similar to those of uninfected individuals. One possible caveat to this would be that infected individuals might have been more likely to perceive themselves as being at risk of infection and therefore be more likely to have modified their behaviour. The second part of this notion is explored in Chapter 6. Notwithstanding this possibility, it was believed that by collecting data on HIV-1 prevalence at antenatal clinics - in the manner employed by the Zimbabwe Ministry of Health in its own sentinel surveillance programme - and on recent patterns of mortality and other demographic variables in each of the study areas, any significant population-level relationship between HIV-1 prevalence and changes in the proximate determinants of fertility - eg:

breastfeeding - could be observed.

The 1992 Zimbabwe National Census and the 1988 and 1994 Zimbabwe Demographic and Health Surveys have been mentioned. In addition, a Census was carried out in 1982 [183] and a National Intercensal Survey was conducted in 1987 [184]. Reports from each of these were obtained and utilized as they became available. In particular, Central Statistical Office maps and household listings - updated during preparations for the 1992 Census - were used as a basis for defining the study areas and assessing levels of household coverage. Results, including some at provincial and district levels, were used both for data evaluation purposes and to examine the similarities and contrasts between the study populations and those in other areas of Zimbabwe. Details of numbers of registered births and deaths were extracted from District Registry Offices in Mutasa and Chimanimani and were utilized in the study of HIV-1 prevalence and mortality trends (Chapter 4). Finally, results of HIV-1 prevalence sentinel surveys and data on numbers of reported STD cases, AIDS cases and associated deaths were obtained from the Zimbabwe Ministry of Health. These are referred to in the description of the HIV-1 and AIDS epidemics in Zimbabwe (Chapter 4) and again in Chapter 5.

2.4 Sociological Studies

2.4.1 Aims

The aims of the sociological studies were:

i To develop knowledge and understanding of the local culture and language in each study area and of recent determinants and processes of change, for use in the development of the survey questionnaires; and

ii To collect qualitative data on topics covered in the survey questionnaires, for use in the evaluation and interpretation of the quantitative results.

2.4.2 Design and Conduct

A combination of focus group discussions, pocket-chart voting sessions, personal observation and key informant interviews was used, following established procedures [185-189]. Focus group discussions are semi-structured discussions with pre-selected groups of individuals, designed to elicit common views and actions in relation to a number of pre-determined topics - eg: popular methods of family planning and rationales for their use. Pocket-chart voting is a technique for eliciting information on sensitive topics by using secret ballots on key questions [189]. The technique is often used in conjunction with focus group discussions, where the latter can be used to obtain explanations for the pocket-chart voting results on an impersonal basis. A key informant interview is an interview with an individual who is believed to have particular knowledge or understanding of a topic of interest - eg: a local Chief on the history of his area or traditional birth attendants on rural childbirth practises.

First, a review of the literature was conducted on pre-dominant historical and contemporary social systems in Zimbabwe, with particular reference to factors relevant to sexual behaviour, fertility and gender roles. The information obtained was then used, by the Research Co-ordinator (Simon Gregson) and Project Sociologist (Tom Zhuwau) to prepare for the first round of focus group discussions. Two group discussions were held, one in each area, with women attending the local antenatal clinics. The discussions explored the local cultures and dialects, with particular reference to the content and terminology of the proposed survey questionnaires. The findings of the literature review and of these initial focus group discussions were written up in a report by the Project Sociologist (Zhuwau 1993).

In the second round, four focus group discussions were carried out in each area between March and June 1994. The groups interviewed and the principal topics covered are set out in Table 2.2. A third round of focus group discussions was undertaken in April 1995. This round was to investigate religious differences in attitudes towards child and health care arrangements and to explore gender issues in each area.

Key informant interviews were conducted with local chiefs, elders, party officials (VIDCO

Table 2.2 Composition and content of second round focus group discussions held in Honde and Rusitu

Reference	Village	Composition of Group	Topics covered
Honde Valley			
(i)	Danhama *- close to growth point*	8 local women *- mixed ages*	Traditional and contemporary: marriage, prostitution, family building strategies
(ii)	Chigweshe *- centre of growth point*	14 local women *- mixed ages*	Perceived roles of women as: a woman, a mother, a wife (including marital disharmony and domestic violence); a caregiver; a (new) breadwinner; a food producer
(iii)	Nyatsanza *- outlying area*	14 local women *- 7 elderly, 7 young*	Sex within marriage: nature of relationship; STDs; terminal abstinence
(iv)	Hauna *- growth point*	6 traditional birth attendants	Roles in and attitudes towards traditional and modern family planning and HIV-1/AIDS
Rusitu Valley			
(v)	Kushingirira	12 local women *- mixed ages*	Women's lives: upbringing, marriage, social position, role in agriculture, control over produce and earnings; recent changes
(vi)	Mukondomi	19 local women *- mixed ages*	Polygyny; consequences of widowhood; extra-marital relationships (for husbands and wives)
(vii)	Rujeko B and Ngorima A	12 local women *- 7 elderly, 5 young*	Family planning: traditional and modern; perceived use of condoms; gender roles;
(viii)	Chingwekwe	11 local women *- 5 middle-aged, 6 young*	HIV-1 and AIDS: impact on sexual lifestyles and future fertility

Note: Focus groups were also conducted with groups of men and women following the pocket-chart voting sessions in each area.

Chairmen), business leaders, Ministry of Health officials, Community Based Distributors (of family planning methods), Environmental Health Technicians, commercial sex workers and survey enumerators. These covered a broad range of topics including local history and culture, recent health problems, characteristics and role of commercial sex workers and problems experienced in administering the questionnaires.

Separate pocket-chart voting exercises were undertaken with groups of men and women, in each study area. These covered sexual behaviour and contraceptive use and entailed secret voting by the participants, on a short series of questions [189]. After each question, the numbers of votes were counted for the different possible responses, and likely reasons for the results were explored with the participants. Details of age, marital status, education level and parity status (for women) were recorded for each participant.

With the exception of some of the key informant interviews and the final round of focus group discussions, the sociological studies were carried out by a trained sociologist from Rusape, Manicaland, who had previous experience of the techniques used (Tom Zhuwau). He was assisted by a retired nurse (Mrs Matowanyika) who came from a nearby area (Nyanga) and possessed a good knowledge of the local culture. The third round of focus group discussions was carried out by a woman from the Honde Valley area who had worked as an enumerator in the 1994 survey (Mrs Kanyenze), under the guidance of the Research Co-ordinator. Interviews and discussions were recorded, using a small unobtrusive tape recorder, and written summaries were produced afterwards. In only one instance - an interview with a Chief in Rusitu, did this prove problematic. The Chief refused to allow the interview - on the history of the local area - to be recorded, on the grounds that it would interfere with his ancestral spirit.

The information obtained in these studies about local history and culture in each area has been incorporated into Chapter 3 and Appendix C. The numerical data on sexual behaviour and contraceptive use are given in Chapter 3.

2.5 HIV-1 Testing at Health Clinics

2.5.1 Aims

The specific aims of the HIV-1 prevalence surveys in the Honde and Rusitu valleys were:

i To obtain information on the relative levels of HIV-1 prevalence among higher and lower risk groups in the two study populations; and

ii To obtain information about the socio-demographic patterns of HIV-1 infection within the study populations.

Data of this kind remains relatively rare for rural areas in sub-Saharan countries. It was hoped therefore that the opportunity to obtain such information, presented by the study, would enable it to contribute to broader understanding of spatial and socio-demographic patterns of spread of HIV-1 infection.

2.5.2 Design and Conduct

Blood samples for the HIV-1 antibody tests were collected at the antenatal clinics at Hauna, Gatsi and Ruda in the Honde Valley, and Ngorima and Rusitu Mission hospital in the Rusitu Valley. The nurses taking the blood specimens informed the women that the study was being carried out for medical research purposes and that they were under no obligation to participate. It was explained that the information and results were being recorded anonymously, so as to ensure complete confidentiality, but that this also meant that the women would not be able to know the results of their own tests. Four small blood samples were taken from the thumb of each woman using a fresh lancet and Ancoscreen filter paper tabs. The nurses administered a short questionnaire requesting details of age, marital status, level of education and parity (Appendix E).

The blood samples obtained were analyzed for the presence of antibodies to HIV-1, by personnel at the Public Health Laboratory in Harare, using two ELISA tests. The tests used were Organon Teknika B.V. Vironostika HIV MIXT, and Behring Enzygnost Anti-HIV-1/HIV-2. In controlled tests, carried out by the United Kingdom Medical Services Directorate [190, p39], the sensitivity of the Vironostika and Enzygnost assays was found to be 96.0 per cent and 97.6 per cent, respectively. Both assays were found to have a specificity of 99.4 per cent. When contradictory results were obtained, these tests were repeated. Where the results still differed or were indeterminate, an Ancoscreen immunoblot assay was applied and the result of this test was taken as being conclusive.

2.6 Household Survey

2.6.1 Aims

The aims of the household survey and follow-up children survey were:

i To identify all women usually resident in the study areas, who would be eligible for the survey of HIV-1 and fertility;

ii To describe the demographic and socio-economic characteristics of the study populations; and

iii To obtain data on recent patterns of orphanhood and adult mortality in the study areas.

2.6.2 Design

A number of census enumeration areas (EAs) were to be selected in each of the chosen study sites, which, it was believed, on the basis of 1992 National Census estimates, would contain approximately 600 women eligible for the individual survey (section 2.7). All households in these enumeration areas would be identified, using Central Statistical Office (CSO) maps of the enumeration areas and lists of households provided by local party officials (VIDCO

Chairmen). A responsible adult within each household would be identified and asked to provide details of the individuals - adults and children - usually (*de jure*) and currently *(de facto)* living in the household, and some background information on the socio-economic status of the household head. This information would be sought by trained enumerators, using structured questionnaires translated into the *manyika* dialect of *Shona*. Households containing children under the age of 16 years in 1994 were visited again in 1995 to obtain further details on orphanhood and the survival status of adults.

2.6.3 Conduct

<u>Introduction of the Study to the Subject Populations</u>

As has already been noted (section 2.3), the success or failure of surveys of this type can depend on the rapport developed with the subject populations. In the current case, this could have been particularly problematic, as it was only possible to offer very limited benefits to participants. These were confined to information about the spread and consequences of HIV, and to a lesser extent, information about family planning. At the community level, it was believed that the study would be able to increase awareness and promote discussion about AIDS, through the conduct of the interviews and sociological exercises - note: opportunities for questions on these topics were made available at the end of each interview and focus group discussion. However, there were very few tangible benefits that could be offered, beyond the services already available through local Ministry of Health outlets.

Permission to carry out the study was obtained first from the Medical Research Council of Zimbabwe and then from the Provincial Medical Director of Manicaland (Dr Chimbadzwa), the Superintendant of Mutare General Hospital (Dr Makanza), the District Nursing/Medical Officers for Mutasa (Mrs Chikukwa) and Chimanimani (Dr Kuske), the District Administrators for Mutasa (name not recorded) and Chimanimani (Mr Dhliwayo) and the local paramount Chiefs (Chiefs Mutasa, Ndima and Ngorima). The Chiefs and VIDCO chairmen for each village informed the local people about the study and requested their co-operation. Before starting work in a new village, the project staff sought permission from the local Headman - a procedure which had been found helpful in the pilot study [191].

Before commencing interviews with household and individual women respondents (section 2.7), the enumerators would introduce themselves and the study, and request permission to carry out the interview. The importance of these preliminaries was stressed to the enumerators during training, and a number of practise sessions, including role plays, were conducted.

Mapping of the Survey Area

In the Honde Valley, four census enumeration areas (numbers 12, 31, 41 and 42) were selected from within the Samanga A ward in Mutasa District. Excluding police and army households, these areas contained a total of 448 households, according to the 1992 Census records. In Rusitu, four EAs were chosen (32, 41, 51 and 61), from the Chibika and Ngorima A wards in Chimanimani District. These were estimated to contain a total of 440 households. As the survey in Rusitu progressed, it became apparent than an additional EA could be completed within the fieldwork budget and timetable. Census enumeration area 31 was therefore added, which comprised an estimated 60 further households. The Honde and Rusitu valley areas selected in this way, were estimated to contain approximately 550 and 650 women of childbearing age, respectively.

Lists of households were obtained from the VIDCO chairmen, for each of the villages found within the selected census enumeration areas. However, these proved to be problematic. It had originally been anticipated that VIDCO chairmen's lists would be preferable to census lists, as the latter would be two or more years out of date - note: the mapping for the 1992 census was carried out in advance. Given, the high levels of migration and changes due to deaths, marriages and the creation of new homesteads - particularly around the growth points - it was expected that significant numbers of changes would have taken place. The VIDCO chairmen's lists, on the other hand, being maintained by officials resident within the study areas, for use in day-to-day administration, seemed likely to be more up-to-date, more reliable and easier to use. However, the VIDCO chairmen's lists posed a number of practical difficulties. In the first instance, the villages, which appeared from the census maps to fit neatly within EAs, frequently extended into neighbouring areas. It was discovered that *Shona* villages are often family rather than spatial concepts [178, pp57-60], and that extensions to pre-existing villages can be established in new locations, in circumstances where there is a family split or a land shortage. Secondly, households were listed by name of household head, a male in most cases. In areas where polygyny was common, such as Mboto in the Honde Valley, several households shared the same household head. To a degree, these problems were dealt with in discussions with the VIDCO chairmen and a locally-based CSO official (Mr Stacha), using the EA maps. However, the consultation process was extremely time-consuming, and the spatial dispersion of the households contained on each village list, made it difficult to deploy the interviewers efficiently - ie: to avoid repeat visits to households already enumerated and to identify the locations of some outlying households.

Changes were therefore made to these arrangements when the fieldwork team reached Rusitu. It was decided to revert to using the Census household lists. Each enumeration area - with the exception of EA 31 - was allocated to two enumerators. The enumerators were given copies of the census household lists for their areas and CSO maps showing the main features and boundaries of these areas. They were instructed to add any new households they found which were not shown on the lists, and to record details of any listed households which were found to have broken up, due to death or migration, since the census lists were prepared.

Questionnaire Preparation and Translation

The structure of the questionnaire (see Appendix F) was based on that used in the 1988 Zimbabwe Demographic and Health Survey. Small changes were made to both layout and content. The latter principally entailed the addition of a set of questions on sibling survival - to increase the amount of data collected on mortality - and minor changes to the questions on socio-economic features. A small number of changes were made to the wording of questions, in the light of insights into the local *manyika/ndau* dialects and culture obtained during the first round of focus group discussions.

Questions were translated from English into *Shona* and independently back-translated by two *manyika* speaking women. Where the back-translation differed from the original meaning, corrections were made to the *manyika* version. The questionnaires were tested during the interviewer training programme and the pilot study, and individual question wordings were clarified where necessary.

Enumerator Selection and Training

Following discussions within the project team (Research Co-ordinator, Sociologist and Fieldwork Manager), a set of four essential criteria were established for use in the recruitment of enumerators. These were that the enumerators should be:

i Female of mature age - which was deemed to be 20 years or above;
ii Holders of five or more 'O' level qualifications;
iii Fluent in both English and *Shona*; and
iv Adept at working with people from rural communities.

In addition, it was agreed that previous experience of health-related work and/or social research would be taken into consideration.

Following an interview process, twelve women were recruited on a probationary basis. Five of these held diplomas in Social Work and had prior experience of HIV-1 research; three were nurses, two were teachers and the other two also met the criteria. All those recruited undertook an initial two week training course organized by the project staff. This comprised one week's classroom instruction and one week in the field. Ten of the original twelve women were considered to have performed satisfactorily during the course and were taken on as enumerators for the remainder of the study. One of the other women - a retired nurse from Nyanga, in Manicaland - was recruited as an assistant for the Project Sociologist. A further week of training, picking up on problems arising during the pilot study (see below), was undertaken, prior to the commencement of the survey proper.

A project manual, including detailed instructions on the household and individual questionnaires, was prepared by the Research Co-ordinator and issued to the enumerators, before the start of the training programme.

Pilot Study

A one week pilot study was carried out in areas adjacent to those identified for the main survey - Rori Village, near Hauna, and EA 21 in Rusitu. This was designed to test the adequacy of the research tools, interviewer training and logistical arrangements established prior to the survey. The data collected from 56 households and the 78 eligible women who were identified as usually living in these houses were entered into SPSS-PC+ files created for the purpose (section 2.8) and some simple data analyses and checks were carried out.

Broadly speaking, the pilot study was well received by the study populations and it was felt to have been a success [191]. However, a number of minor problems were identified and steps were taken to address these in the final training sessions and by amending the questionnaires and interview arrangements. Several questions, which appeared to be either superfluous or to provide undiscriminating information - eg: almost all the households relied on wood as their primary source of fuel - were removed. To increase the average number of eligible women per household, it was decided to reduce the lower age limit for inclusion, from 15 to 13 years. This also raised the number of respondents of school age and thus increased the amount of data which could be obtained on knowledge, attitudes and beliefs about AIDS, amongst the cohort which was about to become sexually active. A number of errors in the skip rules within the questionnaires were also identified and corrected at this stage.

Interview Supervision

The implementation of the interview process was managed and overseen by the Fieldwork Manager (Tigere Muzenda in the Honde Valley; Joshua Ndlovu in the Rusitu Valley). He was assisted in this by a Fieldwork Supervisor (Elijah Dhauka). All returned questionnaires were checked by the supervisors for legibility, plausibility, completeness, correct application of the skip rules and internal consistency. Spot checks of this kind were also carried out by the

Research Co-ordinator and Project Sociologist. Errors and inconsistencies were raised with the enumerators, and, where necessary, they were asked to re-visit respondents and/or to correct the errors. The supervisors indicated final acceptance of questionnaires by signing the front sheets. Some errors were also picked up by the data processing staff, during data entry or in the course of periodic reviews of the data entered. Details of these were passed back to the fieldwork supervisors and appropriate action was taken.

Some monitoring of the enumerators was carried out while they were in the field. This included observation of interviews and a small number of re-interviews (Appendix C).

2.7 HIV-1 and Fertility Survey

2.7.1 Aims

The aims of the HIV-1 and Fertility Survey were:

i To collect data on knowledge, awareness and personal experience of HIV-1 and AIDS, among women in the study areas; and

ii To collect data on recent trends and patterns in fertility and in its proximate determinants.

These data would be used to explore possible mechanisms for interaction between the HIV-1 epidemic and the proximate determinants of fertility, with particular reference to attitudinal and behavioural changes which might result from the HIV-1 epidemic (Chapter 6).

2.7.2 Design

Population size computations were carried out using standard statistical formulae and procedures for the comparison of two means or proportions, as appropriate [192, 193]. On the basis of initial estimates of the variance of the principal statistics to be studies - ie: age-specific fertility rates, desired family size, breastfeeding periods, contraceptive usage and so on - and allowing for the need to control for age and/or level of HIV-1 awareness, socio-economic status etc, study populations of the order of 600 women per site were calculated as being required to achieve at least a 90 per cent chance of detecting a significant difference - say 10 per cent or more - at the 95 per cent level. It was decided to attempt a complete census of two selected "study areas", estimated to contain this number of women, rather than to conduct a sample survey, for the reasons given earlier (section 2.3.2). Women aged between 13 and 49 years, usually resident in the study areas, would be considered eligible for the survey. These women would be identified through the household survey described above (section 2.6).

The survey would be carried out on an anonymous basis with participation being voluntary. As in the household survey, interviews would be conducted in the local *manyika* dialect of *Shona*. Survey questionnaires (see Appendix F) would again be based on those developed in the WFS and DHS surveys. However, it was decided to use calenders to record details of the proximate determinants over the five years preceding the survey date. These are generally only used in countries where contraceptive use is considered to be high, and were not completed in the 1988 Zimbabwe Demographic and Health Survey (Mandishona 1989c). It was thought that the level of contraceptive use had probably increased since 1988. Furthermore, close examination of recent patterns of change in the proximate determinants of fertility was considered to be essential in view of the objectives of the study. The standard DHS calender would be modified to include "sexual activity and union histories", as information on extra-marital sexual activity was believed to be needed to permit a good understanding of the respective roles of the different proximate determinants of fertility [106, pp674-675], as well as to enhance understanding of recent patterns of spread of HIV-1 infection. The standard DHS questionnaire would be adapted by replacing most of the questions on infant and child health and anthropometric measurements with detailed questions on knowledge, awareness and experience of HIV-1 and AIDS. The standard DHS fertility history questions, which include questions on the survival status of all children, would be retained, for use in the analysis of recent trends in fertility and infant and childhood mortality. The resulting questionnaire would be similar in length to those used in DHS surveys and would generally take one hour or less to administer.

2.7.3 Conduct

Similar procedures were followed for questionnaire preparation, translation and pre-testing, and interviewer training and supervision, to those described for the household survey (section 2.6.3). As in the household interviews, enumerators began by introducing themselves and the study, and followed the order and wording of the questions set out in the questionnaire forms, to ensure consistency within the survey. At the end of each interview, respondents were asked if they had any comments or questions about the interview and its content. Enumerators recorded any difficulties - such as disruptions or refusals to answer particular questions - in spaces provided at the end of the questionnaires.

Close control was maintained over the issue and return of questionnaires. A sequential register of survey reference numbers was maintained. As household questionnaires were returned, details of any women eligible for the individual interviews were extracted and recorded against unique survey reference numbers in the register. The details recorded were the enumerator's name, the household reference number, the name of the household head and the woman's date of birth and line number in the household questionnaire. To maintain confidentiality, no record was made of the woman's name in the register, although the first name could be traced via the line number on the household questionnaire. As individual questionnaires were returned, these were ticked off in the register as completed. The status of outstanding questionnaires was kept under review with the enumerators concerned. Completed questionnaires were batched and sent to Dangamvura, near Mutare, where the data entry was carried out.

2.8 Data Processing

2.8.1 Methods

Data entry forms were designed for each data file and set up on SPSS-PC+. The forms included skip rules - to avoid entries being made for questions which did not apply in individual cases - and cleaning rules - which rejected entries outside pre-specified ranges. These ranges were established in advance for each question and restricted acceptable entries to the codes appearing on the questionnaires or, for questions requiring a numerical non-pre-coded answer, to a plausible range of responses. The data entry forms and procedures were tested during the pilot study and corrections and improvements were made where necessary.

Data collected on the survey questionnaires was entered into SPSS-PC+ computer files as the fieldwork progressed, so as to allow feedback to supervisors and enumerators in the field. Two data entry clerks with previous experience of SPSS-PC+ entered the data, with assistance from a qualified secretary and two of the enumerators, each of whom was given appropriate training and close supervision. Periodic reviews of the frequencies of responses to each question were carried out by the data entry clerks and by the Research Co-ordinator, as the data was entered. Inconsistent or unexpected results were checked and corrected where necessary. Approximately 10 per cent of questionnaires were re-entered using SPSS-PC+'s verification option, by data entry clerks other than those responsible for the original entries. The results of these checks are given in the following section. Total numbers of cases entered in each file were reconciled with fieldwork records of completed questionnaires.

All the completed questionnaires were brought back to England after the fieldwork was finished and a preliminary analysis of the computer results for each question was undertaken. Once again, any unusual responses were checked back to the questionnaire forms and the computer records were adjusted where appropriate.

2.8.2 Data Entry Errors

The results of the data entry verification tests are summarized in Table 2.3. These show a low overall level of errors during data entry. While further errors may have been made and repeated in the verification exercise, the overview procedures mentioned above indicated that the incidence of such errors is probably also low. Nonetheless, these could be important where precise measurement of unusual events and attitudes is required - eg: re: orphanhood and extra-marital sex. Two files (**HHIDENT** and **HHCHARS**) from the household questionnaire were not tested due to lack of time. These are both short and are restricted to data on the socio-economic background characteristics of the households. The questions contained in these files are straightforward and there is no reason to believe that the incidence of data entry errors is any higher than in other files.

The highest error rates were encountered in the **WNCHARS** and **PREG** files. Both files are relatively long and the **PREG** file is probably the most complicated to follow. The most common error in the **WNCHARS** file was failure to use a 24 hour clock, when entering interview start and finish times, and there was one instance of a skip rule being over-ridden in error. Errors in the **PREG** file were evenly distributed between the questions and were mainly reading/punching errors. A common problem throughout all the files was the use of the code for "Don't know" (98), instead of that for "Data missing" (-9). Most of these errors were made by the same data entry clerk.

2.9 Summary and Conclusions on Data Evaluation

2.9.1 Introduction

The detailed procedures employed during the data evaluation exercise are described in Appendix C. The approach used and main findings from the exercise are summarized in this section.

Table 2.3 Results of data entry verification tests

File	Tested	Errors found	Error rate
HHCOMP	4,758	21	0.44%
WNIDENT	714	5	0.70%
WNCHARS	4,590	63	1.37%
FERTHIST	2,856	5	0.18%
CHILD	3,366	6	0.18%
CONTREST	3,162	5	0.16%
PREG	4,488	49	1.09%
MARRIAGE	3,060	10	0.33%
HIV	7,242	20	0.28%
FERTATT	4,590	22	0.48%
CALS	11,322	25	0.22%
	50,148	231	0.46%

Note: All files tested except **HHIDENT** and **HHCHARS**.

2.9.2 Overview of Data Evaluation Procedure

i An integrated range of data collection methods and secondary sources was used, tailored to the needs of the study;

ii A number of precautions were taken during the fieldwork preparations and conduct, in order to limit the impact of potential sources of data error and bias;

iii A range of checks was carried out to assess the degree to which the data were affected by problems typically encountered in demographic and social surveys (Appendix C);

iv Overall, the standard of the data appears to be good. The census approach minimized the extent of sampling errors; a high level of coverage was achieved and item non-response was low, so that selection biases are small. Age and birth history reporting is generally good; the questions and coded responses were relevant; there was a high degree of internal and external consistency and reliability; and the level of data entry errors was low;

v However, a number of specific problem areas were identified during the data quality review; these are summarized in the following sub-section.

2.9.3 Biases in Data due to Data Collection and Processing Errors (see Appendix C for details)

i Substantial selection biases are present in the HIV-1 sentinel data collected at the antenatal clinics - see Chapter 4 (Appendix I), for a fuller account and discussion;

ii Some, pre-dominantly small, households were omitted from the survey, particularly in the Honde Valley. The main effect of this appears to be that old people - ie: 60 years and above - were under-enumerated in the household survey;

iii A small number of non-responses due to absenteeism were recorded. The effect of these on the study results is believed to be minimal;

iv Age-reporting for older women and around the boundary ages for inclusion in the HIV-1 and Fertility Survey is less reliable. At the younger boundary (12-14) the effect will be that 13-14 year olds will be under-represented in the study. However, as these young women have very few births, this will have little impact on the study of fertility. As the effect is believed to be unbiased and numbers are reasonably large in this age-group, the data on knowledge about HIV-1 and AIDS among 13-14 year olds should remain valid. At the older age boundary (49-51) the number in the oldest eligible age category (45-49) will have been reduced, among an already small group. The anticipated problems in identifying trends in older age fertility will therefore have been increased. Less educated women, who might be expected to have higher than average fertility, are most likely to have been excluded;

v The estimates of orphanhood obtained in the Household Survey appear to have been under-enumerated. Further details are given in Chapter 5;

vi The statistical data on female rates of sexual partner change and on condom use - in questions on HIV - are unreliable and demands careful and cautious interpretation. In particular, a number of commercial sex workers are known to have under-reported their numbers of sexual partners;

vii The data on knowledge of methods of family planning and on knowledge of HIV-1 and AIDS is subject to questionnaire effects, with respondents using guesswork on some questions and sometimes giving answers intended to please or impress the interviewers. The scale of these effects appears to be quite small in the case of family planning methods, but greater, in some cases, in the HIV section of the questionnaire. Again, care will be required in interpretation of these data;

viii A small number of ambiguously worded questions and uncoded responses were present in the questionnaires. Particular care will be needed in any attempt to interpret the data from these questions. Some may not be usable;

ix Low, but statistically plausible, sex ratios at birth were recorded. Similar results have been recorded in earlier studies in Zimbabwe. However, it is possible that these may indicate a degree of under-reporting of children, particularly boys, who died soon after birth. This would imply that estimates of fertility and infant mortality, based on the data, will tend to marginally understate the true levels. An element of shifting of dates of births into the period 5-9 years before the survey date may have occurred, which would tend to distort recent trends in fertility; and

x Responses to some of the questions on opinions and knowledge about HIV-1 and AIDS were inconsistent. This appears - together with point (vii) above - to reflect uncertainty among respondents about these issues, rather than errors in the data collection process.

2.9.4 Points Arising For Consideration In Future Studies

i Sentinel surveillance at antenatal clinics *may* not be appropriate where data on HIV-1 prevalence among general populations is required. As a minimum, data on basic socio-demographic characteristics such as age, marital status, education and religion should be obtained, analyzed and assessed in seroprevalence surveys;

ii VIDCO chairmen's lists are an inappropriate sampling frame where spatially defined populations are to be studied. However, these lists may be useful in other circumstances - eg: where cluster sampling of broader areas is applied;

iii Data from sociological studies can help in the design and evaluation of statistical surveys;

iv Drawing age-bounds more widely than the minimum required can help in reducing age mis-reporting at key ages and in maximizing coverage of eligible individuals;

v Supplementary questions or specially designed surveys may be required to prevent under-enumeration of orphans;

vi Pocket-chart voting is a useful method for eliciting qualitative information on sensitive personal behaviour. Adaptation of the basic technique may permit a broadening of its use to the collection of quantitative data, in circumstances where education standards are low;

vii Male interviewers may be more effective when personal information is to be sought from female commercial sex workers;

viii New or supplementary questions may be needed to elicit more reliable data on knowledge of ways in which HIV can be spread;

ix Condom use may be overstated in HIV and AIDS-related KABP studies due to an interview effect, wherein respondents report actions which they believe will impress the enumerators. Care is also needed to draw a clear distinction between consistent and occasional use of condoms when survey questions are framed;

x Further investigation is required into the reasons for the low sex ratios at birth repeatedly reported in demographic surveys in Zimbabwe.

<u>CHAPTER 3</u>

Socio-Economic Characteristics of the Study Populations

Easter gathering of Mwazha Apostolics, near Wedza, Zimbabwe, 1994.

3

Socio-Economic Characteristics of the Study Populations

3.1 Aims of the Chapter

The aim of this chapter is to provide a national and local context for the examination of demographic trends and the early impact of the HIV-1 epidemic in rural areas of Manicaland, by:

i. Summarizing the changes in demographic profile which have taken place in rural areas of Manicaland in recent years and contrasting these with the wider changes which have occurred in other parts of Zimbabwe; and

ii. Identifying key aspects of the local socio-cultural contexts, including patterns and determinants of sexual behaviour, which are shaping the pattern of spread of HIV-1 infection in the Honde and Rusitu valleys,

3.2 Organization of Chapter

The chapter begins with a short review of recent demographic trends in Zimbabwe, including those seen in Manicaland (section 3.3). The spatial situation and historical background of the study populations are described (section 3.4). In section 3.5, socio-economic characteristics of the study populations identified during the fieldwork are summarized. A description of the background *shona* culture is given in Appendix D. Section 3.6 examines the data obtained on sexual behaviour patterns, while the final section (section 3.7) draws out some possible implications of the findings in this area, for the spread of HIV-1 infection within the study populations, and for the design of future HIV-1 control and family planning programmes.

3.3 Recent Demographic Trends

3.3.1 Population Growth

Zimbabwe Central Statistical Office estimates for the size of the national population and for inter-censal growth rates since the turn of the century are shown in Figure 3.1 [173, 183]. These indicate that the country's population has been growing rapidly throughout the century, with perhaps the fastest rates of growth being experienced since the 1940s. The figures reflect patterns of net international migration as well as levels of natural population increase. In particular, the early 1980s were characterized by migration flows following Independence, while in-migration from Mozambique has been a feature of the most recent intercensal period.

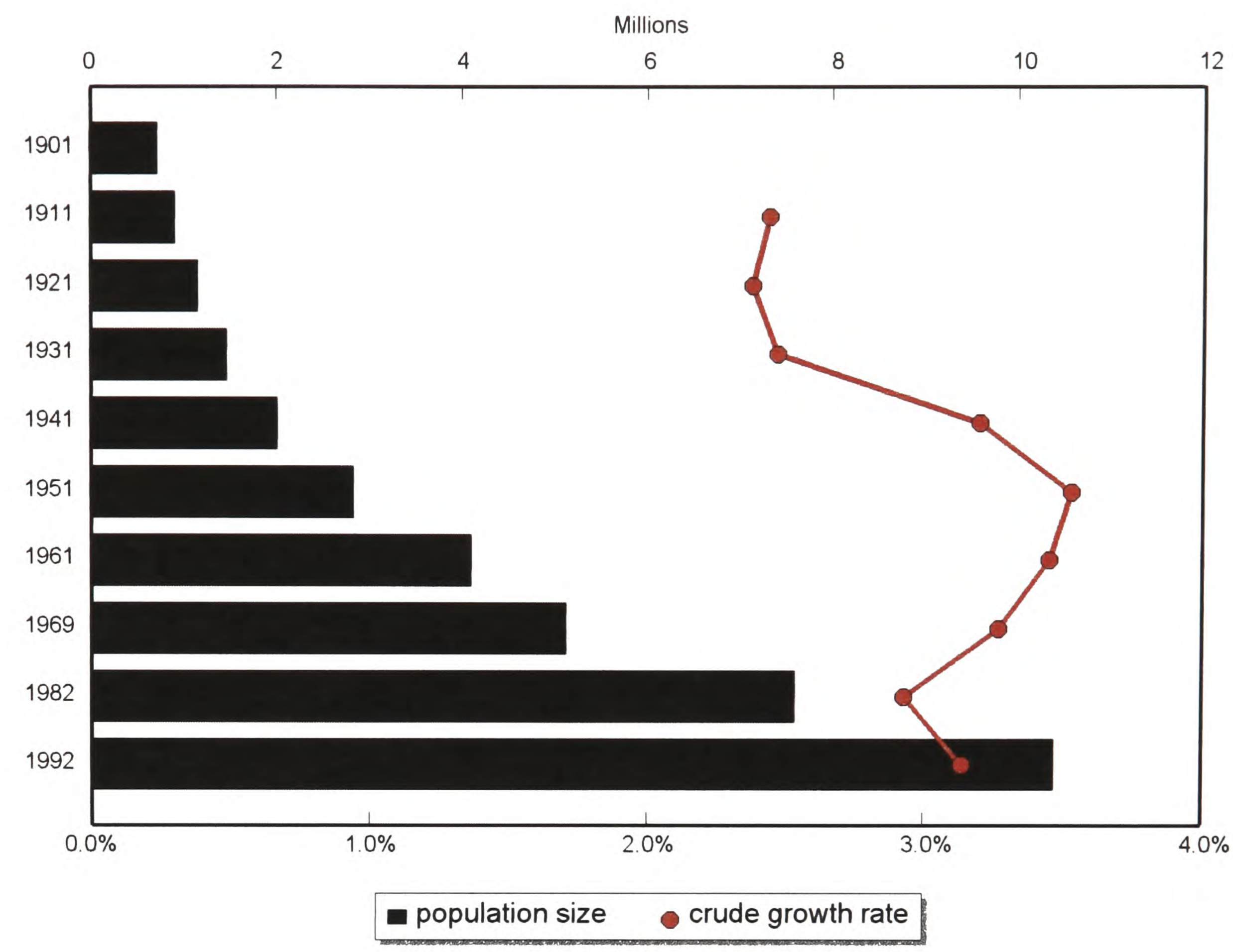
Figure 3.2 shows the rates of natural increase in population, ***r***, recorded in the Census for the period 1991-92, for Zimbabwe, as a whole, for the province of Manicaland, and for the districts of Mutasa and Chimanimani, which include the Honde Valley and Rusitu Valley study areas, respectively [173, 194]. The rates of natural increase in the study districts are similar to that for the whole country; however, the crude birth and death rates recorded in Mutasa District are both marginally higher.

3.3.2 Mortality

Estimates of male and female life expectation at birth have been derived from census data by the Central Statistical Office [173, 183, 194]. The results for Zimbabwe, Manicaland and the study districts are summarized in Figure 3.3. Nationally, there appears to have been a consistent increase in life expectancy since the early 1970s reaching a peak of 61 years for males and 63 years for females around 1988. Since the late 1980s, there is a suggestion that this trend may have been reversed. Throughout the period covered by the data, female mortality has consistently been lower than male mortality, by a matter of 1-2 years.

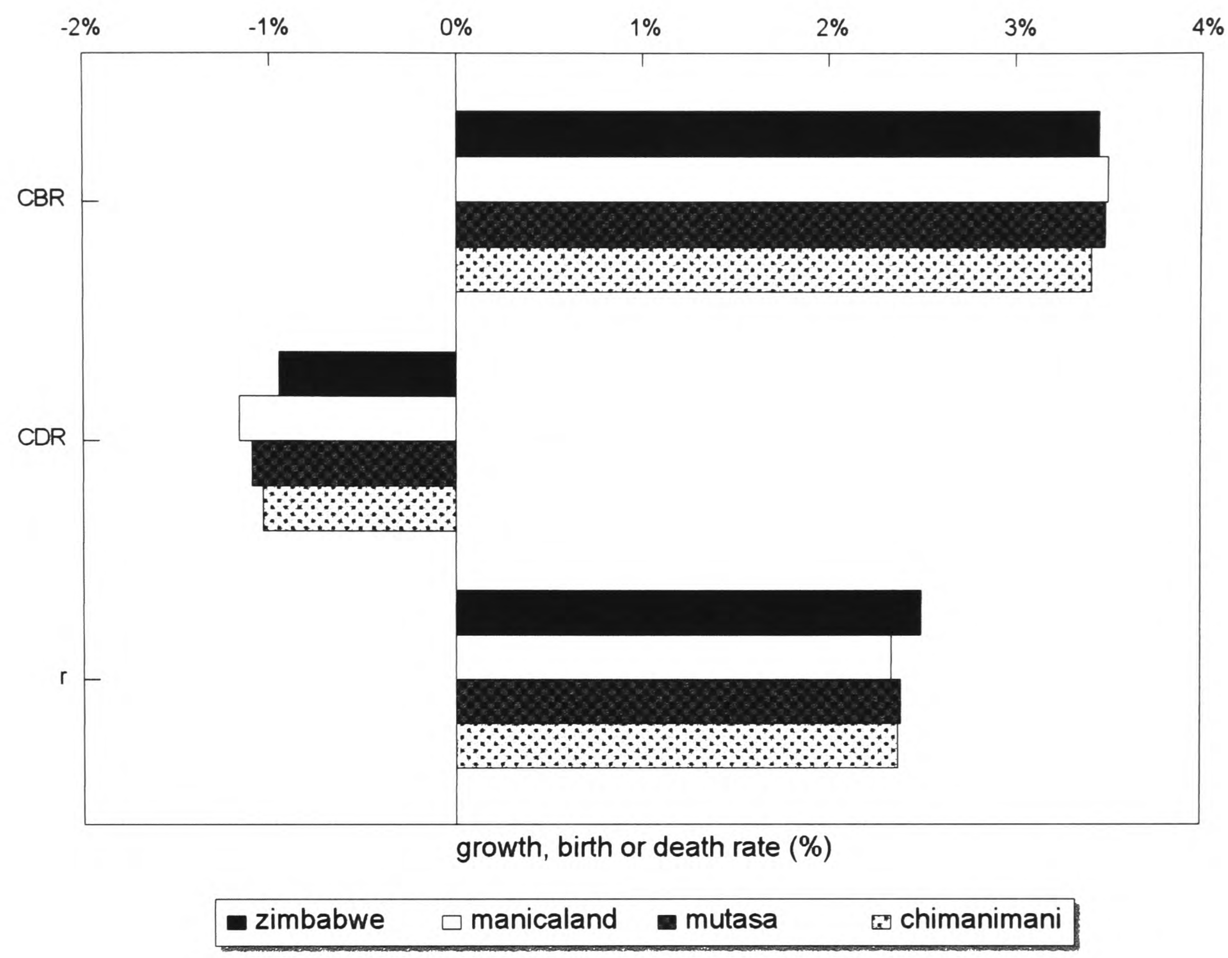
Life expectancy also increased in Manicaland in the 1970s and 1980s, but from a lower starting point and with the upward trend appearing to have been less steep. This may be due

Figure 3.1 Growth in the population of Zimbabwe: 1901-92



Sources: Zimbabwe census reports: [173] and [194].

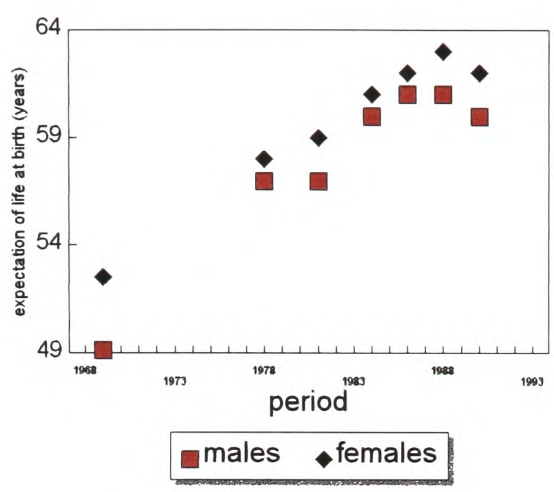
Figure 3.2 **Rate of natural population increase, crude birth rate (CBR) and crude death rate (CDR) for 1991-92: Zimbabwe, Manicaland, Mutasa District and Chimanimani District**



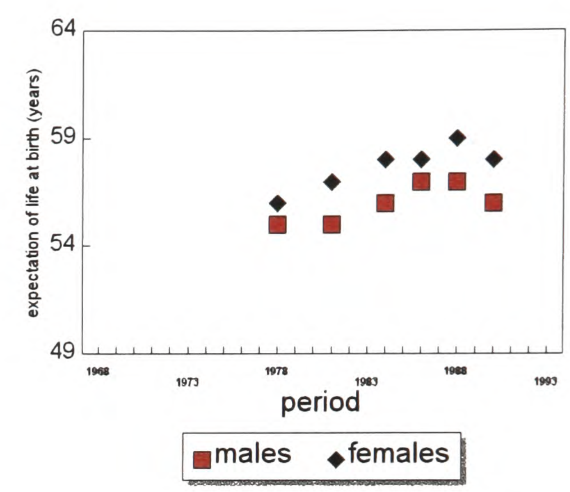
Sources: Zimbabwe census reports: [173] and [194].

Figure 3.3 Life expectancy at birth for males and females in Zimbabwe and Manicaland: 1968-90

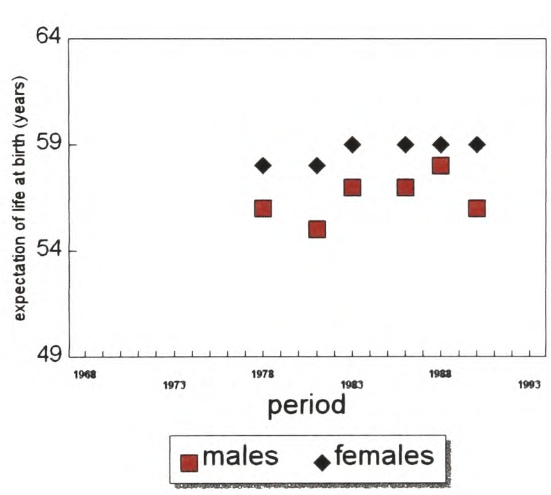
(a) *Zimbabwe*



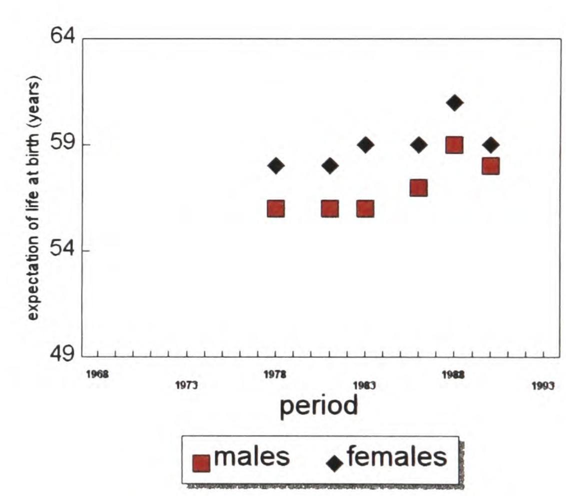
(b) *Manicaland*



(c) *Mutasa*



(d) *Chimanimani*



Sources: Zimbabwe census reports: [173], [183] and [194].

to the relatively low level of urbanization in the province (Table 3.1). The trends in the predominantly rural districts of Mutasa and Chimanimani are less distinct. However, as a pointer to the discussion in Chapter 5, it may be worth noting that the declines recorded in life expectancy since 1988 are more concentrated among males in Mutasa and among females in Chimanimani.

Figure 3.4 shows the national census and survey estimates for infant mortality since the late 1960s [173, 183, 194-196]. Each source indicates steady declines in infant mortality between the early 1970s and the mid-1980s, followed by a modest upturn in the late 1980s and early 1990s. The Demographic and Health Survey (DHS) results are consistently below those indicated by the census data. In each DHS, estimates are given for three periods prior to the survey date; the earliest of these three estimates, in each case, may be particularly unreliable, as they are based on women's recall of events which took place ten or more years prior to the survey. The results for Manicaland show a similar, but slower, downward trend, to that which is apparent in the national figures. However, the estimates are consistently higher, again, perhaps, reflecting the more rural population. The modest increase in infant mortality since the late 1980s also echoes the national pattern. Within Manicaland, infant mortality levels recorded in Mutasa have frequently exceeded those for Chimanimani. The results for both areas show increases in infant mortality between the late 1980s and early 1990s.

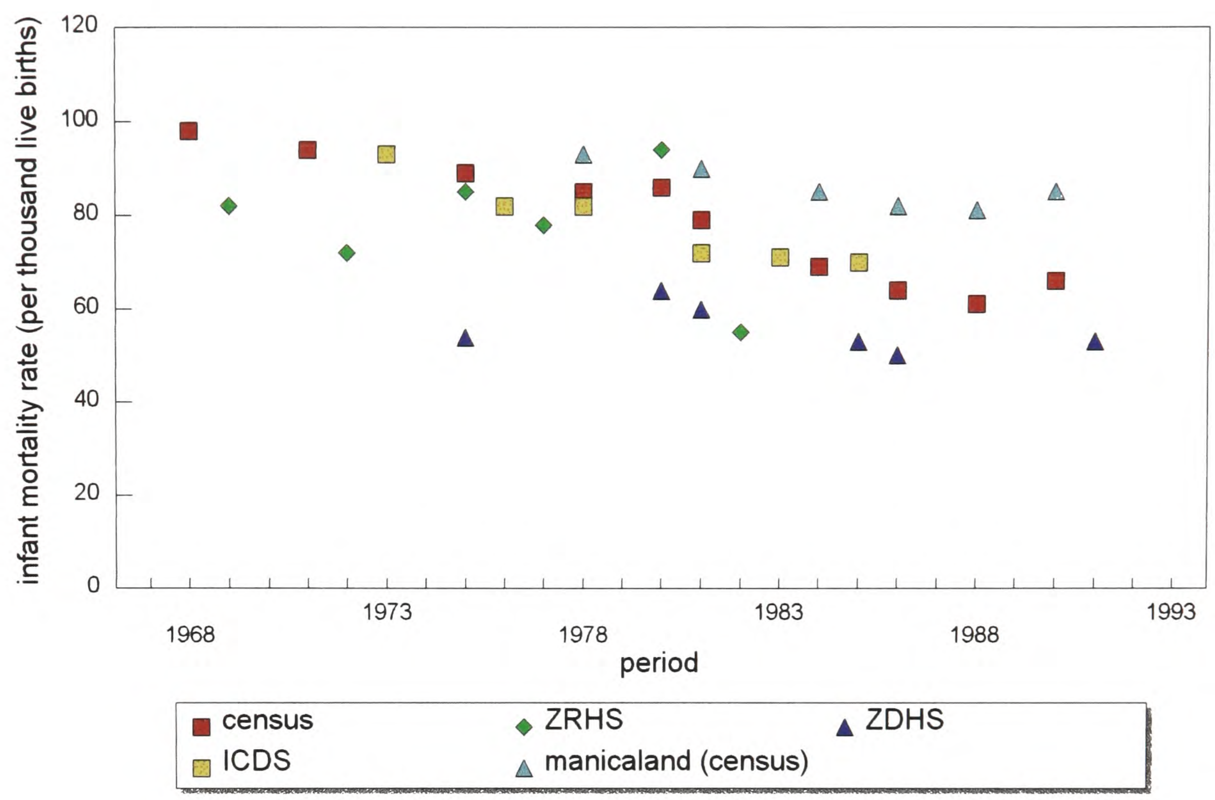
Female life table probabilities of survival from age 25 years to ages 45 to 75 years, based on 1992 Census results are shown for Zimbabwe and Manicaland in Figure 3.5 [173, 194]. These suggest that adult as well as infant mortality rates may be slightly higher in Manicaland than is the case in Zimbabwe, as a whole.

3.3.3 Fertility

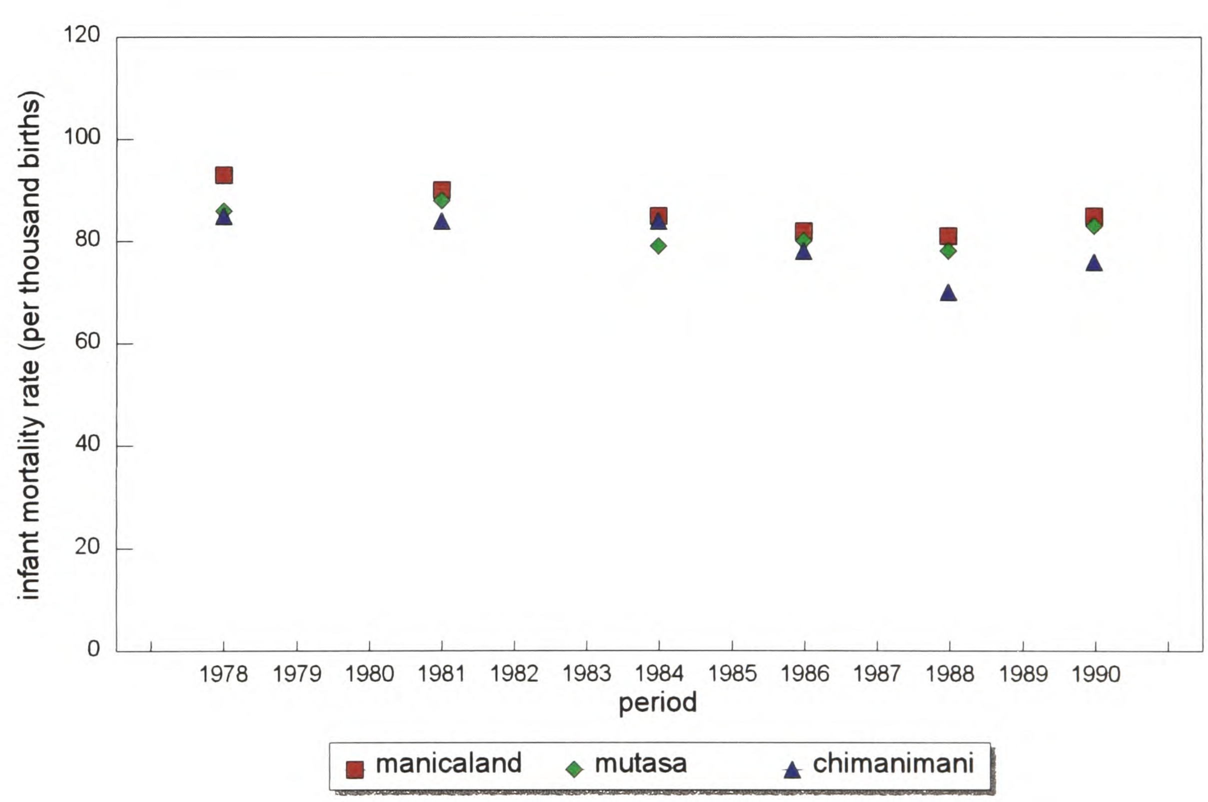
Estimates of the total fertility rate for Zimbabwe have been derived from data obtained in successive censuses [173, 183, 194], an inter-censal demographic survey [184] and a series of fertility surveys [195, 197, 198] undertaken since 1987. A summary of the results is given in Figure 3.6. Both the census and survey results show steady declines in fertility since the

Figure 3.4 **Infant mortality rate estimates for Zimbabwe and Manicaland: 1968-94**

(a) *Zimbabwe*

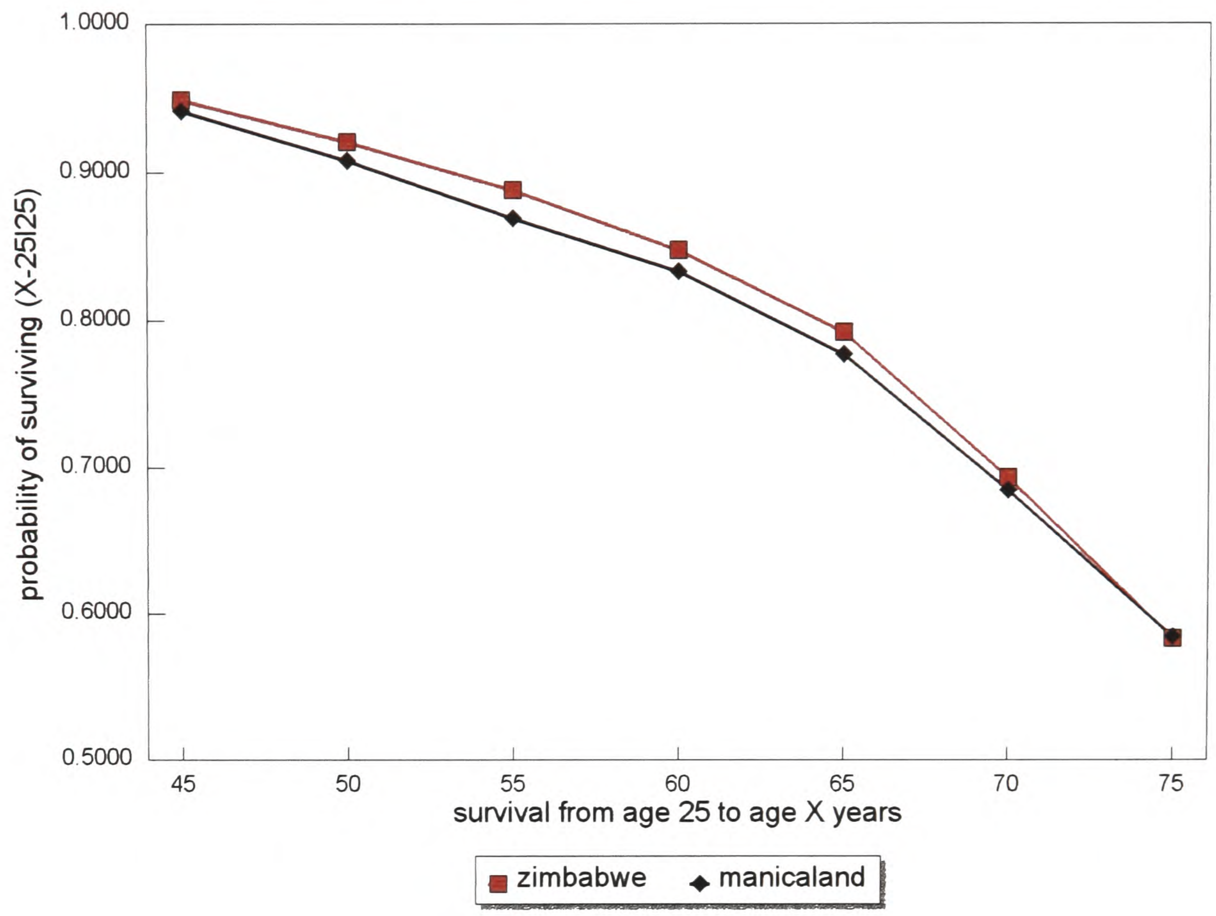


(b) *Manicaland*



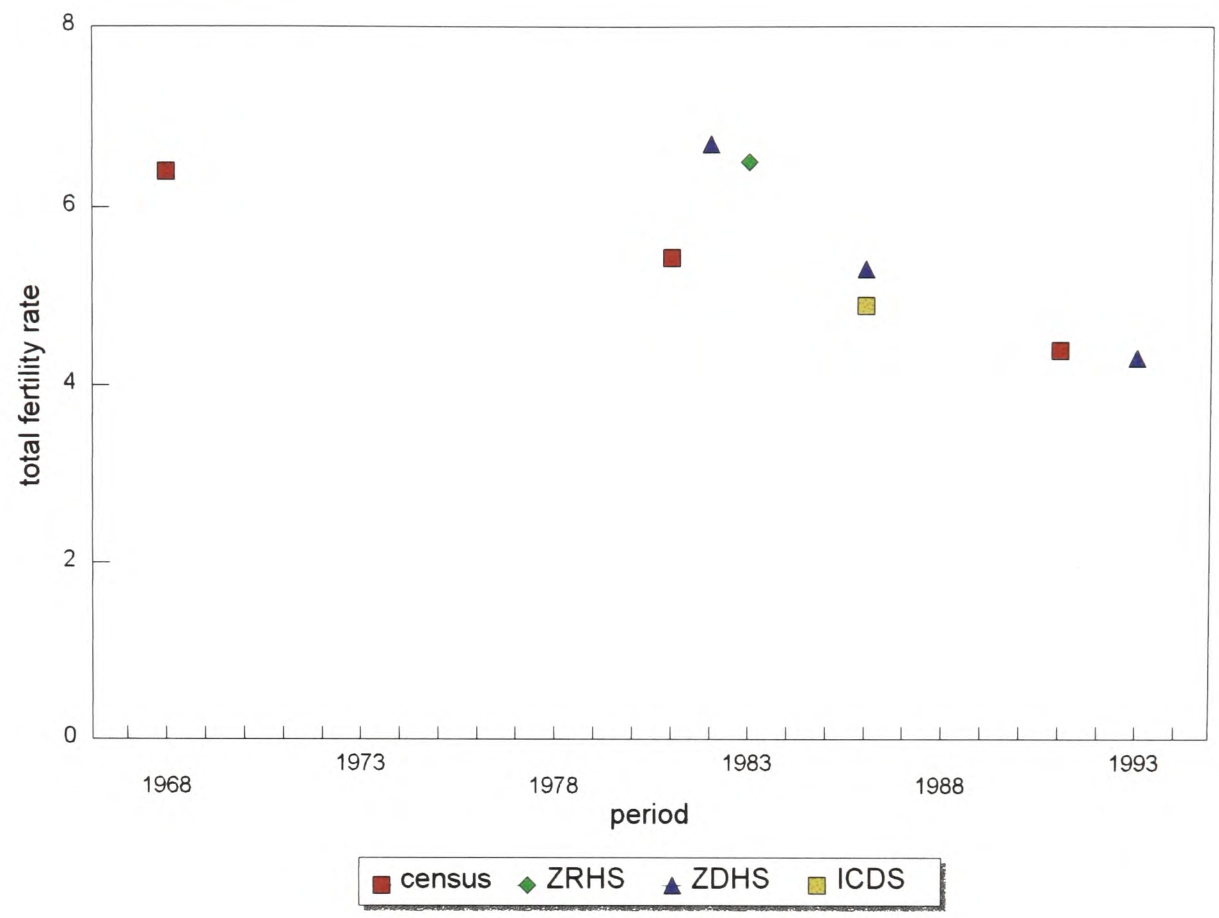
Sources: Zimbabwe census and DHS reports: [157], [173], [183], [184], [194], [195], [196] and [197].

Figure 3.5 **Adult mortality: female probabilities of surviving from age 25 to ages 45 to 75, $_{x-25}l_{25}$, for Zimbabwe and Manicaland, 1992**



Sources: Zimbabwe census reports: [173] and [194].

Figure 3.6 Total fertility rate (women aged 15 to 44 years) estimates for Zimbabwe: 1968-94



Sources: Zimbabwe census and DHS reports: [173], [183], [184], [194], [195], [196] and [197].

1970s, with the latter suggesting a rather steeper recent decline. However, the early census figures, in particular, are believed to be under-estimates [199, 200], so that the sharper decline indicated by the Demographic and Health Survey results may be more plausible. Fertility may have increased in the early 1980s following Independence [201, p17] but a long-term downward trend now seems to be firmly established [195, 202, p22]. The decline in fertility has run in parallel with a reduction in desired family size - 4.9 (1988) to 4.3 (1994) [157, 198]. It has been suggested that each has resulted, at least in part, from the "increased monetization of the economy and the consequent increase in the costs of feeding, clothing and educating children" [200]. Others have argued, more generally, that the role of economic development in explaining fertility decline is often exaggerated [203]. Increased use of contraception from under 10 per cent of married women, prior to 1980, to 43 per cent in 1988 appears to have been the principal mechanism through which the reduction in birth rates has been achieved. Modern forms of contraception became more widely accepted during the Liberation Struggle of the 1970s. Reductions in the proportions of women marrying at young ages are also thought to have contributed to the decline in total fertility [200, 204].

3.3.4 Migration

Between the 1982 and 1992 censuses, the population of Manicaland grew from 1,103,837 to 1,537,224 - ie: at an average annual rate of 3.31 per cent. During this period, the average rate of natural increase within the population was 2.34 per cent per annum. The difference may be explained by internal and international migration and, perhaps, by boundary changes, which are known to have occurred during the period, but whose effects on the population size of Manicaland have not been ascertained. Over the ten year inter-censal period, net out-migration from Manicaland to other provinces amounting to 7.3 per cent of the population resident in 1982 is understood to have occurred. The rate for the twelve months immediately preceding the Census was recorded as 3.3 per cent; this may have been particularly high because of the severe drought in 1992 [173]. In general, the pattern of net out-migration from Manicaland reflects a tendency for adolescents and young adults to migrate to urban areas to further their education or search for paid employment.

Net international immigration, principally from Mozambique, represents perhaps the most plausible explanation for the apparent disparity between natural and absolute population growth rates, which remains, after adjusting for internal migration. In total, 12,868 individuals were enumerated in Manicaland - 9,102 in Chipinge District, where the Tongogara Refugee Camp is located - in the 1992 Census, who said that they had been resident in another country one year previously. In view of the close cultural and family ties between the populations of eastern Zimbabwe and Mozambique (see section 3.4) and the instability in the latter country in the years leading up to the Census, it is reasonable to suppose that most of these will have been Mozambicans and that many others will have entered the country since 1982 - two thirds of foreign nationals identified nationally in the 1992 Census were Mozambicans [173, p20]. The figure for Manicaland for 1991-92 could also be an under-statement of the true number of Mozambican immigrants in that year, as others undoubtedly entered the country unofficially and their migrant status may not have been identified in the Census.

Within Manicaland, high rates of migration between districts are evident from the 1992 Census reports [173, p190]. Both Mutasa and Chimanimani Districts recorded modest net *inter-censal* in-migration from other districts: 1.94 per cent and 0.58 per cent, respectively. However, in each case, more than 10 per cent of current residents were said to have moved into the district from another part of Manicaland since the previous Census. Some of these movements will, of course, reflect circular migratory patterns. The observed direction of migration within Manicaland, which mirrors lifetime migration patterns, may be due to the relatively favourable conditions for agriculture and small business development found in these areas. Both regions have been classified as lying within natural agro-ecological zone 1, which is a high rainfall area characterized by forestry, fruit, tea and coffee growing, and tourism.

3.3.5 Urban-Rural Composition

The population densities estimated in each census year since 1969 and the proportions of the populations recorded as living in urban areas in 1992 are given for Zimbabwe, Manicaland and the two study districts in Table 3.1 [173, 183, 194]. The population density in Manicaland is higher than the national average, despite the low level of urbanization. This may reflect the

Table 3.1 Population densities, 1969-92, and proportions living in urban areas, 1992

Area		**1969**	**1982**	**1992**
(a)	*Population Densities (per sq km)*			
	Zimbabwe	13.00	19.30	26.65
	Manicaland Province	22.00	31.50	42.16
	Mutasa District			60.48
	Chimanimani District			31.91
(b)	*Proportion Living in Urban Areas*			
	Zimbabwe			
	Manicaland Province			30.61
	Mutasa District			11.45
	Chimanimani District			4.66
				0.00

Note: Mutasa District contains the small mining town of Penhalonga - population in 1992: 7,728

Sources: Zimbabwe census data: [173], [183] and [194].

favourable climatic and thus agricultural conditions which predominate and recent migration from Mozambique after the Liberation Struggle and during the subsequent period of unrest in Mozambique. Mutasa District has a particularly high population density, largely for similar reasons, although there is also a small mining town (Penhalonga) within the district. Areas were classified as urban in the Census, if they were officially designated as such or had a population in excess of 2,500 people living within a compact settlement and with more than 50 per cent of employed persons being engaged in non-agricultural occupations [173, p24]. Neither Hauna nor Dzingire, the growth points in the two study areas, qualified as urban under this definition.

3.4 Situation and Historical Background

The Honde Valley and Rusitu Valley areas, where the study was conducted, are located to the north and south, respectively, of Mutare, Manicaland's provincial capital. Both study sites lie in communal areas - formerly "tribal trust lands" - within 25km of the border with Mozambique.

A total of 2,368 individuals were enumerated on a *de jure* basis in the Honde Valley and 2,593 in the Rusitu Valley. The populations of both areas come predominantly from within the *shona* tribal grouping and, in common with many of the peoples of sub-Saharan Africa, are believed to be of Bantu origin. Of the various *shona* dialects, the *manyika* and *ndau* dialects are dominant in Honde (78 per cent and 5 per cent) and Rusitu (6 per cent and 84 per cent), respectively. Prior to the 18th century, both areas are understood to have been occupied by *manyika* people, but the *ndau* subsequently developed a more distinct dialect, principally as a consequence of the period of *gaza nguni* occupation during the 19th century [205, 206]. Around 1889, immediately prior to the colonial period, the *gaza,* who arrived, like the *ndebele*, from South Africa, migrated out of Zimbabwe into Mozambique. Many of the *ndau* people living in the Rusitu Valley today have retained *nguni* names and maintain close ties with relatives in Mozambique. As a consequence of their interaction and intermixing with the *gaza* and their relative isolation from other *shona* groups, the *ndau* have a number of distinguishing characteristics, including a distinct accent, but they are still regarded as falling within the *shona* linguistic unit [178, pp17-18]. A detailed description of aspects of *shona* culture of relevance to the study is given in Appendix D.

The eastern kingdom of Manyika is believed to have been established by the year 1512 [205] and its history up until the onset of the colonial period has been described in detail by Bhila [206]. From its early days, the Portugese exerted a strong if not deep influence on the kingdom, due to their interest in local gold deposits and trading opportunities. The Rhodesians arrived during the 1890s and the present day eastern border of Zimbabwe represents the boundary between British and Portugese spheres of influence, established at this time [205, p166]. As such, the boundary between Zimbabwe and Mozambique now divides many *manyika* and *ndau* families. Arab traders and Christian missionaries were active in the period preceding colonialism, but are not believed to have exerted much influence over local beliefs and customs [205, pp161-163].

The widespread effects of colonialism and the Liberation Struggle, which led to Independence in 1980, and of broader western and socialist influences on *shona* culture, in general, have been described by a number of authors [205, 207-210]. A brief review, based, in part, on key informant interviews and focus group discussions, was undertaken in the current study with specific reference to the Honde Valley and Rusitu Valley populations [211]. The various influences and their effects on local culture are considered in Appendix D.

3.5 Socio-Economic Characteristics of the Study Populations

3.5.1 Features of the Study Areas

The study site in the Honde Valley was centred around the growth point of Hauna, which lies on a tarred road connecting Mutare (90km), Rusape (130km) and Nyanga (60km) with the Mutasa tea and coffee estates. The area is situated between the Pungwe and Honde rivers in the shadow of the Mtarazi Falls and enjoys a temperate climate. The study area was defined by boundaries used by the Central Statistical Office in the 1992 Census. In all, the area comprised four census enumeration areas in the Samanga A Ward of Mutasa District - 12, 31, 41 and 42 - and included all or part of eight villages - Chigweshe, Nyatsanza, Pangeti, Mboto, Mandiopera, Danhama, Madziro and Samushonga. Hauna itself is a medium sized, expanding growth point, with three supermarkets, two beer halls, three bottle stores, a variety of other specialist and general stores, a petrol station, a post office and telephone exchange, and a large, solidly constructed central market place. Extensive forestry plantations lie to the west of Hauna and the Katiyo and Aberfoyle tea estates can be reached 25-30km further along the tarred road to the east.

The study area is characterized by small-scale agriculture. Maize is the principal crop, but finger millet, cowpea, sunflowers, sugarcane, avocadoes, groundnuts, yams, chilies and cotton are also grown. A variety of fruit grow in the area, including bananas, pineapples, citrus fruits and tomatoes. Local livestock include cattle, goats and chickens; there is a European Community funded dairy project based near Hauna, with 178 members - 101 men and 77 women - 114 of whom own animals. Traders take maize, bananas and other primary products to the markets at Nyanga, Rusape, Mutare and Harare. There are also regular bus services to these locations and the growth point is visited by a mobile bank. A small District Development Fund (DDF) camp is situated in the area and there is a strong Agritex (agricultural extension scheme) presence, together with an ARDA coffee-processing plant. Piped water is available at the growth point and some of the houses have access to electricity supplies and telephone connections. Outside the growth point the situation is less good. There are no other tarred roads in the area and the dirt tracks which provide access to the villages are generally in poor condition. Households located away from the growth point do not have access to piped water, electricity or telephones. The study area is served by three health clinics, at Hauna, Gatsi and Ruda, and there were separate family planning and STD clinics at the growth point and the Ruda Army Camp, respectively. There are three primary schools in the area, Ruda, Nyatsanza and St. Columba's, and the latter also runs a secondary school. The catchment areas for these clinics and schools extend beyond the boundaries of the study area. The army maintained a substantial camp - 20-30 personnel - next to the police barracks - 46 men in June 1994 - approximately 2km from the growth point until 1995. There is an air strip opposite Hauna which belongs to the DDF but is currently being used by owners of the Eastern Highlands tea estates.

The Rusitu Valley study area included the smaller growth point at Dzingire. The nearest towns are Chipinge, Chimanimani and Mutare, which are located 30km, 50km and 170km from Dzingire, respectively. The Rusitu Valley lies in the foothills of the Chimanimani mountain range and has a somewhat cooler climate than the Honde Valley, being at greater altitude. The study area borders onto the Roscommon Estate and there is another large coffee estate close by - the ARDA Rusitu Estate. As in the Honde Valley, there are forestry plantations and saw-mills nearby - Border Timbers and Forestry Commission. The area comprised five census enumeration areas situated in the Ngorima A - 41, 51 and 61 - and Chibika - 31 and 32 - wards of Chimanimani District. Five villages fell within these wards: Chingwekwe, Mukondomi, Rujeko, Kushingirira and Masvaa. The growth point is relatively small and lies at the junction between two dirt roads which connect it to Chimanimani and Chipinge, close to the Nyahode and Rusitu rivers. It has a poorly developed market area, a small number of general grocery shops, one beer hall and a bottle store.

Small-scale agriculture again predominates and a similar range of crops, vegetables and fruit are grown. Cattle, goats and chickens are found, but in rather smaller numbers than in the Honde Valley. Traders are once more in evidence and provide transport for bananas and other produce to Chipinge, Mutare and Harare. Close to Dzingire, there is a jam making co-operative, currently comprising more than eighty local female members. The co-operative buys fruit from its members, produces and cans jam, and sells it on to local shops, Agriculture Development Agency estates and others. The co-operative has been in business since 1982, when it was founded using the savings of seven local fundraising clubs and with the assistance of a community worker from the Ministry of National Affairs and Employment Creation. Since this time it has received support from a number of international non-governmental organizations [212]. There was also a fish project at Rujeko, but this is no longer operative. As in Hauna, there is a strong Agritex and DDF presence and work is currently under way to improve the local roads and central market area. There are two primary schools at Dzingire and Ndakopa and a secondary school at Ndima. There is also a secondary school at Rusitu Mission, just to the north of the study area. This Baptist mission also runs a small hospital, which is attended by two American doctors, and provides family planning services and STD treatment. Besides this, the main health facility in the area is the Ministry of Health clinic at Ngorima, close to the growth point, which also provides family planning services. There is no police camp in the area but there is a small army camp stationed at Dzingire. This is understood to have been rather larger during the war in Mozambique.

3.5.2 Characteristics of Household Heads

Details of a number of socio-demographic characteristics of household heads in the study areas are given in Table 3.2. This information is available for 921 of the 929 households enumerated in the survey. Household heads in the Rusitu Valley area are typically rather older and less well educated than their counterparts in the Honde Valley. They are also slightly more likely to be female. Patterns of employment were similar, although household heads in the Honde Valley were rather more likely to be engaged in public service or retail occupations and less likely to be involved in primary agriculture - note: many of those recorded as "unemployed" were in fact working in the informal agriculture sector. The Dzingire growth point in Rusitu is smaller than its equivalent in the Honde Valley. In part as a consequence, there is a higher concentration of in-migrant households, with relatively young, more educated household heads frequently engaged in higher status employment. There were also a number of households in Dzingire whose heads were employed by the nearby estates.

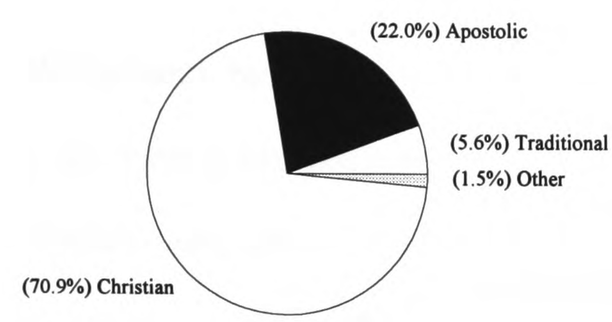
The distributions of household heads by religion are shown in Figure 3.7. These data were obtained during the follow-up Childhood Survey in 1995. The figure includes a breakdown by religious sect for household heads belonging to Apostolic or other Christian faiths. The Apostolic category is taken here - and elsewhere in this document - to include spiritualist religions such as the Zionist, Jekeniseni and GRJ churches. These religions share similar beliefs in prophetic powers and spiritual healing, but are not strictly speaking "Apostolic". Only those households which had included children under the age of 16 years in 1994 were

Table 3.2 Characteristics of household heads in the Honde Valley and Rusitu Valley

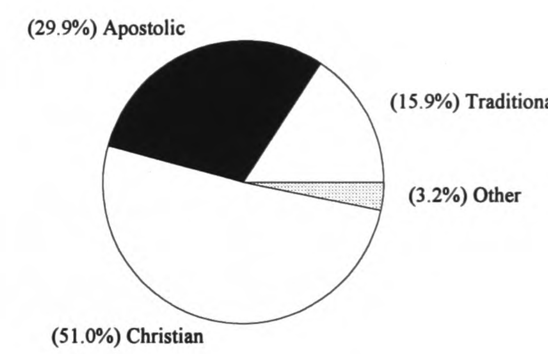
Characteristic	**Honde Valley** Growth Point	Outside Growth Point	All	**Rusitu Valley** Growth Point	Outside Growth Point	All
	%	%	%	%	%	%
Gender						
Male	73	79	77	81	73	74
Female	27	21	23	19	27	26
Age						
20-29	18	6	11	21	11	12
30-39	27	26	26	36	21	22
40-49	16	22	20	11	17	17
50-59	14	23	19	17	17	17
60-69	19	12	15	11	13	13
70+	6	11	9	4	21	19
Education						
None	3	11	8	15	22	21
Primary	50	65	59	38	51	49
Secondary	42	22	30	26	26	26
Higher	5	2	3	21	2	4
Employment Level						
Professional/managerial	15	12	13	39	10	14
Self-employed	15	13	14	10	12	12
Skilled labour	33	24	27	14	20	19
Manual/unskilled labour	17	30	25	14	26	25
Unemployed	20	21	20	24	32	31
Employment Sector						
Estates	5	5	5	29	6	9
Manufacturing or mining	9	8	8	6	8	8
Building trade	6	7	6	0	8	7
Public services or retail	41	39	40	23	28	28
Informal (incl. agriculture)	20	16	18	35	27	28
Other	19	26	24	6	23	21
Total number of households	166	263	429	54	438	492

Figure 3.7 Religion of household heads in the Honde Valley and Rusitu Valley

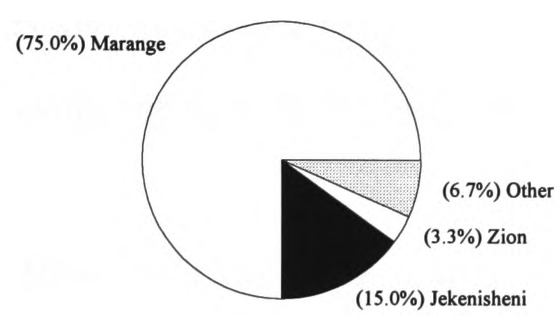
Honde Valley: Principal Religions



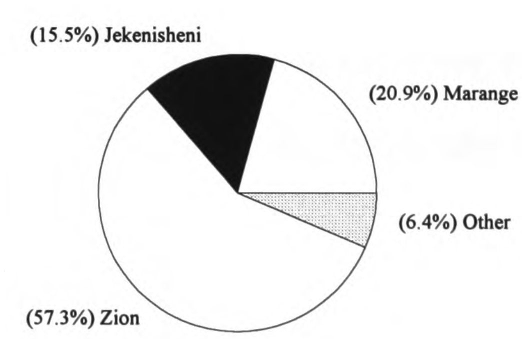
Rusitu Valley: Principal Religions



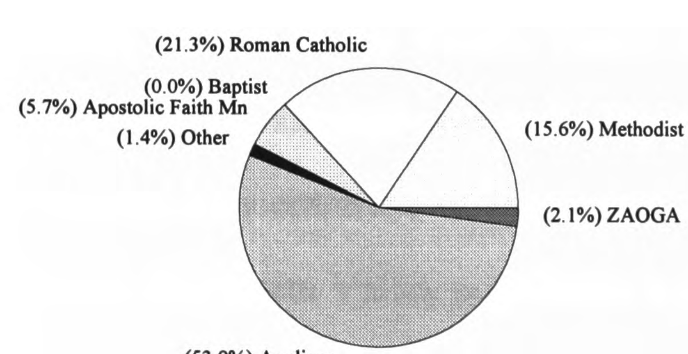
Honde Valley: Apostolic Sects



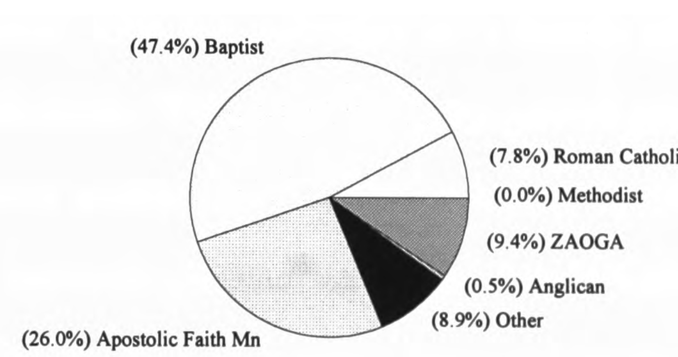
Rusitu Valley: Apostolic Sects



Honde Valley: Christian Sects



Rusitu Valley: Christian Sects



Note: Spiritualist religions (Zionists, Jekenisheni etc) have been treated here as "Apostolics".

visited, so these results are based on smaller numbers of households (79 per cent) than those presented in Table 3.2. An element of bias may be present as a consequence, because, for example, Marange Apostolic households may have been more likely to have contained children and therefore to be included in the figures than households belonging to other religious groups. Bearing this in mind, the results indicate that there is a greater concentration of Apostolics and Spiritualists in the Rusitu Valley area, but that the mix of faiths differs between the two study populations. In particular, over 90 per cent of the Apostolics in the Honde Valley subscribe to one of the more fundamentalist sects - ie: the Marange and Jekeniseni sects - compared to just over one third of Apostolic household heads in the Rusitu Valley. The significance of this finding will be considered further in section 3.5.4. Differences also exist among the Christians living in the two areas, with Anglicans forming the majority in the Honde Valley and Baptists being predominant in the Rusitu Valley. However, these differences are believed to be less significant in terms of their impact on family planning practises and associated beliefs and behaviour. Rather more household heads were reported as following the local traditional religion in Rusitu than was the case in the Honde Valley.

3.5.3 Household Type, Size and Composition

Details of the construction and facilities of households are given in Table 3.3. These show a greater concentration of more modern dwellings in Rusitu, particularly among households located away from the growth point. This would seem to reflect the greater scattering of small business centres in the Rusitu Valley area, together with the activities of a family brick making concern situated near to the Ngorima health clinic. Within the Dzingire growth point, the greater concentration of in-migrant development workers is probably a factor. In other respects, the Rusitu Valley population is generally less well off than that in the Honde Valley. There is less access to electricity, radios, televisions and more modern forms of transport, although a small number of electrical appliances running off car batteries and, in at least one instance, a solar panel, were noted. An apparent anomaly in the results is the greater presence of motorcycles in Rusitu; the more hilly terrain and the work opportunities on the nearby estates could account for this.

Table 3.3 Dwelling type and amenities in the Honde Valley and Rusitu Valley

Characteristic or amenity	**Honde Valley** Growth Point	Outside Growth Point	All	**Rusitu Valley** Growth Point	Outside Growth Point	All
	%	%	%	%	%	%
Modern construction	38	6	19	47	15	19
Modern furniture	44	16	27	47	21	24
Flush or Blair toilet	53	29	38	58	28	31
Electricity	31	2	13	19	0	2
Radio	41	22	30	47	24	26
Television	12	3	6	13	2	3
Bicycle	27	18	21	9	10	10
Motorcycle	3	2	2	19	3	5
Motor car	16	5	9	13	4	5

Table 3.4 provides information on the composition and size of households in the two areas. In terms of composition, the two populations are very similar. As might have been anticipated, given the sociological background, young men are more likely to be found living with their parents than young women, whilst younger and older women were sometimes found living with their in-laws and sons, respectively. Average household size is slightly greater in the Honde Valley than in Rusitu Valley - mean: 5.49 vs 5.25 persons. This is thought to be attributable to the larger household sizes which are common among Marange Apostolics. Households are typically smaller in the growth points.

3.5.4 Characteristics of Women of Childbearing Age

A total of 1,237 women - 593 in the Honde Valley and 644 in the Rusitu Valley - were interviewed. Data on socio-economic characteristics were obtained from 1,233 of these women and are summarized by age in Table 3.5. The results for education show the impact of post-Independence policies very clearly. In both areas illiteracy is now rare among women under the age of 30 years and secondary education is common, in contrast to the situation among older women. In the past, education levels appear to have been slightly higher in the Honde Valley than was the case in Rusitu. Levels of partner's education are very similar in each area, although the literacy rate is somewhat higher in Honde. Exposure to modern media, including newspapers, is also higher in the Honde Valley, even among younger more educated women.

Marriage - defined here as including cohabiting and long-term (over six months) unions - has been almost universal in both areas: 99 per cent of women in their 40s had been married. Median ages at first marriage, by age-group, were shown in Figure C.6 and reveal some signs of an emergent upward trend. Customary marriages are most popular and there is a suggestion in the data that religious weddings may have been more common in the past. Divorce and separation appear to be slightly more common in Rusitu, although the figures may be affected by differential remarriage rates - a point which will be investigated further in Chapter 6. A number of married women in Rusitu reported that bridewealth payments, *lobola*, had not been agreed in connection with their marriages. Just under 30 per cent of married women in both areas were in polygynous unions.

Table 3.4 Household size and composition in the Honde Valley and Rusitu Valley

Characteristic	**Honde Valley**			**Rusitu Valley**		
	Males	Females	All	Males	Females	All
	%	%	%	%	%	%
Relationship						
Head	27	7	16	26	9	17
Spouse	0	25	13	1	23	12
Child	49	40	44	46	44	45
Son or daughter-in-law	1	3	2	1	3	2
Grandchild	10	10	10	15	11	13
Parent	0	2	1	0	2	1
Sibling	2	3	2	2	1	1
Other relative	6	6	6	3	5	4
Unrelated	6	3	5	6	2	4
Household Size	Growth Point	Outside Growth Point	All	Growth Point	Outside Growth Point	All
1 person	5	3	4	18	6	7
2 person	12	7	9	20	9	10
3 person	16	16	16	20	12	13
4 person	13	11	12	9	18	17
5 person	18	15	16	9	11	11
6 person	11	17	15	9	13	12
More than 6 person	25	31	29	16	32	30
Mean	5.05	5.77	5.49	3.80	5.44	5.25
Median	4.23	4.87	4.57	2.64	4.51	4.29
Total population	833	1,517	2,350	213	2,362	2,575

Table 3.5(a) Socio-economic characteristics of women in the Honde Valley, by age

Characteristic	13-14	15-19	20-29	30-39	40-49	13-49
	%	%	%	%	%	%
Education						
None	2	1	1	10	12	4
Primary	55	38	36	73	79	51
Secondary	43	61	62	17	9	45
Literate	100	97	97	88	77	93
Partner's Education						
None	-	-	-	-	-	4
Primary	-	-	-	-	-	41
Secondary	-	-	-	-	-	55
Literate	-	-	-	-	-	95
Media Exposure						
Read newspaper	39	50	50	35	25	43
Listen to radio	24	38	33	15	23	29
Watch television	6	11	14	5	3	9
Ever Married						
Religious	0	0	6	10	37	9
Customary	0	22	58	70	49	45
Legal	0	1	9	14	13	8
Never married	100	78	26	6	1	38
Bridewealth paid	-	72	93	93	95	92
Current Marital Status						
Married or stable union	0	24	71	86	85	58
Widowed	0	0	1	6	8	3
Divorced	0	1	3	4	4	3
Separated	0	0	2	1	4	1
Single	100	75	22	4	0	35
Husband polygynous	-	29	27	33	24	29
Number of women	51	144	207	113	78	593

Table 3.5(b) Socio-economic characteristics of women in the Rusitu Valley, by age

Characteristic	13-14	15-19	20-29	30-39	40-49	13-49
	%	%	%	%	%	%
Education						
None	2	1	3	23	21	9
Primary	67	26	43	67	65	50
Secondary	32	73	54	9	14	41
Literate	94	95	92	65	68	84
Partner's Education						
None	-	-	-	-	-	5
Primary	-	-	-	-	-	41
Secondary	-	-	-	-	-	54
Literate	-	-	-	-	-	90
Media Exposure						
Read newspaper	35	39	36	15	15	29
Listen to radio	18	17	28	12	9	18
Watch television	5	10	11	4	3	8
Ever Married						
Religious	0	0	5	5	13	5
Customary	2	13	67	81	70	51
Legal	0	0	5	13	15	7
Never married	98	87	22	1	1	38
Bridewealth paid	100	71	79	84	92	83
Current Marital Status						
Married or stable union	2	15	74	82	76	56
Widowed	0	0	2	7	15	4
Divorced	0	0	7	7	5	5
Separated	0	0	3	2	2	2
Single	98	85	14	2	1	34
Husband polygynous	0	0	22	29	38	28
Number of women	66	152	192	138	92	640

Details of the employment histories of women and their partners are given in Table 3.6, by level of education of woman or partner, as appropriate. The results are very similar for both areas, except that slightly more women in the Honde Valley reported themselves as being self-employed in formal sector or other non-agricultural occupations. As might be expected, more educated women were more likely to be involved in formal sector occupations and had higher incomes. Most of the women said that they had control over how their earnings should be spent. This was confirmed by women in a focus group discussion in Kushingirira village in the Rusitu Valley, who said they used the money to buy food, clothing and other family needs. Some of the women reported that friction sometimes arose between themselves and their husbands when the latter demanded cash to pay for a drink of beer or for some unexplained use.

In both areas, job loss due to redundancy was rare for women - few having been employed - but quite common among their male partners - 13 per cent in the last three years. High proportions of the women reported sickness within the previous year, with the majority stating that they had sought assistance from a modern medical facility rather than from a *n'anga* (traditional healer). The small numbers of reported visits to *n'angas* could reflect their use as a last resort when modern methods fail. Alternatively it may be due to under-reporting of a practise thought to be disapproved of by more westernized enumerators [213]. Reporting bias may also affect the results on visits to clinics for sexually transmitted disease treatment, given the stigma which is attached to such illnesses. In general, reported attendance at health clinics and hospitals is lower amongst the population in the Honde Valley. However, it is difficult to know how much to make of this, as the Marange Apostolic minority very rarely use these services - Table 3.7. In the case of sexually transmitted diseases, these may be equally or more common among Apostolics in the Honde Valley, but go unreported because they did not result in visits to a clinic or because such visits were made but cannot be openly admitted to.

The survey results indicate that high proportions of women in the study areas were born in other areas. Many of these women moved to the study areas around the time of their marriage (Figure 3.8); a result which is borne out by the closeness of the mean ages at moving (22.4)

Table 3.6(a) Socio-economic characteristics of women in the Honde Valley, by level of education

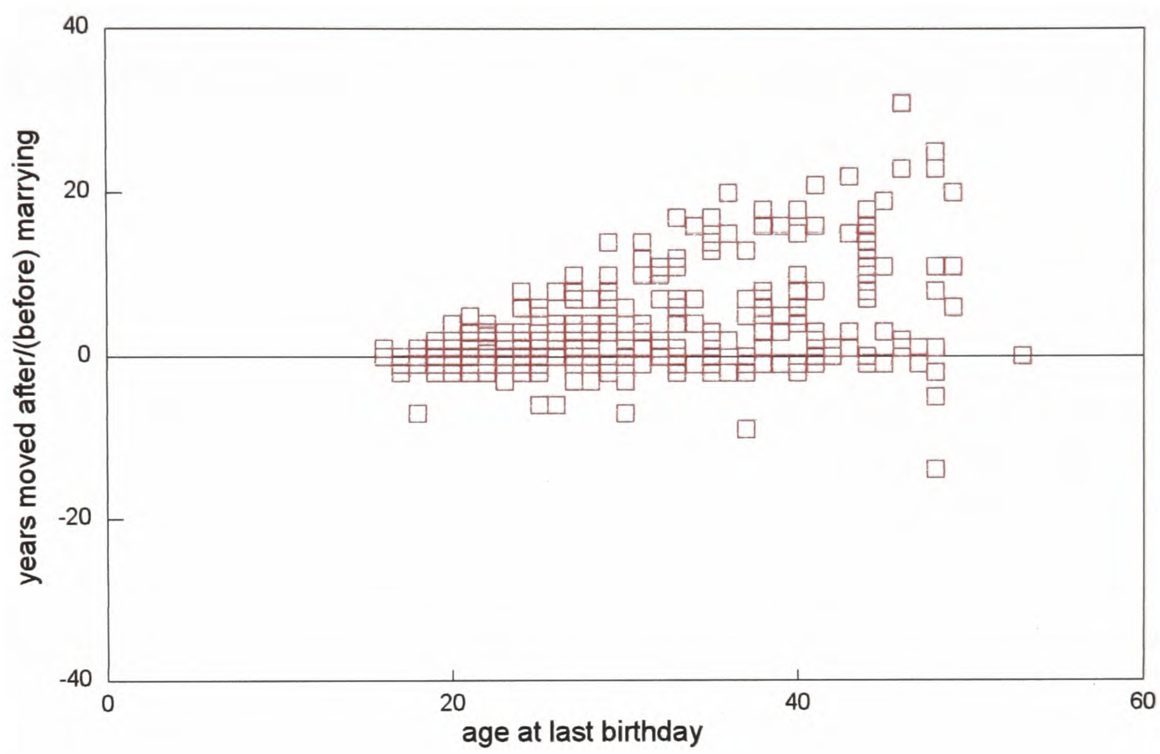
Characteristic	**none**	**primary**	**secondary**	**all**
	%	%	%	%
Employment Sector				
Informal - agriculture	16	20	9	15
Informal - other	16	18	14	16
Formal	4	12	15	13
None	64	50	62	56
Employment Status (other/formal)				
Self-employed	80	56	51	54
Family business	0	7	14	10
Employee	20	38	35	36
Average Earnings				
Average income per month (Z$ = 8p)	653	232	503	350
Control Over Use of Own Earnings				
Decides about all	78	78	81	79
Decides about some	0	14	11	13
Someone else decides	22	7	8	8
Job Loss in Last 3 Years				
Retrenchment (redundancy)	4	2	2	2
Sickness	0	2	2	2
Pregnancy	0	0	3	1
Other	12	7	8	8
No	84	89	85	87
Partner Lost Job in Last 3 Years				
Retrenchment (redundancy)	0	18	10	13
Sickness	0	3	2	2
Other	14	9	10	10
No	86	71	79	76
Health-Seeking Behaviour				
Health clinic or hospital in last year	28	40	46	43
N'anga in last year	4	12	8	10
STD treatment - ever	0	12	6	9
STD treatment - last year	0	7	5	6
Migration				
Born in current home area	40	26	30	28
Mean age at moving into area (years)	-	-	-	19.78
Previously lived in a town or city	16	16	25	20
Stayed outside area in last 12 months	20	26	40	32
Circular migration index (mean) - self	0.059	0.076	0.114	0.092
Circular migration index (mean) - partner	0.148	0.319	0.251	0.274
Total number of women	25	303	265	593

Table 3.6(b) Socio-economic characteristics of women in the Rusitu Valley, by level of education

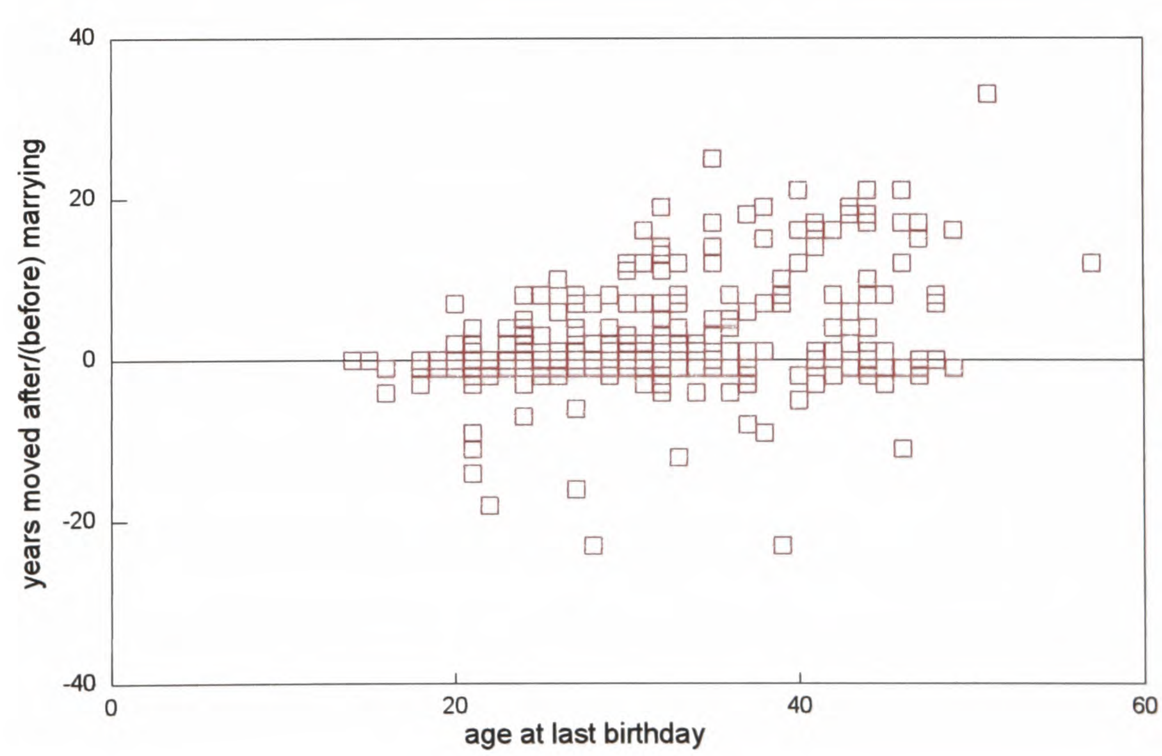
Characteristic	**none**	**primary**	**secondary**	**all**
	%	%	%	%
Employment Sector				
Informal - agriculture	16	19	10	15
Informal - other	18	15	13	14
Formal	5	8	16	11
None	61	57	62	60
Employment Status (other/formal)				
Self-employed	57	57	39	49
Family business	7	11	11	11
Employee	36	32	50	41
Average Earnings				
Average income per month (Z$ = 8p)	221	264	560	374
Control Over Use of Own Earnings				
Decides about all	92	80	77	80
Decides about some	8	14	17	15
Someone else decides	0	6	6	5
Job Loss in Last 3 Years				
Retrenchment (redundancy)	2	2	2	2
Sickness	0	2	2	2
Pregnancy	0	0	3	1
Other	5	7	8	7
No	93	89	85	88
Partner Lost Job in Last 3 Years				
Retrenchment (redundancy)	18	14	13	13
Sickness	12	3	4	4
Other	12	9	8	9
No	59	73	76	74
Health-Seeking Behaviour				
Health clinic or hospital in last year	52	58	65	60
N'anga in last year	15	9	5	8
STD treatment - ever	7	13	10	11
STD treatment - last year	5	9	6	7
Migration				
Born in current home area	33	47	45	45
Mean age at moving into area (years)	-	-	-	20.11
Previously lived in a town or city	10	9	18	13
Stayed outside area in last 12 months	23	28	45	35
Circular migration index (mean) - self	0.035	0.088	0.118	0.095
Circular migration index (mean) - partner	0.088	0.228	0.271	0.235
Total number of women	61	320	262	643

Figure 3.8 Number of years between marriage and moving into current home area, by age of woman

Honde Valley



Rusitu Valley



and at marriage (18.9). However, there were a number of older women in both areas who moved five or more years after marriage. Sizeable minorities of all women (20 per cent and 13 per cent) had previously lived in an urban area, and nearly one third had stayed outside the study area for more than one month at some time during the previous year. A series of questions regarding recent circular migration among women and their partners was included in the survey questionnaire. The results of these questions were used to compute an index of circular migration and urban contacts for each individual, $I \in (0, 1)$, using the following formula:

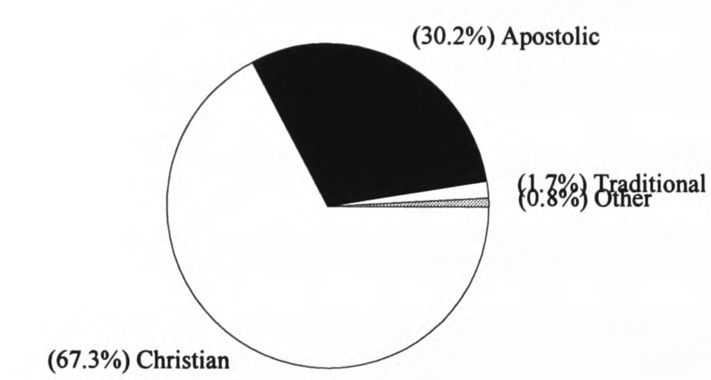
$$I = \frac{[(H + M + T) \times (4 - O) + E + R]}{93}$$

where H, M, T, E and $R \in (0, 31)$ represent the numbers of days in the past month spent visiting Harare, Mutare, other towns, estates and other rural areas, respectively, and O indicates whether the individual stayed overnight in an urban centre during the month - $O=1$, if yes; $O=2$, if no. The design of the index was aimed, in part, at picking up any additional exposure to contracting HIV-1 infection resulting from circular migration involving visits to urban areas, where HIV-1 prevalence is often higher (Chapter 4). The mean values for this index, by level of education, are shown for women and their partners in the Honde and Rusitu valleys in Table 3.6. These indicate that male partners are frequently absent from their home areas; more frequently so than is the case with their wives. Men in the Honde Valley spent rather more time away from their home areas than their counterparts in the Rusitu Valley. There was little difference between women in the two areas, but more educated women in both areas were more likely to have spent time away from home. All of these indicators emphasize the high levels of social and labour migration which are present within the study populations.

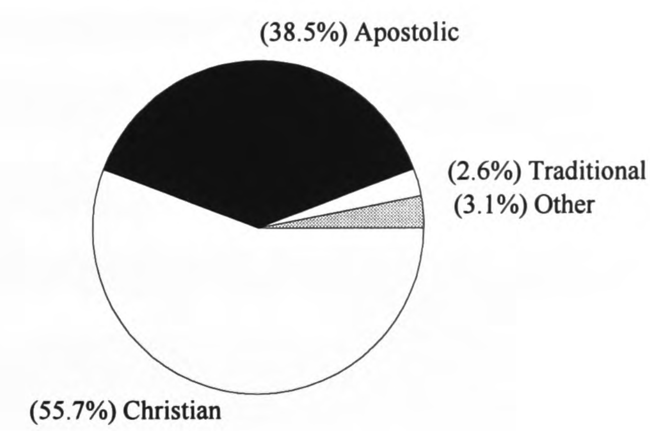
Figure 3.9 shows the religious and tribal affiliations of the women interviewed. Rather more women than household heads reported themselves as Apostolic in the Honde Valley (Figure 3.7). This is in part because Marange Apostolic men in the Honde Valley are far more likely to be polygynous than men from other religions (Table 3.7). However, it is also due to an

Figure 3.9 Religion and tribe of women in the Honde Valley and Rusitu Valley

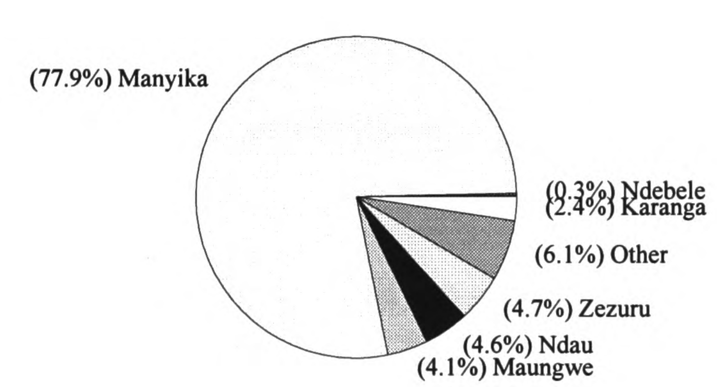
Honde Valley: Religion



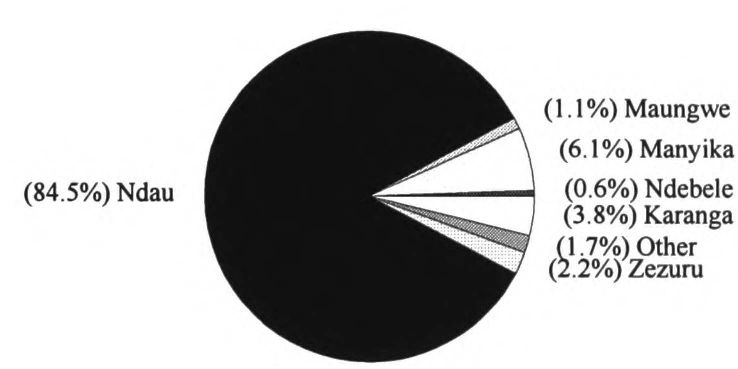
Rusitu Valley: Religion



Honde Valley: Tribes



Rusitu Valley: Tribes



Note: Women classified as Apostolic in both the Fertility and Childhood surveys who were resident in households headed by members of the Apostolic Faith Mission have been re-classifed as Christian in this figure. In all, 64 women were re-classified in this way: 8 in the Honde Valley and 56 in the Rusitu Valley. Spiritualists have been included as "Apostolics". See text for further explanation.

error in classification which came to light following the Childhood Survey. Individuals who reported themselves as belonging to the Apostolic Faith Mission (AFM) were incorrectly recorded by enumerators as being Apostolics when this is in fact a Christian church. Sixty-four women classified as Apostolic in both the Fertility and Childhood surveys, who were resident in households headed by members of the AFM, were subsequently re-classified as Christian. However, a degree of misclassification may remain within the results as presented, as not all women belong to the same churches as their household heads. Most women convert to their husbands' religions at marriage. But there may be a problem where a woman is living in a household headed by her father or father-in-law. Such a bias would be expected to be greatest in the Rusitu Valley where the AFM has a significant following.

Less of the women in the Rusitu Valley reported themselves as traditional and more said they were Christian than was the case among household heads. This could be because household heads tended to be older than the women interviewed and households of mixed religion (Traditional/Christian) are not uncommon. Indeed many Christians retain elements of traditional religious beliefs. Unfortunately, no details of the sects of Christian and Apostolic women were recorded in the Fertility Survey, as their significance was not initially appreciated. However, it is thought that the distributions of the various sects in each area broadly reflect those recorded for the household heads. The proportion of women who are Marange Apostolics may be somewhat higher than is the case for household heads because of the greater concentration of polygynous households.

The final table in this section, Table 3.7, contrasts some of the socio-demographic characteristics of Apostolic and non-Apostolic women in the study areas. The Apostolics of the Honde Valley are clearly very distinctive: they are less educated, less likely to use modern medical facilities, less likely to have been divorced or separated, but more likely to be in polygynous marriages and to have high desired and actual family sizes. A similar pattern can be seen in the Rusitu Valley, but the differentials compared to women of other religions are far less marked. In fact, it was discovered in the sociological studies and the follow-up Childhood Survey that even women from the stricter Marange and Jekeniseni sects in Rusitu found ways of accessing modern health and family planning services. The differences between

Table 3.7 Comparison of socio-demographic characteristics of Apostolic and Non-Apostolic women in the Honde and Rusitu Valleys

Characteristic	**Honde Valley**			**Rusitu Valley**		
	Apostolics	Non-Apostolics	All Women	Apostolics	Non-Apostolics	All Women
	%	%	%	%	%	%
Education						
Primary	93	97	96	87	93	91
Secondary or higher	25	53	45	31	47	41
Health-Seeking Behaviour						
Used a health clinic in last year	20	51	41	57	62	60
Ever used modern family planning	21	58	46	41	52	47
Marriage						
Polygynous husband	62	10	29	37	22	28
Divorced or separated	1	6	5	10	9	9
Fertility						
Desired family size	5.2	4.0	4.4	5.4	4.9	5.1
Total fertility rate (1989-94: ages 15-44 years)	7.0	4.0	5.0	5.2	5.0	5.2
Number of women	179	414	593	248	395	643

Note: Spiritualist religions are included in the Apostolic category.

Apostolics and non-Apostolics in the Honde Valley are important for understanding differences in recent demographic trends between the two study areas. They will be taken into consideration in the analyses of mortality, fertility and HIV-1 prevalence patterns undertaken in the following chapters.

3.6 Sexual Behaviour among Women in the Honde and Rusitu Valleys

3.6.1 Introduction

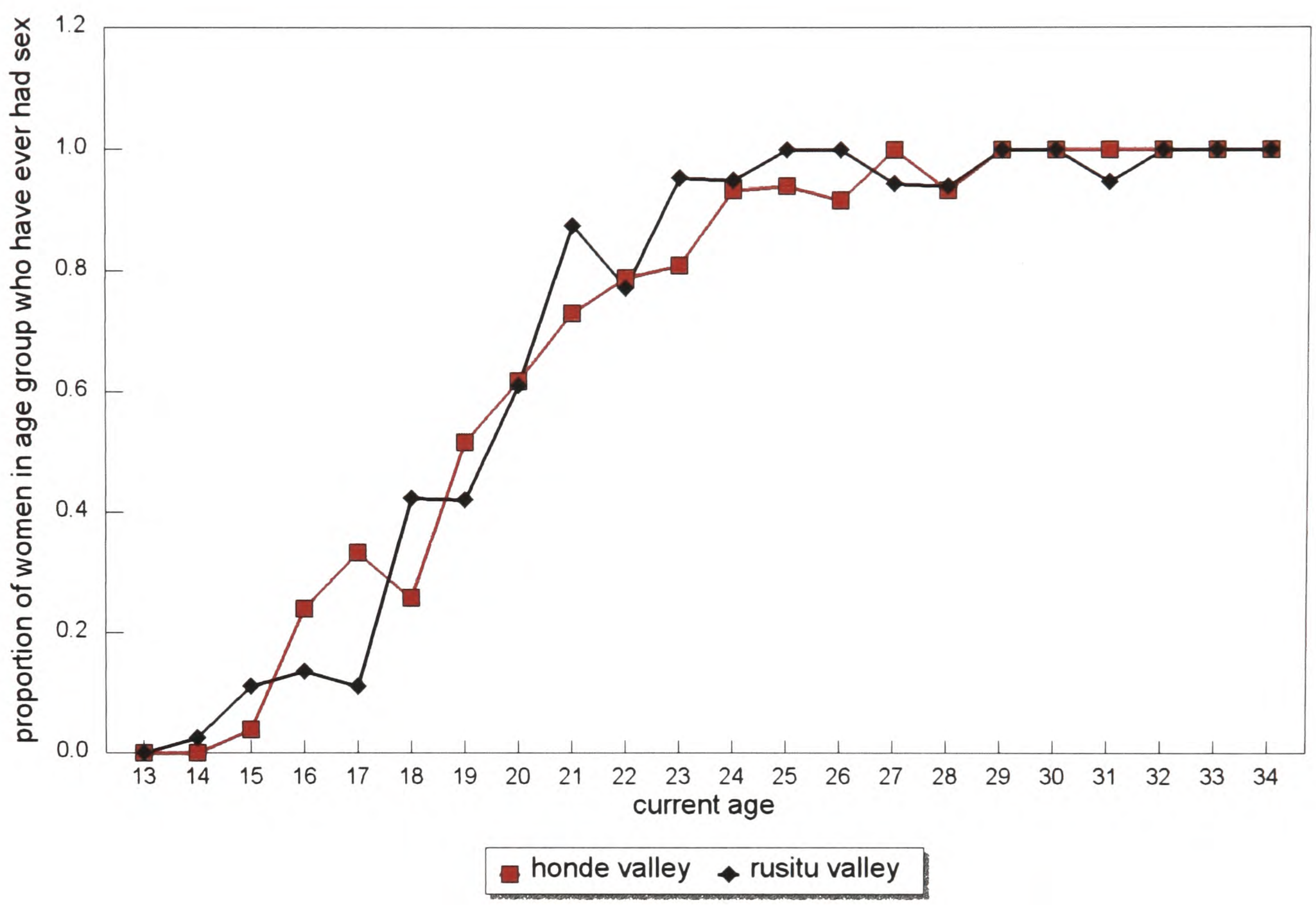
The aim of this section is to describe and quantify the patterns of sexual activity which underpin fertility and the spread of HIV-1 infection among women currently living in the study areas. The results of the statistical survey carried out following the methods described in Chapter 2 will be presented. In view of the possible reporting biases discussed in Appendix C, the statistics given must be regarded with some caution. Qualitative data obtained in the pocket-chart voting, focus group discussions and key informant interviews are used to validate and interpret the statistical results.

3.6.2 Age at First Intercourse and Universality of Sexual Experience

Almost all the women interviewed had experienced sex by their mid-20s (Figure 3.10). This finding is in keeping with results from the 1994 Zimbabwe Demographic and Health Survey, where 97.9 per cent of women aged 25-29 reported that they had had sex [157, p79]. Figure 3.10(a) shows that the pattern of onset of sexual relations is similar in the Honde and Rusitu valleys. There is a slight suggestion in the data that more women in the Honde Valley do not experience sex until their early 20s, possibly because of the higher education levels of non-Apostolics in the area. Mean and median ages at first sex are given in Table 3.8, and lie between 18 and 19 years. Seventy-five per cent and 95 per cent of women reported having experienced sex by the ages of 20 and 25, respectively. Figure 3.10(b) provides a breakdown of age at first sex by birth cohort, for the two areas combined. The data is censored by the survey date for women in their teens and early twenties. However, there appears to have been

Figure 3.10 Age at commencement of sexual activity among women aged 13-49 years in the Honde and Rusitu valleys

(a) Proportions of women reporting themselves as ever having had sex, by current age



(b) Proportions of women reporting having had sex before age X, by birth cohort

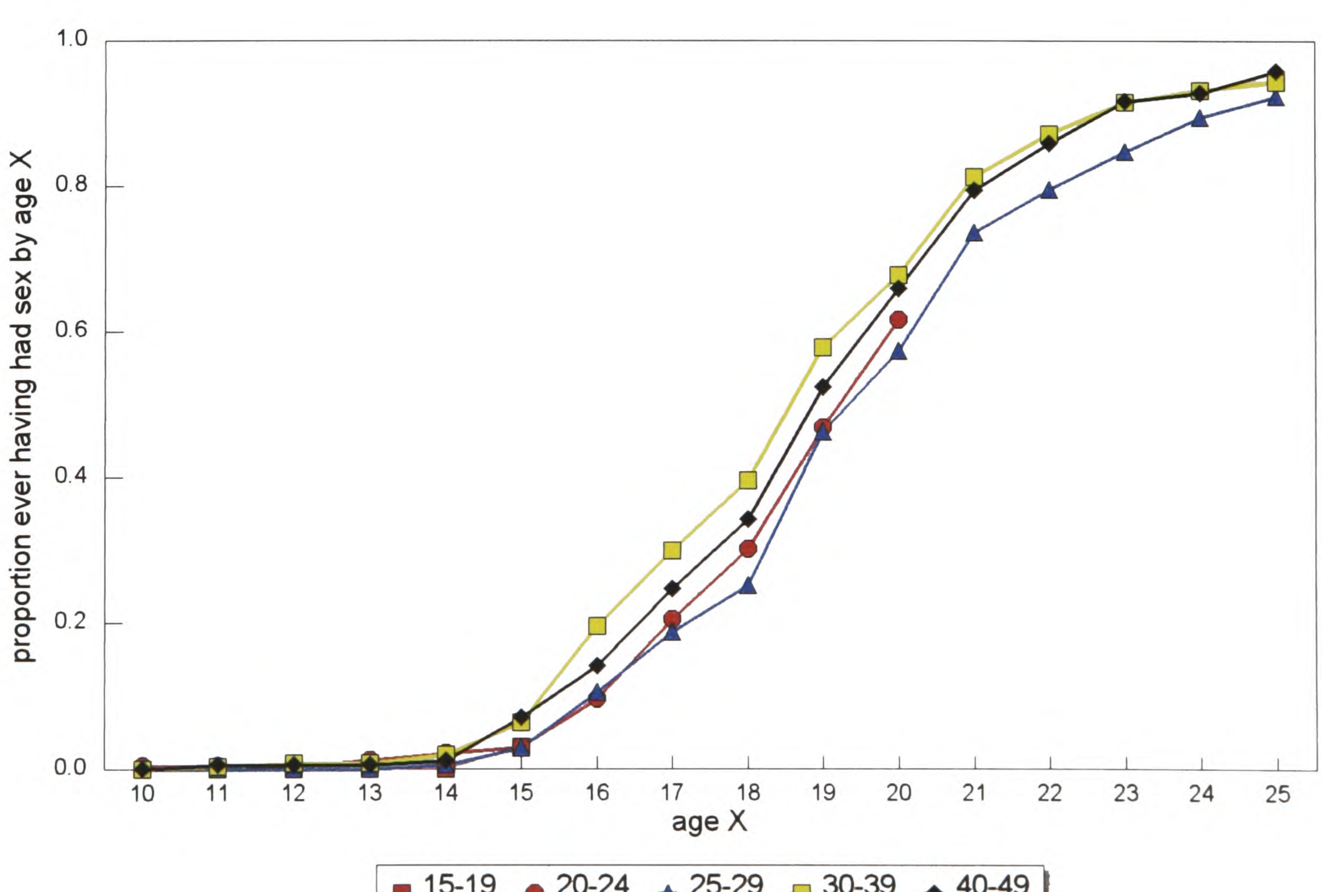


Table 3.8 Selected survey results on female sexual behaviour: Honde and Rusitu valleys combined

Aspect of behaviour	n	Mean	Standard deviation	Lower quartile	Median	Upper quartile
Age at first intercourse:						
25-29	171	19.3	2.8	17.3	18.6	20.4
30-39	251	18.5	2.0	15.8	17.8	19.8
40-49	170	18.9	2.9	16.3	18.2	20.0
All ages* - Honde	363	18.9	2.7	16.6	18.3	20.3
All ages* - Rusitu	402	18.5	2.8	16.2	18.1	19.9
All ages* - Combined	765	18.7	2.8	16.4	18.2	20.1
Days since last sex:**						
Married	354	5.2	5.1	0.8	4.2	12.1
Other stable union	38	5.9	5.7	1.8	6.6	23.7
Sexually active	25	9.5	9.3	1.1	8.2	27.1
All currently active	417	5.5	5.5	0.8	5.8	12.3
Sex acts in the last four weeks:**						
15-19	22	5.0	4.5	1.2	3.7	5.8
20-24	79	6.7	7.2	1.4	3.6	7.8
25-29	88	6.2	6.2	0.8	4.0	8.0
30-39	136	5.3	5.4	1.1	3.2	7.3
40-49	87	4.5	5.6	0.9	2.7	4.1
15-49	412	5.6	6.0	1.1	3.5	7.8
Condom use in the last four weeks:**						
15-19	19	0.4	1.1	0.0	0.0	0.0
20-24	70	1.2	3.1	0.0	0.0	0.0
25-29	76	1.2	3.8	0.0	0.0	0.0
30-39	122	0.6	2.4	0.0	0.0	0.0
40-49	79	0.2	1.4	0.0	0.0	0.0
15-49	366	0.7	2.7	0.0	0.0	0.0
Proportion of sex acts protected	-	0.13	-	-	-	-

Notes:
i Medians and quartiles computed by interpolation between ages reported in exact years.
ii Women have been assumed to start sex, on average, one quarter of a year after the (downward rounded) age reported in the calculation of the mean and median ages.
iii * Includes women currently aged 20-49 years.
iv ** Women included if "currently sexually active" - ie: not abstaining, had sex in past 3 months and partner not been away for more than three months. The mean (but not median) periods since last sex (*only*) also exclude 57 women who reported not having had sex in the last four weeks.

a movement towards later onset of sex in recent years. Whereas 37 per cent of women currently aged 30 years or above reported having had sex before the age of 18, this was reported by only 28 per cent of women currently in their 20s - absolute difference 9.3 per cent: $p < 0.001$, 95 per cent confidence interval: 2.9 per cent - 15.7 per cent. There may have been an upward reporting bias due to later marriage and disapproval of sex before marriage (Chapter 2). However, the survey question on age at first sex preceded that on age at marriage, so that the opposite effect - ie: a downward bias in age at first marriage - might be considered more plausible. Reporting errors by older women due to memory lapse may be present but it is not clear why these should have resulted in a downward bias. The possibility that the effect is genuine must therefore be considered seriously. The pattern and level of median age at first intercourse by birth cohort is very similar to that observed nationally in the latest Zimbabwe Demographic and Health Survey [157, p79].

The presence of sexual activity among non-married women is clear from the results summarized in Table 3.9. These show that significant minorities of single, divorced and widowed women are sexually active and that this is the case even for those not currently in a stable non-marital union - ie: a cohabiting or long-term - defined as having lasted more than 6 months - union.

3.6.3 Abstinence, Frequency of Sexual Intercourse and Condom Use

While the great majority of women over the age of 20 are married, many of these will be abstaining from sexual intercourse at any point in time, for one of a number of possible reasons. This can be seen from the results given in Table 3.10, which shows the proportions of women in stable unions, including marriage, who were abstaining at the time of the interview. Just over two in five of the women interviewed reported current abstinence or stated that their regular partner had been continuously away from home for more than three months. Spousal separation, primarily for work reasons (87 per cent), was the reason given in half of all cases. The median period of spousal separation for those women whose regular partners were currently said to be away from home was 4.1 weeks. Current pregnancy and recent birth - post-partum abstinence - were the next most common reasons given for

Table 3.9 Union and sexual activity status by current marital status, women aged 13-49 years

Sexual activity status	n	Single	Married	Divorced or separated	Widowed
		%	%	%	%
Married	624	-	100	-	-
Cohabiting	25	3	-	8	11
Long-term union	46	5	-	19	13
Sexually active	36	4	-	17	7
Not sexually active	506	88	-	56	69
Number of respondents	1,237	470	620	88	55

Table 3.10 Sexual abstinence, by age and reason, for women aged 15-49 years in stable unions

Form or reason for abstinence	**n**	**15-19**	**20-29**	**30-39**	**40-49**	**15-49**
		%	%	%	%	%
Reason for Abstaining						
Current pregnancy	23	9	4	3	1	3
Recent birth	76	28	13	9	4	11
Self or partner has an STD	4	2	1	0	0	1
Risk of HIV/AIDS	4	0	1	0	1	1
Terminal abstinence	4	0	0	0	3	1
Other reasons	36	9	6	4	4	5
Currently living apart	144	23	19	21	22	21
	291	70	44	37	34	42
Not abstaining	399	30	56	63	66	58
	690	100	100	100	100	100
Number of respondents		57	289	210	134	690
Period of Spousal Separation (weeks)						
Lower quartile		0.9	1.6	1.4	1.5	1.5
Median		6.8	3.8	4.0	4.3	4.1
Upper quartile		11.4	8.0	10.1	14.5	10.4
Number of respondents		11	52	37	27	127

Note: The partners of 12 women who did not report abstinence but whose partners had been living away from home for more than 3 months have been included in the "Currently living apart" category. Women whose partners *are* currently living at home have been excluded from the calculations of the median and quartile periods of spousal separation.

abstaining; these will be considered further in Chapter 6. However, it may be worth noting that post-partum abstinence was more commonly reported than abstinence due to pregnancy. This is actually quite plausible as it is believed that continued sexual intercourse is beneficial to the foetus for the first 6-7 months of the pregnancy. At this point pregnant women traditionally went to stay with their parents in preparation for the birth. It seems that this tradition is still adhered to in the study areas, particularly in the case of first births.

The information obtained on sexual activity for those women who did not report current abstinence or temporary separation from their regular partners is summarized in the centre of Table 3.8. In total, 417 (37 per cent) of the women aged 15-49 were recorded as being currently sexually active - defined here as not reporting abstinence and having had sex in the past three months. The median period since last intercourse was 5.8 days, with 25 per cent of women reporting having had sex in the last twenty-four hours. However, a further quarter of the women reported not having had sex in the previous two weeks. For women who had had sex in the past four weeks the mean period since last intercourse was 5.5 days. The median number of sex acts in the four weeks prior to the interview was 3.5, or just under once per week. The upper quartile was approximately twice per week and the lower quartile once a month. Comparison of the median reported period since last sex and the median number of sex acts in the past four weeks suggests a degree of under-reporting of the latter, perhaps of the order of 20 per cent. This may reflect the rather long period (4 weeks) over which the women were asked to recall these events. The pattern of sexual activity, by age, is rather more plausible, with women in their twenties reporting the highest numbers of sex acts.

Rates of reported condom use are low and are concentrated among a small number of women, as can be seen from the upper quartile level of zero (Table 3.8). Nine point five per cent of currently sexually active women reported any use of condoms within the past four weeks and 13 per cent of the sex acts reported were said to have been "protected" through the use of condoms. This pattern implies that the more sexually active women were more likely to report condom use, an interpretation which is consistent with the peak in usage among women in their 20s.

The results of the pocket-chart voting sessions were broadly consistent with the statistical survey findings. In a session with fifteen currently sexually active women in Rusitu, a median number of sexual encounters in the past four weeks of 3 was recorded (mean: 4). Condom use was reported by eight of the women, but only three had used condoms more than twice. In the subsequent discussion, women stated that condoms were artificial, inconvenient to use and reduced sexual excitement; it was difficult to persuade their partners to use them. It was also stated that condoms were generally associated with prostitution and disease prevention. Condoms were rarely thought of in terms of family planning. However, some women did report using them for the first few days after giving birth before starting to use the pill. Similar sentiments were expressed in a focus group discussion at Hauna.

3.6.4 Rates of Partner Change and Extra-Marital Sex

The survey questionnaire included a short set of questions on numbers of sexual partners and numbers of new partners in the previous four weeks. However, the number of women who reported more than one partner was smaller than that indicated by information obtained from the background qualitative research. In total, nine women (2.16 per cent - n=417) reported having had more than one partner and just two (0.48 per cent) reported more than two partners - one each in the Honde and Rusitu valley populations: 12 partners in each case. The qualitative research which included observation at the local beer halls and semi-structured interviews with women engaged in this work, indicated that there were probably of the order of 20-30 commercial sex workers currently active in each study area. The commercial sex workers (CSWs) met by the study team were mostly divorced or single women - similar findings have been reported in Harare - where 67 per cent of CSWs were divorcees - and Murambinda [214, 215]. A summary of the information collected at local beer halls and through key-informant interviews and focus group discussions with commercial sex workers and their clients is given in Table 3.11.

The unreliability of the data obtained on numbers of women with multiple sex partners raises doubts about the information regarding extra-marital sex obtained in the statistical survey. This is because non-reporting is liable to occur in each case because of the stigma attached

Table 3.11 Commercial sex workers in the Honde and Rusitu valleys: notes of focus group discussions and key informant interviews with women currently involved in commercial sex work

Contrasts between women interviewed in the Honde and Rusitu valleys	
Introduction	Visits were made to the principal beer halls at Hauna and Dzingire during the study fieldwork. The aim was to obtain information about the nature and extent of the commercial sex work which took place within this context and socio-demographic characteristics of the individuals involved. Discussions were held with a number of women and men involved in commercial sex and follow-up semi-structured interviews were arranged and carried out with some of the women the next day. Some interesting differences were noted between the two study locations.
Principal activities	Drinking of "Chibuku" or opaque beer, listening and dancing to music, socializing and buying and selling commercial sex. At Dzingire, cooked food was also being sold.
Age of women	The women at Hauna were in their early twenties whilst a number of those at the Nyahode beer hall in Dzingire were in their thirties.
Marital status	In both areas, the majority of commercial sex workers were divorcees. A few were single or widowed. Each of the four women interviewed in Hauna had children by a marriage which had now ended - no equivalent information was obtained in Dzingire.
Education	None of the four women at Hauna had more than 6 years of primary education.
Place of origin	The women at Hauna were all from villages bordering on the study area. The women at Dzingire fell into two groups: some stayed close to the growth point but may have come from more distant areas; the others lived in the outlying villages surrounding the growth point.
Forms of sexual activity and charges	In both areas, two forms of sexual activity were on offer: "short times" or "brief encounters", cost a minimum of Z$10 and whole night sessions, for which the charge was Z$30-50. The level of charges was similar in each location. An extra Z$10 was charged in Dzingire for sex without a condom, to cover the additional risk involved. At Hauna, the women maintained that they always insisted on condom use because they wanted to avoid contracting STDs and AIDS.
Food-sellers	In Dzingire, a number of women were found selling cooked foods inside the beer hall. At face value, they appeared to be there solely to sell food. However, it later became clear that men were going up to them on different occasions, in turns. Upon enquiry it became apparent that they were also doubling as commercial sex workers. The men were trying to negotiate a price for the night. These women said they considered themselves to be a "decent" group of commercial sex workers for they did not parade themselves like the other group of "desperate" women who hang around inside and outside the beer hall. There was no evidence of this kind of practise at the beer hall at Hauna.
Boyfriends	Several of the women at the Nyahode (Dzingire) beer hall said they also had a regular boyfriend - eg: teachers and DDF workers - who provided them with ongoing financial and practical support. When he was absent, the woman would sell sex at the beerhall. The women who reported regular boyfriends were usually those who also sold cooked food at the beer hall.
Clients	The male clients were of all ages. They included labour migrants - soldiers, policemen, development workers, teachers, traders, estate workers - and local men. The local school teachers and prominent community leaders were the focus of attention for the younger female patrons at the Nyahode beer hall. At Hauna, the commercial sex workers said they preferred the tea-pickers and local herdboys, as the soldiers, policemen and teachers were rude and often had STD infections. "Short-times" were generally preferred, as the fee for a whole night was too expensive. Some of the men at Dzingire admitted to having unprotected sex with commercial sex workers and stated that they used their "experienced eye" to tell who was likely to have an STD or HIV before deciding who to have sex with. The younger and most healthy looking prostitutes were most popular and commanded the highest fees.

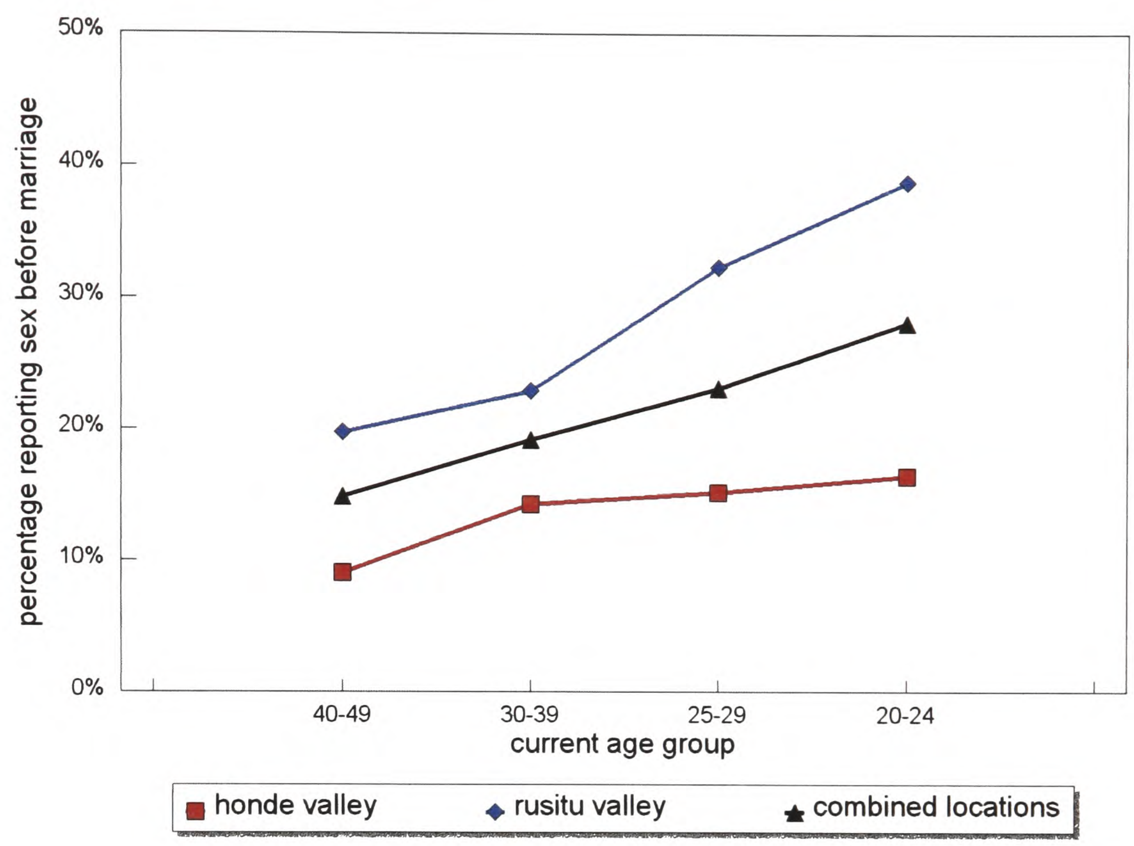
Source: Fieldnotes from visits to the beer halls at Hauna and Dzingire (Tom Zhuwau & Simon Gregson) May-June 1994 to these kinds of activities. However, the qualitative data does support the view that the great majority of women in stable unions are strictly monogamous. None of the married women in a pocket-chart voting session near Dzingire reported having had an extra-marital affair. In the subsequent focus group discussion they were adamant that they believed in the traditional idea that serious misfortune would befall them if they were to do such a thing. In the statistical survey, 99.5 per cent (1,195/1,201) of the women interviewed expressed the view that a woman in a stable union should not have sexual relations with another man.

In all, seventeen women said they had had a new partner within the past four weeks. Three women reported having a partner who was related to their previous husband; two of these were divorcees and one was a widow. Sixteen women reported having received money for sex and a further fourteen reported receiving favours of other kinds.

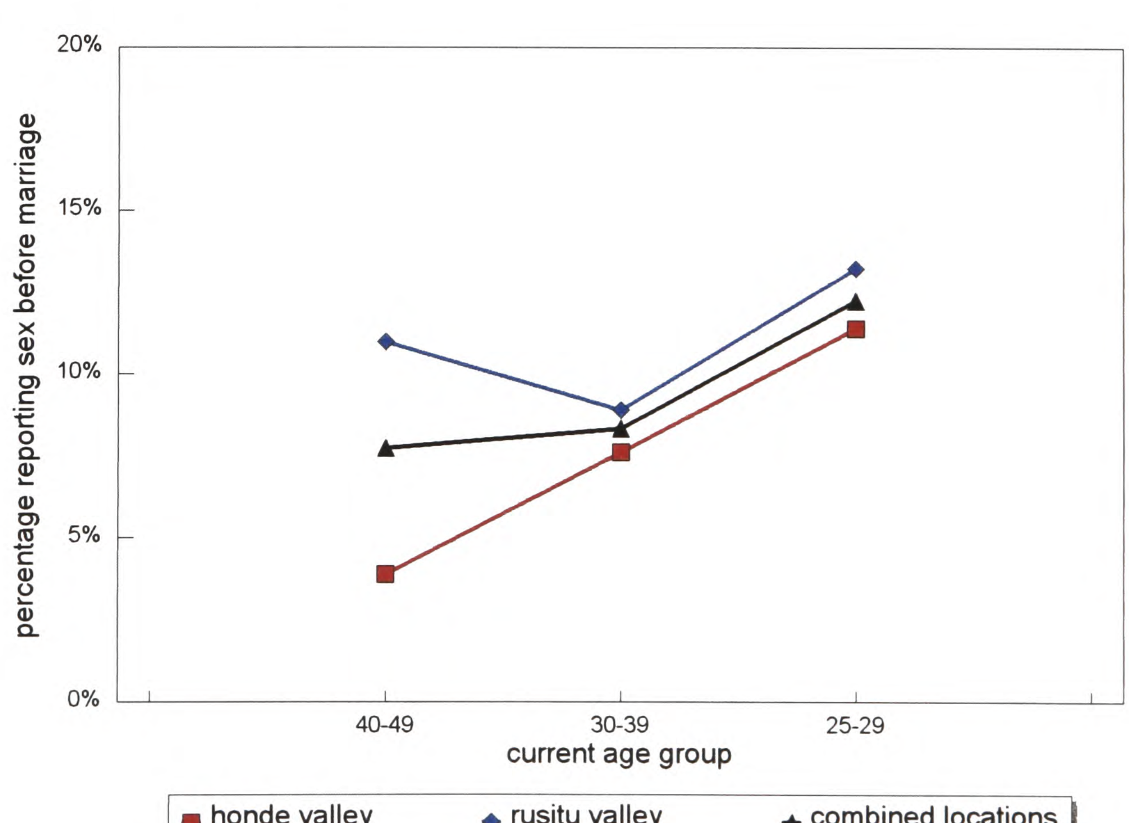
Overall, 21 per cent of women who had ever been married - excluding other stable unions - reported having had sex before marriage. However, less than half of these women (9.5 per cent) said they had commenced sexual relations more than one year prior to marriage. Sex before marriage was more common among women from the Rusitu Valley (27 per cent) than for those living in the Honde Valley (11 per cent), possibly reflecting the different religious profiles of the two areas. In both locations sex before marriage was more likely to be reported by younger women (Figure 3.11). This almost certainly reflects the recent increase in age at first marriage (Figure C.6), but also indicates a relaxation of the traditional taboo on pre-marital sex, particularly as it appears that an increasing minority commence sexual relations one year or more before marriage (Figure 3.11(b)). In these cases it is less tenable to see early sex as a preliminary to marriage, although the coincidence or otherwise of first sex partners and first marriage partners was not established in the study. The trends in Honde and Rusitu are somewhat different: in the Honde Valley the increase in reported pre-marital sex is relatively modest but more women reported sex over one year prior to marriage. This may reflect a dichotomy whereby the Marange Apostolics continue to enforce the taboo on pre-marital sex, while many non-Apostolics have abandoned it altogether.

Figure 3.11 Sex before marriage: proportions of women experiencing sex before marriage by study site and age cohort

(a) *Sex before marriage at any age*



(b) *Sex more than one year before marriage*



3.6.5 Socio-Demographic Correlates of Sexual Behaviour

Ordered logistic regression models were developed to investigate the socio-demographic correlates of sexual behaviour. A summary of the results is presented in Table 3.12. The models for age at first sex and condom use provide better fits than those for sexual activity. In the former case, this is partly due to the higher number of women represented.

Increasing age at the survey date was associated with higher reported age at first sex in the age range 15-30 years and reduced sexual activity among older women. The first of these effects is principally an artefact of the censoring of the data for younger women. There was an association between residence outside the growth points and longer periods since last sex, but this was not a significant factor in respect of sexual activity in the last four weeks. Women with secondary education were likely to start sex at older ages and were (slightly) more likely to report condom use. Being a member of an Apostolic sect was associated with younger ages at first sex and with reduced likelihood of using condoms. It was noted earlier that differences exist between the different Apostolic sects but it was not possible to distinguish these here, due to the absence of a question on the religious sects of women in the main survey questionnaire. However, it seems likely that the effects recorded are strongest among the Marange Apostolics in the Honde Valley. Many of the Apostolic women in the Honde Valley and of women of all the principal religions in the Rusitu Valley are in polygynous unions. Polygyny was found to be correlated with reduced rates of female sexual activity. More generally, being married - taken here as including other stable unions - was associated with higher reported sexual activity and a lower level of condom use.

Other factors were tested in the models but showed no significant associations. These included study location, level of education of husband or partner and staying overnight in urban areas. Younger age at first sex showed a small but non-significant positive effect on subsequent sexual activity.

Table 3.12 Socio-demographic determinants of sexual activity as reported by women aged 15-49 years

Socio-demographic characteristic	Age at first sex		Days since last sex		Sex acts: last 4 wks		Condom use: last 4 wks	
	Co-eff	p > |t|	Co-eff	p > |t|	Co-eff	p > |t|	Co-eff	p > |t|
Age								
15-19	-	-	-	-	-	-	-	-
20-24	**1.453**	0.000	DFM	-	DFM	-	DFM	-
25-29	**2.237**	0.000	DFM	-	DFM	-	DFM	-
30-39	**2.020**	0.000	DFM	-	DFM	-	DFM	-
40-49	**2.262**	0.000	DFM	-	**-0.426**	0.041	DFM	-
Location								
Growth point	-	-	-	-	-	-	-	-
Outside growth point	DFM	-	**0.423**	0.032	DFM	-	DFM	-
Education								
None	-	-	-	-	-	-	-	-
Primary	DFM	-	DFM	-	DFM	-	DFM	-
Secondary	**1.008**	0.000	DFM	-	DFM	-	**0.746**	0.037
Religion								
Non-Apostolic	-	-	DFM	-	-	-	-	-
Apostolic	**-0.334**	0.009	**-0.370**	0.087	DFM	-	**-0.810**	0.055
Marital Status								
Single	-	-	-	-	-	-	-	-
Married	-	-	**-0.980**	0.010	**0.924**	0.010	**-2.744**	0.000
Divorced/separated	-	-	DFM	-	DFM	-	DFM	-
Widowed	-	-	DFM	-	DFM	-	DFM	-
Polygynous union	-	-	**0.476**	0.024	**-0.571**	0.006	DFM	-
Sexual activity								
SEXFOUR	-	-	-	-	-	-	**0.081**	0.001
Observations	841		416		410		361	
Chi2	138.98		17.16		16.12		50.52	
df	6		4		3		4	
P > Chi2		0.0000		0.0018		0.0011		0.0000

Notes:

i The results shown derive from ordered logistic regressions performed in STATA version 3. DFM indicates those variables which were not significant and have been dropped from the model in each case.

ii The **SEXFOUR** variable indicates the number of sex acts reported in the last 4 weeks.

iii Women included in last three regressions if not abstaining, had sex in past 3 months and partner not away for over 3 months.

3.6.6 Male Attitudes and Practise regarding Sexual Behaviour

The focus here as elsewhere in this document has been on women. It should perhaps also be stressed that all the structured interviews were also carried out by women. The results therefore reflect a female perspective. The women may have felt constrained towards providing responses which complied with current social norms - and/or the perceived views of the enumerators - regarding what constitutes appropriate and acceptable female behaviour, despite reassurances that the interviews were being carried out on a confidential basis. Such norms obviously place constraints upon the behaviour which women feel able to adopt and raise doubts about their willingness to report any instances where they themselves have breached these norms. It is difficult therefore to know how these results should be interpreted.

While noting that the results shown and the biases present in the data reflect a women's perspective, it should be borne in mind that the social norms involved are determined in large part by the male dominated socio-cultural context outlined in Appendix D. Some direct insight into the male perspective regarding sexual behaviour may be obtained from the results of the pocket-chart voting and focus group discussions carried out with men in the two study areas. In the Honde Valley, twenty-three mainly older men participating in a pocket-chart voting session reported a median number of five sexual encounters in the previous four weeks. However, ten stated they had had more than seven such encounters. Condom use was low with only six men reporting any use and the highest number of occasions being four. No data was collected on sexual partner acquisition.

In the Rusitu Valley, fourteen younger men (median age: 30 years) participated in a pocket-chart voting session. The median number of sexual encounters reported was one - surprisingly low - with four of the men reporting no sex in the past four weeks. However, ten men (71 per cent) reported having had a partner other than their wife - or other regular partner - in the last month. All of these indicated that they had used condoms with their casual partners, a finding which appears to contradict the reports received from men and women engaging in commercial sex at the Nyahode beer hall (Table 3.11). The men did acknowledge that condom use could not always be guaranteed in circumstances where alcohol had been consumed.

Condom use with a regular partner was reported by five of the men. In the discussion, men gave disease prevention and avoidance of unwanted pregnancies as reasons for using condoms. These were also the most common reasons given in a national survey of Zimbabwean males, in which 40 per cent of respondents reported non-regular partners and 45 per cent of these said they used condoms during extra-marital sex [153, 216]. Partner resistance and the need to bear children were given as reasons for non-use. The former was said to be because wives felt demeaned if their husbands used condoms with them, as these were associated with commercial sex workers and prevention of disease. Condom use with wives was said to be most common in the period immediately following a birth. The minimum six-week period for wives to rest before resuming active sex recommended by family planning workers was said to be too long a period in terms of sexual control. Condoms were used to reduce the need for husbands to seek casual partners. They were preferred to other methods of contraception because they also provided protection against the spread of STDs. Until a mother's wounds were fully healed this was considered to be very important. The risk that the husband would have an STD might also be thought to be high at this time, bearing in mind the wife's period of abstinence during the latter stages of pregnancy.

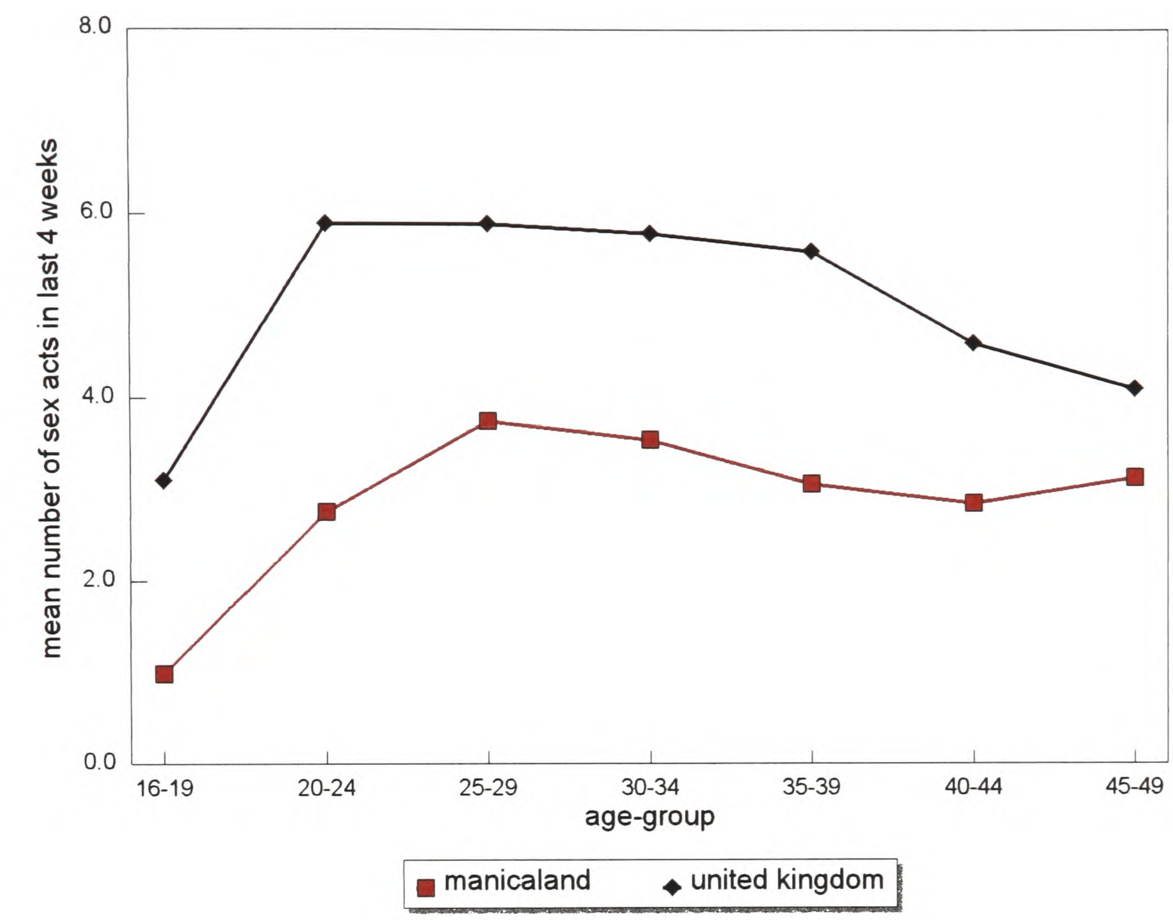
The need for birth control measures was also discussed with the men in Rusitu. One man complained that such measures could lead to a wife's being unfaithful. Others countered this by saying that men must trust their wives. They said that wives were wise enough "to know the consequences of infidelity" - these are thought to have been domestic violence and possible divorce. The men stated that they thought a husband should play the major part in family planning matters, since he was the head of the family. It was said that some wives were not willing to use modern contraceptives because they felt insecure and feared desertion if they stopped conceiving children. One man said land constraints were forcing people to reduce the sizes of their families against their will. The cost of living and economic conditions no longer allowed for larger families; otherwise "they could be multiplying like the fish in the sea". The men agreed that four children was the optimal family size.

3.6.7 Comparison of Sexual Behaviour Results with Findings from other Studies

As a final footnote to this section, it may be of interest to compare some of the above results with equivalent findings from earlier studies in sub-Saharan Africa and Europe. In a study in a rural area of north-west Tanzania, a lower mean age at first intercourse among women aged 15-49 years was recorded - 14.9 years; standard deviation 2.1 years - [149]. Mean age at first marriage was also lower than in the current study - 16.5 years vs 19 years. A figure of 0.8 was recorded for the mean number of partners in the last month compared to 0.6 for all women aged 15-49 years including current abstainers, in rural Manicaland. This rate was low in comparison to that reported by the men in the same study (1.3) and it was suggested *inter alia* that this might be due to under-reporting of rates of partner change by females and/or exaggeration by males or to under-representation of women with very high rates of partner change. The Tanzanian study recorded information on rates of partner change within a number of time periods, including lifetime to date. An interesting correlation between young age at first intercourse and subsequent high rates of partner change was found. The women reported an average of 1.7 sex acts per week, a slightly higher rate of sexual activity than was recorded in the current study. The observed differences between the two populations will in part be due to differences in culture, development and labour migration patterns and in part to differences in study methods.

Some comparisons can also be made with results from the World Health Organization's (WHO) Partner Relations and Knowledge, Attitudes, Beliefs and Practices (KABP) surveys [150]. The WHO survey in Tanzania found a very similar level - 34 per cent of women currently aged 25-29 years - and age-pattern of female sexual experience before marriage. A higher prevalence (69 per cent) and more static age-pattern of this activity was recorded in Kenya. Female extra-marital sex was rarely reported in both of these surveys - 7 per cent and 3 per cent of currently married women, respectively, reported extra-marital sex in the previous year. Non-regular partners were most frequently reported among "formerly married" women - 43 per cent and 35 per cent - but high proportions of "never married" women were also found to have had such partners - 32 per cent and 28 per cent. Direct comparisons are difficult to

Figure 3.12 Frequency of heterosexual sex in the last 4 weeks by age: Manicaland Survey results compared with data from the United Kingdom Sexual Attitudes and Lifestyles Survey, 1991



Source: Johnson *et al.*, 1994 (Table 6.1) [8] and survey data.

make here, but the overall patterns of sexual activity by marital status appear to be similar to those recorded in the current study.

Patterns of sex, contraception and childbearing before marriage as recorded in Demographic and Health Surveys in Zimbabwe and other sub-Saharan Africa countries have been studied previously [217, 218]. Pre-marital sex and pre-marital childbearing were found to be increasingly common but to vary considerably between countries. They were less common in Zimbabwe than in the majority of the other countries studied - Botswana, Burundi, Ghana, Kenya and Liberia. The impact of education on the extent of pre-marital sex and childbearing varied between countries. In Zimbabwe, increased education was associated with less pre-marital sex and childbearing.

In Figure 3.12, mean rates of sexual activity within a four week period are compared, by age-group, for women in the Manicaland Survey and the United Kingdom Sexual Attitudes and Lifestyles Survey [8]. The overall level of female sexual activity reported in Manicaland is much lower. After standardization, using the age-distribution of women in the survey, the mean rate of coital frequency for 16-49 year olds was 2.7 sex acts per four week period, compared to 5.0 in the United Kingdom. Contrasting data collection methods used in the two studies could account for some of this difference - anonymous self-completion questionnaires were used in the United Kingdom survey - and commercial sex workers may have under-reported their numbers of sex acts. However, the high level of female sexual abstinence in Manicaland (Tables 3.9 and 3.10), resulting from higher fertility, longer post-partum abstinence and extensive labour migration would seem to explain much of the difference.

3.7 Summary and Conclusions

3.7.1 Summary

Mortality rates appear to have been in decline in Zimbabwe and in Manicaland in particular during the 1970s and 1980s, but there are signs of a levelling off and a possible increase in the early 1990s. Fertility seems to have begun to fall in the late 1970s and is currently still in decline. As a consequence, the rate of natural increase in the population has been high in the recent past but slowed somewhat during the 1980s. Throughout the last 25 years there have been extensive migration flows. The most significant, internationally, were the exodus of many white Rhodesians and return of Africans around the time of Independence and the more recent influx of refugees from Mozambique. Internally, labour migration to agricultural and forestry estates and to urban centres has been a major factor, particularly for males originating in rural areas. Women are involved in shorter-term circulatory migration for social and economic reasons and frequently make long-term moves around the time of marriage. Adolescents and young adults may also migrate in order to further their education.

Traditional *shona* culture was complex and male-centred (Appendix D). It fitted the agriculture-based rural life-experience of the *shona* peoples and comprised a mesh of internally consistent beliefs and practises. The pre-colonial, colonial and post-Independence periods brought many new influences. Many of the new ideas were adopted but others were modified or blended with the pre-existing belief system. For women, the early changes appear to have been a mixed blessing, but more recently there have been some more encouraging developments. Women have become increasingly aware and assertive with respect to their human rights, although *shona* society remains very much male dominated. AIDS is liable to create further major upheavals but one positive outcome could be an acceleration in the pace of change in regard to gender roles.

Study of the socio-economic characteristics of the Honde and Rusitu valleys reveals that the two areas are broadly similar environmentally, but that there are differences in the pattern of development between the two areas. The Honde Valley area has a larger growth point and, through its location on a high quality tarred road and physical proximity, is more accessible to major towns and commercial areas. Signs of development in the Rusitu Valley site are more dispersed. A small number of "business centres" (clusters of small shops) are found in the area and the secondary roads connecting the villages are in a better condition. Important differences in the religious profiles of the two populations were identified, with the Honde

Valley population including a significant minority who belonged to the fundamentalist Marange Apostolic sect.

Marriage was found to be pretty well universal as a life course event for women. However, many currently married women reported sexual abstinence primarily due to childbearing or spousal separation linked to employment patterns. Female extra-marital sex seems to be rare. On the other hand female pre-marital sexual activity appears to be on the increase despite a rise in the mean age at first intercourse. To some extent this must reflect the increase in age at first marriage. Commercial sex is extremely common among men, regardless of their current marital status. In most cases, this involves divorced or single women, reflecting their especially weak socio-economic position. The majority of women - ie: those in stable unions - appear to have moderate rates of sexual activity. Significant minorities of men in both areas were found to practise polygyny. In the Honde Valley, polygyny was most commonly associated with the Marange Apostolic religion. Taking the two areas together, women in polygynous unions reported lower levels of sexual activity. Condom use was reported in some casual relationships. However, factors such as alcohol consumption, the desire to have children or to demonstrate commitment to a developing relationship represent considerable barriers to greater use, even outside marriage.

3.7.2 Implications for the Control of HIV-1 Infection and Family Planning

Heterosexual and vertical transmission appear to be the main routes of HIV-1 transmission in both study areas. The risks of transmission through contaminated blood during medical operations or through homosexual activity are small. The incremental risk from breastfeeding needs to be quantified in African settings and could be significant, given that this is an almost universal practise.

The nature and scale of labour migration in Zimbabwe and of its social impact, taken together with the ease of movement between urban and rural areas, probably explains the high prevalence of STDs within rural populations. Similar factors, combined with the now pre-existing high levels of these other STDs, would seem to account for the rapid spread of HIV-

1 infection to rural parts of the country during the late 1980s and early 1990s (see next chapter). Within the two rural areas of Manicaland studied here, relatively small groups of commercial sex workers and male labour in-migrants constitute core groups for the transmission of STDs including HIV-1 infection. In the Honde Valley, Marange Apostolics may be insulated from the HIV-1 epidemic, due to their relatively closed community and strictly observed social practises. More generally, it is not clear what effect polygyny might have. The presence of polygyny may reduce male extra-marital activity and women in such arrangements appear to experience lower levels of coital frequency. On the other hand, once infected, a husband is liable to spread the infection to each of his wives.

Given the patterns of sexual behaviour identified and their dominant role in *shona* culture, it is clear that men should be a particular target of HIV-1 control initiatives. In most cases men seem likely to be the first household members to become infected and are liable to pass on the infection to their wives and subsequent children. Wherever possible, further efforts need to be made to enhance the economic and social standing of women, so that they are in a better position to insist on effective precautionary measures. To a degree, family planning programmes can assist in this respect, as women with less children may be in a better position to further their education and to improve their income generating activities. However, it may be that current attempts to target men more directly in family planning programmes will need to be intensified. Many men appeared to accept the principle of family planning but others - eg: the male leaders of the Marange Apostolics - continue to advocate large family sizes. Women in the current study noted that male unemployment had been rising and that they were often taking on an increasing share of the "breadwinning" role in their households. As a result they had more control over the domestic finances. While this increased their workloads and sometimes resulted in violent disputes, there were signs that women's negotiating power with their husbands was rising. Some were beginning to question and challenge behaviour which placed them and their children at risk of HIV-1 infection.

Young unmarried women are a particular group who must be addressed by both HIV-1 control initiatives and family planning programmes. The data presented here suggests that, even in rural areas, women are increasingly becoming sexually active before marriage. As such they are at risk of HIV-1 infection and unintended pregnancies. The latter may result in premature marriage and/or abandonment of education and could restrict future life chances.

Family planning programmes have had a great deal of success in Zimbabwe and it may be that HIV-1 control initiatives can learn from this success. In the rural areas visited in the study, Community Based Distributors and Traditional Birth Attendants have helped to achieve widespread acceptance of modern methods of family planning. It may be that these or other local individuals could assist in communicating the reality of the risks and consequences of HIV-1 infection within their communities. Traditional beliefs may present obstacles but the precedent set by the family planning programmes shows that customs can be adapted relatively quickly, even when the issues involved are central to the *shona* way of life. Work has already been done with *n'angas* in Zimbabwe. For example, in ensuring that any risks of infection from contaminated instruments are minimized and to investigate the potential therapeutic benefits of involving *n'angas* in the care of infected individuals. It may be that *n'angas* could also play an important part in raising local awareness of the risks of HIV-1 infection, given their traditional role in disease prevention. They could assist in breaking down the stigma attached to people known to have HIV-1 or AIDS. As well as improving the quality of life of those who have become infected, this could lead to greater openness, which in turn might result in the prevention of some new infections.

CHAPTER 4

The HIV-1 Epidemic in Rural Manicaland: Current State and Early Social Impact

School theatre and song competition on AIDS issues in Hauna, Honde Valley, 1995.

4

The HIV-1 Epidemic in Rural Manicaland: Current State and Early Social Impact

4.1 Aims of the Chapter

The aims of this chapter are as follows:

i. To describe the current state of the HIV-1 epidemic in Zimbabwe, with particular reference to its extent and characteristics within rural areas of Manicaland; and

ii. To assess the impact of the epidemic and related control initiatives on levels of individual knowledge, experience and perceptions of personal risk of HIV-1 infection within the Honde and Rusitu valleys.

4.2 Organization of Chapter

A brief overview of the history and current state of the HIV-1 and AIDS epidemics in Zimbabwe is given in section 4.3, to provide a national and provincial context for the spread of the epidemics within the study areas in Manicaland. The results of the HIV-1 seroprevalence studies carried out in the Honde and Rusitu valleys - following the data collection procedures described in Chapter 2 - are presented and analyzed in section 4.4. In section 4.5, the survey results on knowledge, experience and perception of personal risk of HIV-1 infection are set out and discussed. Indices of knowledge and experience of HIV-1 and AIDS are derived and are used in an examination of the socio-economic determinants of these factors (section 4.6) and an analysis of reported action taken to avoid HIV-1 infection (section 4.7). The indices will be used again in Chapter 6, to examine possible relationships between knowledge, experience and perceived risk and the proximate determinants of fertility. Section 4.8 provides a discussion of the relationship between knowledge, perception of risk and action taken to avoid HIV-1 infection. The final section (section 4.9), summarizes the principal conclusions from the various analyses carried out in the chapter.

4.3 The HIV-1 and AIDS Epidemics in Zimbabwe

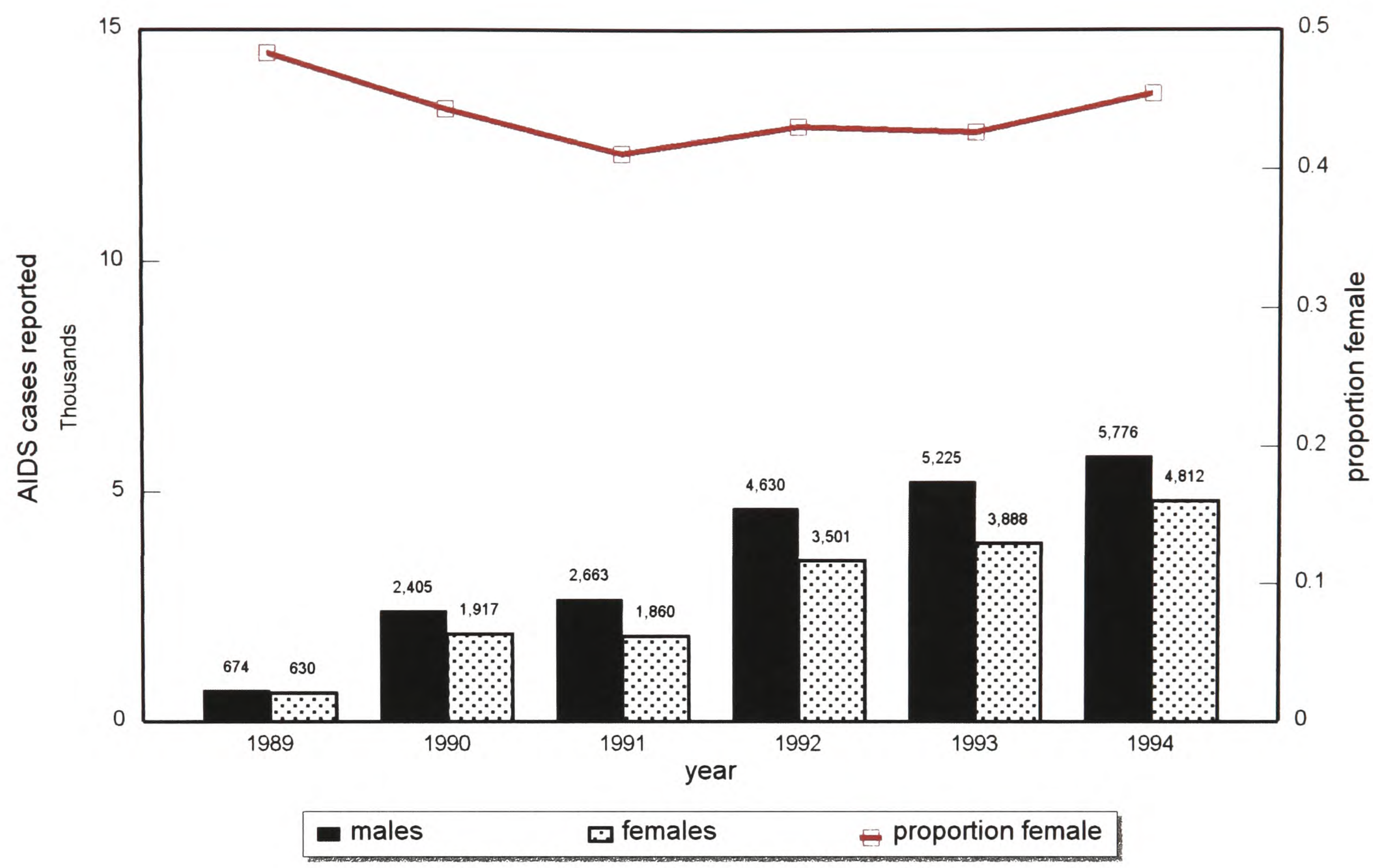
4.3.1 Early History of the HIV-1 and AIDS Epidemics in Zimbabwe

The first AIDS case in Zimbabwe was reported in 1984, although no specific AIDS Case Definition was agreed upon for the country until December 1988 [219, 220]. A nationwide AIDS surveillance system was established in April 1989 [219, 221] and the total cases recorded each year since then are shown in Figure 4.1(a). The early figures, in particular, are generally believed to be gross under-estimates [221, 222]. The Minister of Health stated in 1990 that he thought only one third of cases were being reported and that the disease should be made legally notifiable [223]. Some of the upward trend may therefore be accounted for by improvements in coverage. However, the scale of the increases, together with that of the parallel rise in numbers of reported cases of tuberculosis (Figure 4.1(b)), many of which may be directly or indirectly attributable to HIV-1 infections, points towards a rapid escalation in HIV-1 induced morbidity.

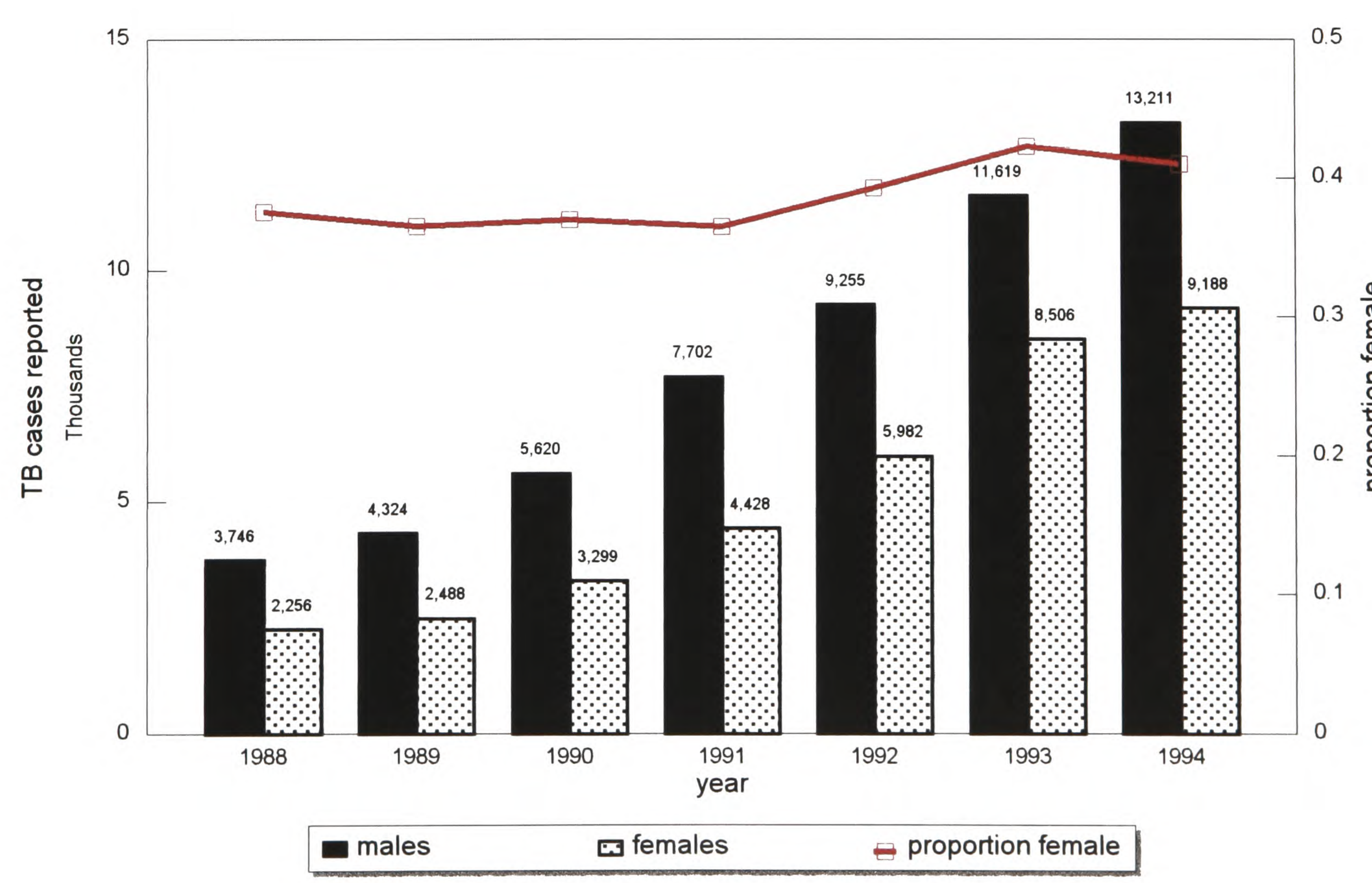
Since 1989, there has been a consistent excess in the numbers of AIDS and tuberculosis cases reported for males compared to females (Figure 4.1). However, it is difficult to know how to interpret this, as it may reflect greater coverage of male cases within the surveillance system. Figure 4.2(a) shows the numbers of AIDS cases reported per hundred thousand population between 1989 and 1994, by province. These demonstrate that AIDS has become a serious health problem in all provinces, with the major cities of Harare and Bulawayo being perhaps the worst affected over this period. Within Manicaland, Nyanga appears to be the worst affected district (Figure 4.2(b)) and the reported case rate in Mutasa is higher than that in Chimanimani. However, variations in coverage between districts are likely, so that this picture of the relative levels of AIDS incidence may be misleading.

Figure 4.1 AIDS and TB cases recorded by the Zimbabwe National AIDS Co-ordination Programme, by year: 1988-1994

(a) AIDS cases by year



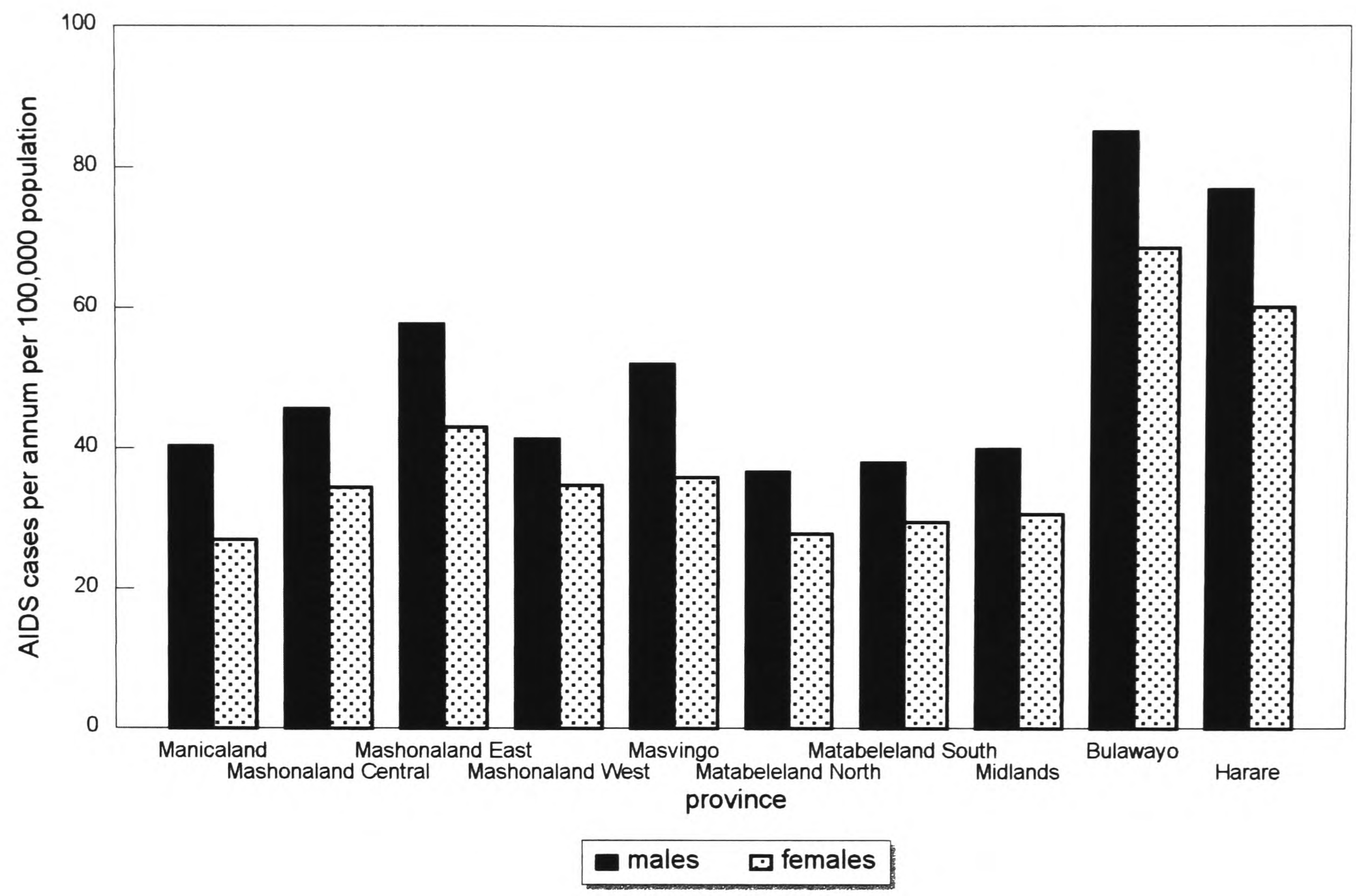
(b) TB cases by year



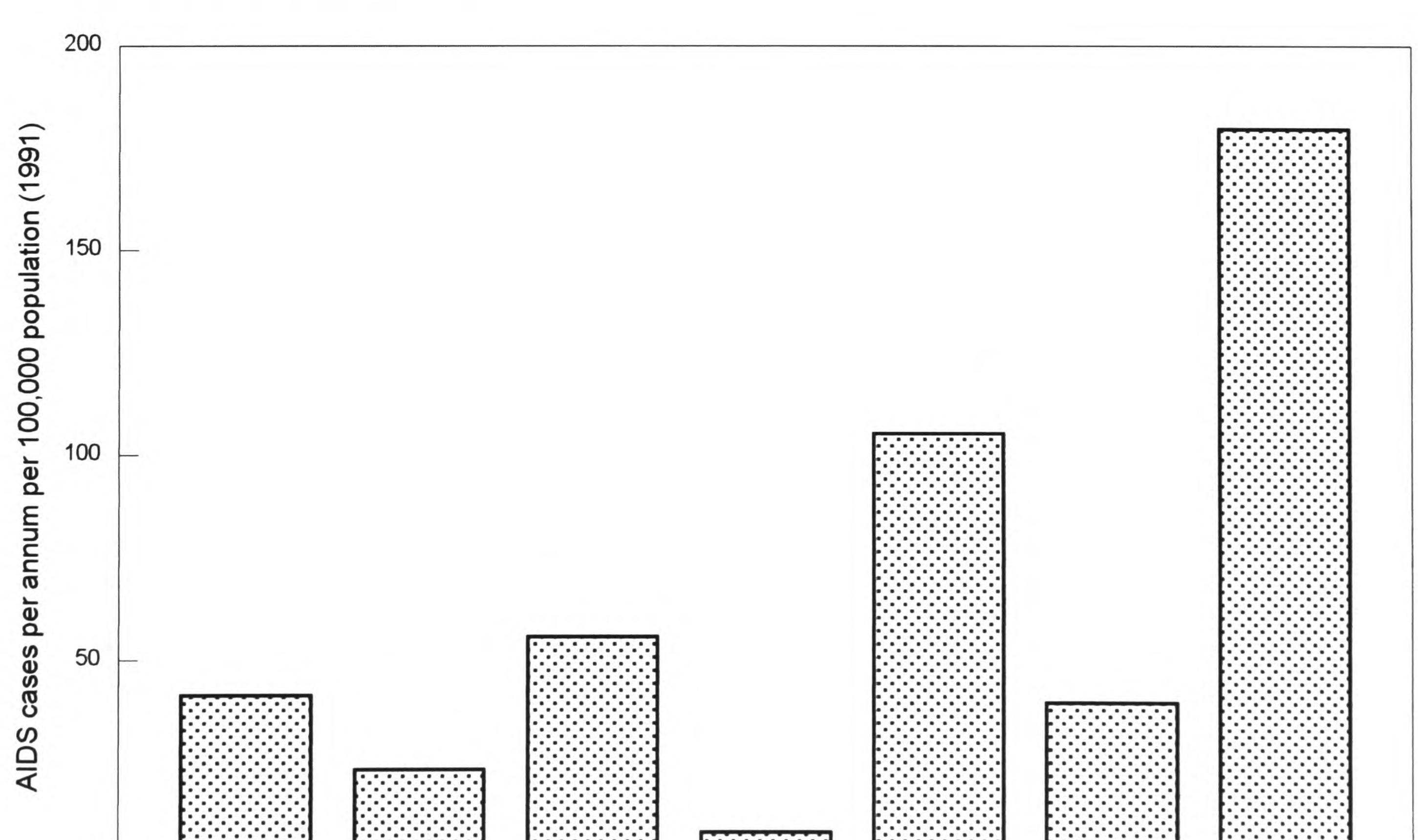
Source: Zimbabwe National AIDS Co-ordination Programme surveillance reports: [219], [226]-[229].

Figure 4.2 AIDS cases recorded by the Zimbabwe National AIDS Co-ordination Programme, by province: 1989-1994

(a) Zimbabwe, by province



(b) Manicaland, by district (1991)



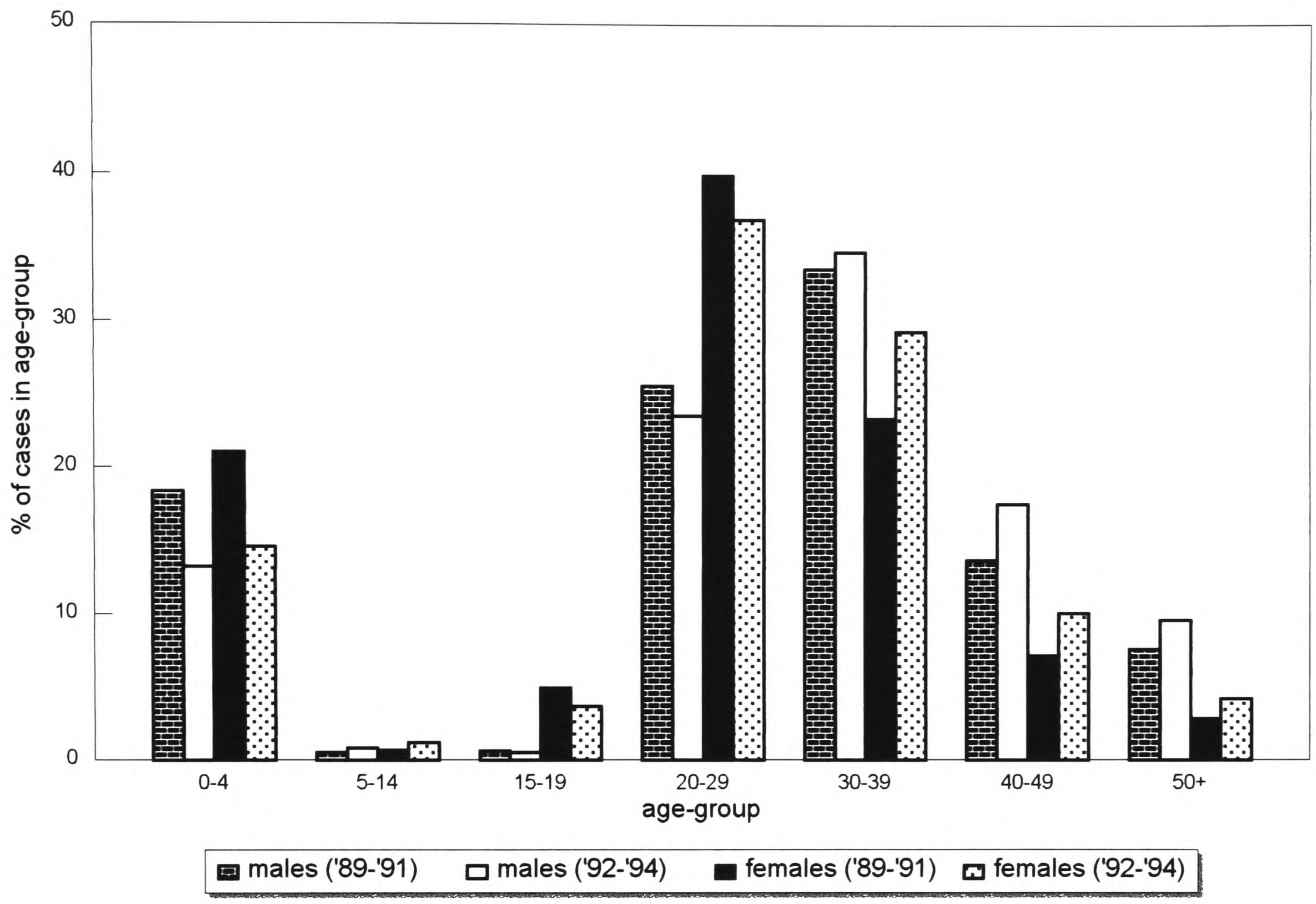
Source: Zimbabwe National AIDS Co-ordination Programme surveillance reports: [219], [226]-[229].

Figure 4.3 shows the age-distribution of reported AIDS cases for Zimbabwe. The pattern by age and sex is a familiar one for sub-Saharan African countries, with case rates peaking in the 20s for women and 30s for men [224], and suggests that heterosexual intercourse and perinatal infection are the predominant modes of HIV-1 transmission within the country. The age-distribution of reported AIDS cases has shifted somewhat towards older ages during the late 1980s and early 1990s. This has been the case for both men and women and supports the view that the rapid spread of HIV-1 infection is a recent phenomenon in Zimbabwe. This is because the first cases in an AIDS epidemic tend to be individuals who become ill after only a short period of infection with HIV-1. As an epidemic ages, AIDS cases - and AIDS deaths - become more of a mixture of individuals who were infected further into the past as well as those who experience a short incubation period [225]. Thus, for example, twenty year-olds infected in 1988, who experience a one year incubation period, would develop AIDS at the age of 21 in 1989, whilst those who experience a six year incubation period would become ill at the age of 26 in 1994. If there were relatively few HIV-1 infections prior to 1988, it would be expected that AIDS cases in 1989 would be younger on average than those diagnosed in 1994 - note: where the average incubation period is short, any trend towards a younger age profile of HIV-1 *incidence* would limit this shift in the age-distribution of AIDS cases.

In July 1985, the National Blood Transfusion Service began to screen blood donations and found that 2 per cent of donors in Harare were infected with HIV-1 [222]. HIV-1 prevalence among blood donors peaked at 5.2 per cent in 1989, fell to 2.8 per cent - 4 per cent of new donors and 1 per cent of established donors [226] - following the tightening up of donor selection criteria, and was 2.1 per cent in 1994 [227]. These figures illustrate the impact of the early measures taken to control the spread of HIV infection within Zimbabwe and indicate that blood transfusion is unlikely to have been a major vehicle for transmission in the country. However, they are of very limited value for broader surveillance purposes, because of the preliminary vetting of potential donors for known risk factors - ie: multiple sex partners and recent history of other sexually transmitted diseases [221].

A programme of sentinel surveillance for HIV-1 infection was first introduced in Zimbabwe

Figure 4.3 AIDS cases recorded by the Zimbabwe National AIDS Co-ordination Programme, by age and sex: 1989-1991 and 1992-1994



Source: Zimbabwe National AIDS Co-ordination Programme surveillance reports: [219], [226]-[229].

in 1990 and was extended in 1992 [228, 229]. World Health Organization guidelines were followed with sentinel sites being established at antenatal and STD clinics [180]. An attempt was made to obtain data from a representative cross-section of the national population, but other logistical problems also had to be taken into account during site selection, including "willingness of local staff to participate, their ability to carry out the screening procedures and the general infrastructure of the site" [228]. Unlinked anonymous testing procedures were adopted throughout the programme [228].

The results of these sentinel surveillance studies are summarized in Table 4.1, for antenatal clinic attenders, and, in Table 4.2, for STD patients. A rough categorization of the study sites according to level of urbanization is given within the tables. Rural areas, in which 70 per cent of Zimbabwe's population currently live [173], were included. However, the rural sentinel sites adopted may be atypical, as they tend to be located close to urban centres (eg: Kwekwe), in mining areas or on plantations, presumably because these are places which can provide the necessary local infrastructure. High levels of labour migration are a feature of such locations in Zimbabwe, so that the likelihood that HIV-1 infection has spread to these areas is high. Bearing this and the relatively small sample sizes in mind, the figures in Table 4.1 do seem to indicate that the highest levels of HIV-1 prevalence are currently found in urban centres, but that prevalence is also high in rural areas. There appear to be some regional variations in the current extent of the epidemic, but it is clear that few, if any, areas have escaped significant exposure to the HIV-1 epidemic. The results given in Table 4.2 suggest that individuals with recent histories of other STDs are at similar levels of risk of HIV-1 infection regardless of where they live in the country.

The sentinel surveillance programme was intended to provide information about incidence and patterns of new HIV-1 infections, as well as prevalence [221]. However, repeat surveys have only been carried out in a small number of locations, at least, in part, due to lack of resources. Where repeat surveys have been conducted, the calculation of incidence rates and the study of trends in HIV-1 prevalence are both problematic, because of the typically small population sample sizes obtained. The broad picture which emerges from the results shown in Tables 4.1 and 4.2 suggests that HIV-1 prevalence levels *may* have begun to level off in

Table 4.1 HIV-1 prevalence at sentinel surveillance sites, 1990-94: antenatal clinics

Study area	**1990**		**1991**		**1992**		**1993**		**1994**	
	%	no.	%	no.	%	no.	%	no.	%	no.
Cities										
Harare	**23.8**	282								
Chitungwiza					**29.3**	150			**28.7**	150
Bulawayo	**17.1**	304			**27.0**	na				
Mutare							**33.0**	na		
Masvingo			**42.1**	159						
Gweru			**28.1**	416			**21.2**	85		
Towns										
Hwange	**12.3**	260	**24.5**	208						
Rusape	**31.6**	294	**33.8**	388			**46.8**	187		
Chipinge										
Plumtree			**9.9**	324	**11.1**	298				
Gwanda			**16.0**	306	**21.1**	331				
Gokwe			**28.1**	303			**21.2**	278		
Bindura									**40.0**	100
Commercial Centres										
Birchenough Bridge					**16.0**	243				
Murambinda			**13.9**	251						
Mutasa Tea Estates							**15.8**	57		
Sanyati	**20.0**	295								
Mtorashanga Mines					**15.0**	100				
Binga					**17.5**	206			**16.9**	160
Shurungwi & Shabanie Mines			**20.5**	224			**16.5**	139		
Rural Areas										
Kwekwe (farmworkers)			**22.4**	58			**25.0**	100		
Mnene & Musume Hospitals	**7.7**	298					**20.0**	80		

Sources: Zimbabwe National AIDS Co-ordination Programme surveillance reports [219], [226-229], SafAIDS News, Meursing & Sibindi (1995) [319] and Plan International.

Table 4.2 HIV-1 prevalence at sentinel surveillance sites, 1990-94: sexually transmitted disease clinics

Study area	1990		1991		1992		1993		1994	
	%	no.	%	no.	%	no.	%	no.	%	no.
Cities										
Harare	**52.0**	612								
Chitungwiza					**59.3**	150				
Bulawayo			**59.0**	304						
Masvingo			**59.6**	111						
Gweru					**48.2**	305			**52.0**	75
Towns										
Hwange	**28.7**	167	**42.0**	143						
Rusape	**59.7**	196	**56.4**	94						
Plumtree			**33.0**	324	**43.1**	116				
Gwanda			**33.0**	306	**40.0**	95				
Gokwe			**48.8**	82	**32.2**	121				
Commercial Centres										
Sanyati	**45.6**	195								
Mtorashanga Mines					**39.0**	100				
Shurungwi & Shabanie Mines			**42.6**	244	**41.0**	283				
Rural Areas										
Kwekwe (farmworkers)			**45.6**	90			**56.0**	280		
Mnene & Musume Hospitals	**24.5**	196					**46.8**	77		

Sources: Zimbabwe National AIDS Co-ordination Programme surveillance reports [219], [226-229] and SafAIDS News.

some areas in the last two to three years.

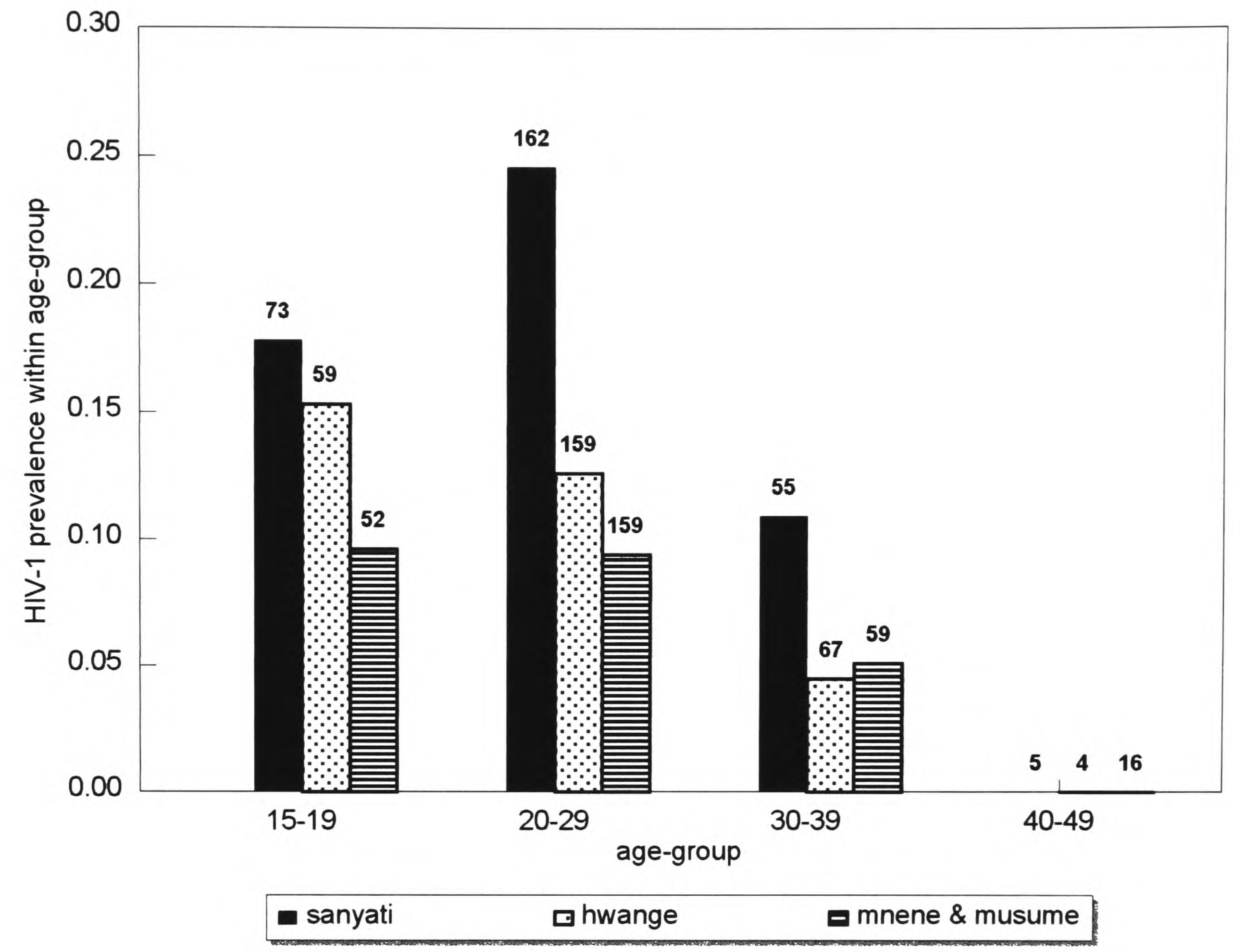
Data on HIV-1 prevalence, by age of participant, was collected in some of the early surveillance studies [221, 228] but was only analyzed in a small number of these. The results are presented in Figure 4.4. At Sanyati Hospital in Mashonaland West, HIV-1 prevalence was found to peak among women in their twenties. However, prevalence was highest among 15-19 year olds in both Mberengwa - Mnene and Musume Mines - in Midlands, and Hwange Colliery in Matabeleland North. This younger age pattern, taken together with the finding that overall prevalence levels were lower may indicate that the epidemic is more recent in the latter two areas. In all three cases, the data show that infection rates are very high among women in their late teens.

On the basis of the information summarized here, the Ministry of Health have produced estimates for the total number of people with HIV-1 infection in Zimbabwe - note: problems in extrapolation of sentinel surveillance data to wider populations will be discussed in section 4.4. These suggest that the total number increased from between 350 and 400 thousand in 1990 to between 700 thousand and one million in 1992 - ie: between 7 per cent and 10 per cent of the national population [222].

4.3.2 Epidemiological Characteristics of the HIV-1 and AIDS Epidemics in Zimbabwe

Heterosexual intercourse and vertical transmission from mothers to infants appear to be the predominant modes of transmission of HIV-1 infection in Zimbabwe [230]. This is a view which is consistent with the data available on age patterns of HIV-1 infection and AIDS incidence (see section 4.3.1), as well as what is currently known about the presence of alternative risks of infection within Zimbabwe. Screening of blood for use in transfusions commenced in 1985, at which time HIV-1 prevalence levels appear to have been low. Knowledge, attitudes and behaviour surveys suggest that homosexual activity and intravenous drug use are rare [119, 230]. Extensive work has been undertaken with traditional healers to reduce the risk of infection through the use of contaminated sharp instruments for ritual scarification, including *nyora*, which may be used as a treatment or an antidote to witchcraft

Figure 4.4 HIV-1 prevalence by age at three Zimbabwe National AIDS Co-ordination Programme antenatal clinic based sentinel surveillance sites, 1990



Note: Numbers above bars indicate numbers of women tested.

Source: National AIDS Control Programme, 1990 [228].

[231], ear piercing and other practises [232-235]. Nonetheless, a residual risk may remain, particularly in more remote rural areas.

Spread of HIV-1 infection through heterosexual intercourse may be facilitated by labour migration - including troop movements - which is especially common amongst men, who frequently use the services of commercial sex workers when away from home [222]. The combination of poverty and low status, severely limits women's power to protect themselves from HIV-1 infection [73]. Very little detailed data on rates of partner change and sexual mixing patterns is available. However, the impression gained from review of the available literature and from the sociological data obtained in the current study (see Chapter 3 and Appendix D), is that male partner change rates are high, the female population is heterogeneous, in regard to rates of partner change, and mixing between groups with varying levels of sexual activity is extensive and disassortative. This combination has been shown in theoretical work to be particularly conducive to a rapid spread of HIV-1 infection [43].

Transmission probability per sexual act or partnership is an important biological determinant of the rate of spread of HIV-1 infection. The presence of other sexually transmitted infections and absence of male circumcision are believed to increase the chances of transmission (Chapter 1). With the exception of the extreme south-east of the country and the Remba people in Mberengwa and Masvingo, male circumcision has been rare in Zimbabwe [58, 236], and other STDs, including those which cause genital ulcers, are common [227]. No direct data on rates of heterosexual transmission of HIV-1 infection are available in Zimbabwe, but it would appear that conditions are present which would tend to make these relatively high.

Perinatal transmission is also believed to be a major route of HIV-1 infection in Zimbabwe. At least one study has been established [237], but results have yet to be published. In the meantime, the large numbers of cases of AIDS among infants and young children (Figure 4.3), together with reports from neighbouring countries [134, 135], comprise the principal available evidence for high levels of vertical transmission.

The annual incidence of AIDS among HIV-1 seropositive adults was found to be 6 per cent in a study carried out at Parirenyatwa Hospital in Harare in 1990 [238]. This suggests a longer incubation period in Zimbabwe than was observed in the Masaka District of Uganda between 1990 and 1991, where the one-year progression rate to death among seropositive adults was estimated as being 10.3 per cent [133]. However, this interpretation must be regarded with caution, as the HIV-1 epidemic was at an earlier stage in Zimbabwe at this time. Recently infected individuals would therefore be more highly represented among seropositives, so that a lower level of disease progression might have been anticipated. No other data on the length of the incubation and infectious periods are available at present. Similarly, there are no systematically collected data on the length of survival periods following diagnosis of AIDS. Anecdotal evidence from the current study suggests that this is short, perhaps six months or less, in most cases, in comparison with the equivalent period of 12-18 months in Western Europe. The difference may be due to later diagnosis or faster progression to the collapse of the immune system.

The clinical characteristics of AIDS among early patients in Zimbabwe have been described [238] and case definitions developed for adults and children [220, 239]. Among adults, individuals are diagnosed as having AIDS if they have HIV wasting syndrome, persistent genital ulceration, pulmonary or extra-pulmonary tuberculosis plus one other recognized symptom, salmonella septicemia (non-typhoid), one of three prescribed viral infections, including herpes simplex in conjunction with another recognized symptom, fungal infection, protozoa, including *pneumocystis carinii pneumonia*, or malignancy, including regressive kaposi's sarcoma, <u>and</u> a positive serological test for HIV infection. Pulmonary tuberculosis has been found to be the most common disease among adults with HIV-1 infections in Zimbabwe [240]. A child is diagnosed as having AIDS if his or her mother is HIV positive and the child itself is confirmed as being HIV positive or as having received infected blood products, and exhibits one or more of a list of symptoms, including failure to thrive, acute fulminant pneumonia under the age of 1 year, tuberculosis and kaposi's sarcoma.

4.3.3 Government, NGO and Community Responses to the HIV-1 and AIDS Epidemics

Organized responses to AIDS in Zimbabwe have been described by Helen Jackson in her book "AIDS: Action Now", first published in 1988 [222]. The principal health-centred Government initiatives are summarized in Table 4.3. In addition to those listed, major initiatives have been launched by other ministries and at the provincial and district levels. Perhaps most notable amongst these has been the AIDS education programme in schools, launched by the Ministry of Primary and Secondary Education, in conjunction with UNICEF. At the national level, the Government has been energetic in its efforts to counter the spread of HIV-1 infection. However, many of the goals set have yet to be fully realised, largely because of resource shortages, which have become more acute since the introduction of the World Bank sponsored Economic Structural Adjustment Programme.

Against this background of financial constraint, Non-Governmental Organizations (NGOs) and church groups have been required to play a major role. A wide range of local, national and international NGOs have been involved and the range of activities has been impressive - see Appendix 1 in [222]. These activities have included targeted peer-group education and workplace initiatives [100, 102, 241, 242], counselling and support for individuals with HIV or AIDS and their families, including hospices, home-based care programmes and support for orphans [136, 243], and the development of community participatory training techniques and materials. Since the inception of ZAINET (the Zimbabwe AIDS Network), these have been increasingly well co-ordinated. Regional networking has also been occurring through the auspices of the Southern African Network of AIDS Service Organizations [222] and included a recent conference on AIDS and Employment held in Harare [244].

Many of these groups have been active in or originated from within local communities. For example, we came across a young man who had contacted the Family AIDS Caring Trust in Mutare to volunteer to assist in HIV-1 control work in his home area in the Honde Valley. Largely sustained by his own initiative and enthusiasm, a dynamic programme of activities, principally organized within local schools, is now under way around the Hauna growth point. More generally, community leaders are being encouraged to promote and support local initiatives. Traditional healers are increasingly seen as having a positive role to play, particularly in regard to the provision of psycho-social support within the context of home-based care programmes [222, 233]. However, it seems that much still has to be done to bring

Table 4.3 Government responses to the AIDS epidemic in Zimbabwe

Year	Event or Government initiative
1983/84	+ First AIDS cases identified in Zimbabwe
1985	+ Routine screening of blood donated to the National Blood Transfusion Centre - the third country to implement this precaution
1986	+ AIDS Advisory Committee (AAC) established
1987	+ AAC re-structured to form the Zimbabwe AIDS Health Expert Committee with several sub-committees
	+ National AIDS Control Programme (NACP) established in the Ministry of Health
	+ National AIDS Co-ordinator appointed
	+ NACP AIDS awareness campaign launched in the press, through posters, leaflets, radio and television, and through workshops for health workers
	+ NACP Short Term Plan, September 1987 to March 1988
	+ National AIDS Awareness Committee writers' workshop to produce AIDS booklets for the armed forces, schools, community workers, industry and the general public
	+ AIDS declared a reportable but not a notifiable disease
1988	+ Multisectoral National AIDS Council established to co-ordinate and monitor intersectoral community HIV and STD control activities, mobilise resources and advise Government
	+ Medium Term Plan 1, (1988-93), adopted by the NACP. Aims: to promote preventive counselling, awareness programmes, better blood screening and testing facilities, improved patient care in hospital and home care services, better surveillance and research
1989	+ Initiation of the Zimbabwe AIDS Network to promote co-ordination and communication among NGOs and with the NACP
1990	+ New Minister of Health appointed, with determination to make AIDS a prominant public issue and improve surveillance
	+ Blair Research Institute given responsibility for co-ordination of AIDS research within Zimbabwe
1992	+ NACP renamed the National AIDS Co-ordination Programme. Tasked with combining STD and HIV control
1993	+ Medium Term Plan 2 to commence. Continued emphasis on improved surveillance, control, co-ordination, counselling, home care and support measures
	+ WHO pledges $5m assistance for the Zimbabwe NACP

Source: Adapted from Jackson, 1992 [222].

home to individuals the reality of the risks they face and to encourage men, in particular, to take responsibility for their actions [245]. Prejudice and discrimination is still experienced by people with AIDS and their families, with many in society still feeling that such people have brought their problems upon themselves, and with unhelpful language and images being in common use [246-248]. Most of the attitudes and behaviour patterns which require modification are deeply rooted in local tradition and culture, as adapted to colonial and post-colonial influences, and are sustained by poverty and inequality [73, 178]. This socio-economic context needs to be understood and addressed, if interventions are to succeed - see Chapter 3.

4.4 HIV-1 Prevalence Studies in the Honde and Rusitu Valleys

4.4.1 HIV-1 Prevalence Results by Age and Location

The results of the antenatal clinic based HIV-1 prevalence studies, conducted in the Honde and Rusitu valleys, are shown in Table 4.4. The procedures followed in the studies are set out in Chapter 2.5. The overall prevalence levels found in the Honde and Rusitu valleys, were 24.3 per cent (95 per cent confidence interval: 19.6 per cent to 29.0 per cent), and 14.0 per cent (95 per cent confidence interval: 11.7 per cent to 16.4 per cent), respectively. In both areas, HIV-1 prevalence was found to peak in the 25-29 year age-group. The distribution of current infection appears to be tilted rather more towards younger women in Rusitu, than is the case in the Honde Valley. However, the numbers of older women included in the studies were small, so that the prevalence levels shown for women aged over 35 years are particularly untrustworthy. The reason there are so few older women is, in part, because there are considerably less older women in the clinic catchment areas (Figure C.2), due to adult mortality, rapid fertility and migration, but is also because the blood samples were taken from women attending antenatal clinics, who differ in certain respects from women in the population as a whole - see section 4.4.3.

Table 4.4 HIV-1 prevalence among women attending antenatal clinics, by age and study area

Age-group	Honde Valley				Rusitu Valley			
	HIV-1+	Total	No Result	% HIV-1+	HIV-1+	Total	No Result	% HIV-1+
15-19	3	24	3	**12.5**	6	43	1	**14.0**
20-24	21	85	4	**24.7**	13	79	1	**16.5**
25-29	17	48	5	**35.4**	13	57	0	**22.8**
30-34	4	23	1	**17.4**	1	37	1	**2.7**
35-39	4	17	1	**23.5**	3	35	0	**8.6**
40-49	0	6	0	**0.0**	1	9	0	**11.1**
15-49	49	203	14	**24.1**	37	260	3	**14.2**
Unknown	1	3	0	**33.3**	0	4	0	**0.0**
All ages	50	206	14	**24.3**	37	264	3	**14.0**

Note: Samples obtained from women attending antenatal clinics at Hauna, Gatsi and Ruda (Honde Valley) and Ngorima and Rusitu Mission (Rusitu Valley), March 1993 to June 1994.

4.4.2 Socio-Demographic Determinants of HIV-1 Infection

The results of an analysis of possible socio-demographic determinants of HIV-1 infection are given in Table 4.5. In univariate analyses, marital status emerges as the most significant factor in both study areas, with single and, particularly, divorced, separated and widowed women (combined due to small numbers) being at greater risk of infection. Age and location also register as significant factors, with women in the Honde Valley being at greater risk of current infection than their counterparts in the Rusitu Valley. Level of education and parity are significant factors in the Rusitu Valley, where women of high parity appear to be at lower risk than those with lower fertility. However, both of these factors are highly correlated with age.

When logistic regression is used to control for confounding, the effects of age and marital status remain significant in both locations. In the Honde Valley, women in their twenties are more than twice as likely to be infected as those currently aged 15-19 years (OR: 2.27), while in Rusitu the odds ratio is 1.45. In both areas, women aged 30 years and over are at less risk of being infected than those in their teens, although HIV-1 prevalence remains at high levels among older women in the Honde Valley. The young age-distribution of current infection implies high incidence rates at young ages and is consistent with a relatively recent spread of infection, particularly in Rusitu, assuming an average incubation period for AIDS of five years or more. It suggests high levels of unprotected sexual activity among young women, at least amongst those seen at antenatal clinics (see section 4.4.3).

Currently married women appear to be at lower risk of infection than non-married women in both areas. Very few divorced, separated or widowed women were seen at the antenatal clinics, reflecting both the low overall prevalence of these forms of marital status and the *relatively* low level of extra-marital fertility, compared to marital fertility (Chapter 6). A further factor here may be the disapproval of female extra-marital fertility within *shona* culture [178]. Non-married women who do become pregnant may be less likely to attend antenatal clinics and, when they do, may be unwilling to admit that they are not married. To a degree, the latter problem may have been limited by the fact that most women and their

Table 4.5 Socio-demographic determinants of HIV-1 infection in the Honde and Rusitu Valley

Independent variable	**Honde Valley**		**Rusitu Valley**		**Combined**	
	Obs	P>Chi2	Obs	P>Chi2	Obs	P>Chi2
Bivariate Analysis						
Aged over 30	202	0.216	260	0.012	462	0.005
Married	168	0.017	258	0.006	426	0.000
Education level	189	0.525	248	0.017	437	0.062
Parity	176	0.823	251	0.013	427	0.079
Location	-	-	-	-	470	0.005
	Obs	**OR**	Obs	**OR**	Obs	**OR**
Multivariate Analysis						
Age:						
15-19	19	**1.00**	39	**1.00**	60	**1.00**
20-29	107	**2.27**	130	**1.45**	243	**1.89**
30+	39	**0.84**	75	**0.50**	118	**0.60**
Marital Status:						
Single	12	**1.00**	9	**1.00**	21	**1.00**
Married	147	**0.52**	232	**0.11**	391	**0.27**
Divorced/Widowed	6	**4.97**	3	**0.00**	9	**1.41**
Education:						
None	9	-	41	**1.00**	50	-
Primary	82	-	140	**0.91**	222	-
Secondary	61	-	63	**1.96**	124	-
Location:						
Honde Valley	165	-	-	-	165	**1.00**
Rusitu Valley	-	-	244	-	256	**0.64**
Observations	165		244		421	
Chi2	10.84		18.95		27.85	
df	4		5		5	
P > Chi2		0.028		0.002		0.000
Constant	-1.188		0.118		0.092	

Notes:

i These results derive from logistic regression analyses carried out using STATA version 3.

ii Variables were included in the model where their addition improved the fit (log likelihood). In the case of the Rusitu Valley, the improvement in the fit following inclusion of education were not statistically significant at the 95% level. This was also the case with the inclusion of location in the model for the aggregate data.

personal circumstances are known to the nurses, who administered most of the questionnaires. One third of the questionnaires in the Honde Valley sample were administered by the Project Sociologist, who took additional steps to combat this problem, and this may account for the higher numbers of unmarried women recorded in the sample there. The greater level of development and consequently higher age at first marriage in the Honde Valley may also be a factor. Four out of the six divorced women in the Honde Valley sample were infected with HIV-1, as was the only currently widowed woman. In Rusitu, two divorced women were seen at the antenatal clinics but neither was infected. Single women were at increased risk of infection, particularly in the Rusitu Valley. However, the numbers are again small - 21 women in total.

The impressions gained from the focus group discussions, pocket-chart voting sessions and key informant interviews - eg: with women engaged in commercial sex work - indicate that the principal risks of infection for women are multiple partners prior to marriage, infidelity on the part of husbands during marriage, and commercial sex work among single, widowed and particularly, divorced women (Chapter 3). The patterns of association between age, marital status and prevalence of HIV-1 infection appear to be consistent with this picture.

In the Rusitu Valley, the model (log likelihood) is improved by the inclusion of level of education, although this improvement is not significant at the 95 per cent level. Women with primary education appear to be at slightly lower risk of infection, while those with secondary education or above are at greater risk. A similar pattern of risk has been noted in a study in Uganda [114]. Furthermore, in a recent cross-national study, men and women with secondary education and above were found to be more likely to report themselves as having had non-regular sex in the preceding twelve months [150]. Level of education is very closely associated with age in the study areas *($p < 0.001$)*, with younger women being much more likely to have received secondary education. The true effect of greater education may therefore be partially obscured by the inclusion of age in the model.

One possible explanation for higher rates of infection among more educated women is that these could be due to their tendency towards later age at marriage. This could result in longer periods between first becoming sexually active and getting married, and higher numbers of sexual partners prior to marriage. Their exposure will also have been greater where they have travelled more widely and have been less closely restricted by traditional social controls, which remain a factor in more rural areas. As a result, they may be more likely to come into contact with higher risk male partners - eg: in urban centres, where HIV-1 prevalence levels are frequently greater (Table 4.1). More educated women may also feel that the disadvantages of pre- and extra-marital relationships are smaller. In general, they are more likely to use effective methods of contraception and, because they can be more economically self-reliant, the risks and consequences of being found out may seem less severe. If this is the case, greater acceptance of condoms for use in casual relationships could lead to a reduction in the differential. However, the problem remains that many pre-marital unions are not regarded as casual and condoms are generally not seen as appropriate for other forms of relationships.

After controlling for age and marital status, the effect of parity ceases to be significant. Women of high parity living in the Honde Valley remain at greater risk, but the effect is only significant at the 90 per cent level. Overall, the optimal model obtained using the factors for which data is available, provides a good fit for the Rusitu Valley data ($p < 0.005$). The model for the Honde Valley is rather less satisfactory ($p < 0.05$) suggesting that other factors may be important, although it should be noted that the sample size is smaller.

4.4.3 Extrapolation of Results to the Study Populations: Selection Effects

Ideally, representative samples of the study populations would have been tested for HIV-1 infection in order to establish the relative levels of HIV-1 prevalence in the two areas. However, at the time the study was approved, the Zimbabwe Ministry of Health had a policy of sentinel surveillance for HIV-1 infection and would not authorize a population-based serosurvey. As a consequence, it was only possible to carry out testing for HIV-1 infection at antenatal and STD clinics, in accordance with national guidelines. This being the case, potential problems arose regarding the representativeness of the women tested of those living in the study areas, as a whole. The nature and extent of these difficulties are assessed in this section.

Contrasting Age-Distributions of Sample (ANC) and Study Populations

Perhaps the most important source of bias arises from the differences between the age distributions of the sample and study populations, which are illustrated in Figure 4.5. In both areas, women aged in their twenties are over-represented in the sample populations, whilst teenagers and women over 40 years old are under-represented. As the twenties age-group is also the age range which exhibits the highest rates of HIV-1 prevalence (Table 4.4), the average level of current HIV-1 infection found at the antenatal clinics, exaggerates that which exists in the general population of women aged between 15 and 49 years. The effect is most acute in the Honde Valley, where the higher levels of development and female education, have lead women to start childbearing at slightly older ages and have lower fertility in their thirties and forties - ie: the fertility peak in the early 20s is most pronounced (Chapter 6).

Where data is available on the age-structures of both the women tested and those in the general population, estimates of the overall level of HIV-1 prevalence among the general population, can be obtained, which control for differences in age-distribution, by using standardization. This can be done by applying the age-specific levels of HIV-1 prevalence found at the antenatal clinics (Figure 4.6) to the proportions of all women, who are found in each age-group within the general population (Table 4.6). For example, by assuming that the same proportion of women aged 20-29 years in the general population are infected as were found to be infected at the antenatal clinics - ie: 28.6 per cent and 19.1 per cent in the Honde and Rusitu valleys, respectively. When this is done, revised estimates for HIV-1 prevalence among women aged 15-49 years in each of the two study populations are obtained: 18.4 per cent and 13.2 per cent for the Honde and Rusitu Valleys, respectively. Both estimates are somewhat lower than the average values obtained from the antenatal clinic data, and the differential between the two areas is reduced.

Marital Status

Further concerns surround the representativeness of the sample populations with respect to patterns of marital status. Unmarried women attending antenatal clinics have been shown to

Figure 4.5 Age distributions of women attending antenatal clinics and those aged 15-49 in the general population as a whole: Honde and Rusitu valleys

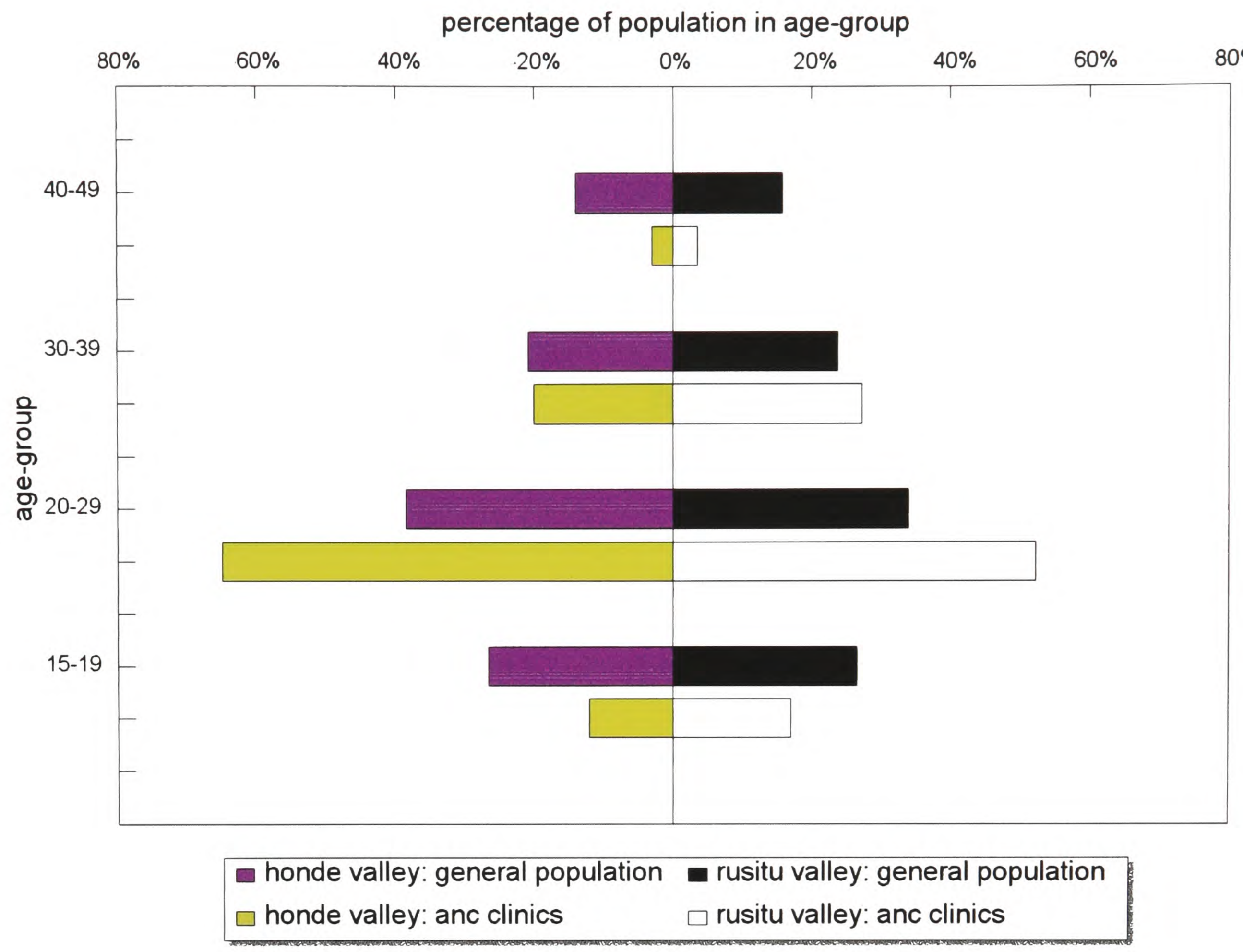
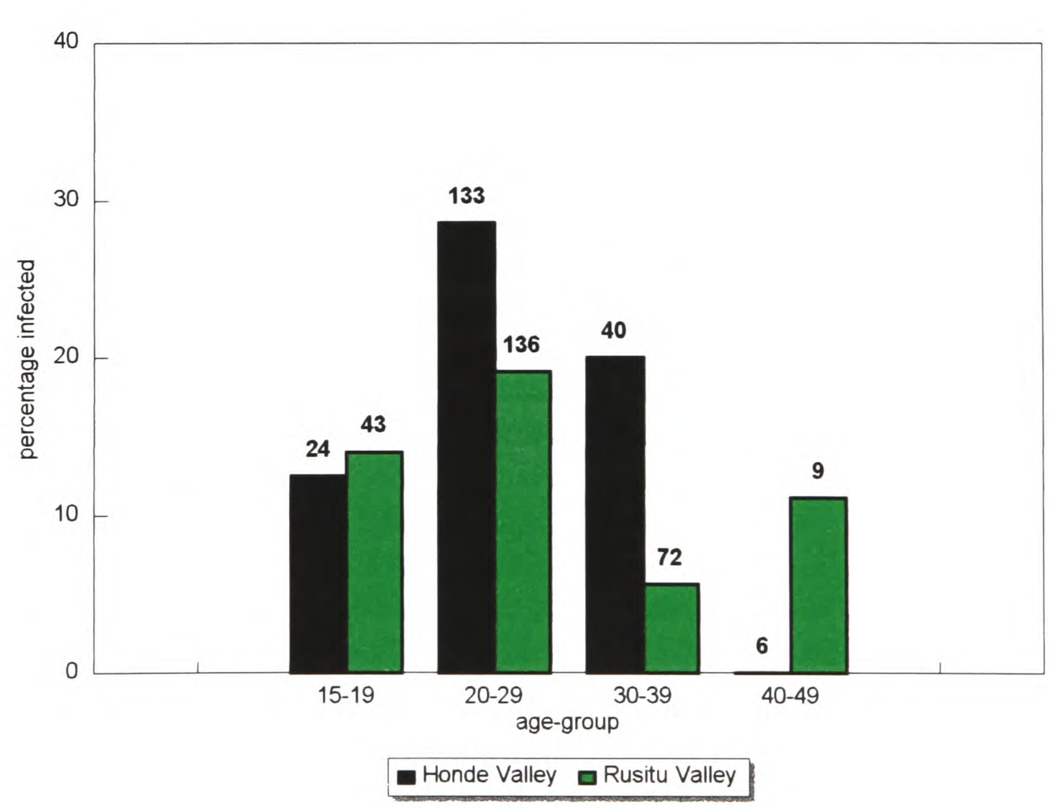


Table 4.6 HIV-1 prevalence among women attending antenatal clinics, by study area: standardized for age using age-distributions of all women usually resident in the study areas

Age-group	Honde Valley			Rusitu Valley		
	% HIV-1+ at ANCs	% of general population in age-group	age standardized HIV-1 prevalence in general pop'n	% HIV-1+ at ANCs	% of general population in age-group	age standardized HIV-1 prevalence in general pop'n
15-19	12.5	26.6	3.3	14.0	26.5	3.7
20-29	28.6	38.4	11.0	19.1	33.4	6.4
30-39	20.0	20.6	4.1	5.6	24.1	1.3
40-49	0.0	14.4	0.0	11.1	16.0	1.8
15-49	24.1	100.0	**18.4**	14.2	100.0	**13.2**

Note: See text for details of the standardization procedure applied.

Figure 4.6 HIV-1 prevalence among women attending antenatal clinics, by age and study area



Note: Data labels indicate numbers of women tested for HIV-1 infection in each age-group.

be at higher risk of HIV-1 infection than currently married women (Table 4.5). The sample populations may include different proportions of such women to those found in the study populations, while those unmarried women who become pregnant and attend antenatal clinics may not be typical of single, divorced and widowed women, in general.

Overall, 9/423 (2.1 per cent) women tested were divorced (8) or widowed (1), compared to 143/1,120 (12.8 per cent) 15-49 year olds interviewed in the HIV-1 and Fertility Survey. Of the latter, 88 (61.5 per cent) had been separated or divorced, whilst 55 were widows. Single women accounted for 21/423 (5.0 per cent) of those tested and 354/1,120 (31.6 per cent) of all women in the study areas. Unmarried women are therefore severely under-represented within the sample (ANC) populations. The same is true in each area.

However, interpretation of this situation is not straight forward. To begin with, it should be noted that the most numerous group involved - ie: single women - are predominantly (98.5 per cent) aged under 30 years old and thus fall within the peak age-group for current HIV-1 infection. The excess prevalence among single women, while substantial, is not therefore quite as great as it would seem at first glance. In addition, it should be noted that unmarried women attending antenatal clinics have, by definition, been exposed to recent unprotected sexual activity, and are therefore at risk of HIV-1 infection. The sociological data has yielded the hypothesis that unmarried women may be at greater risk of HIV-1 infection, but it is by no means certain that single women, in general, have been as sexually active as those seen at the antenatal clinics, particularly bearing in mind the underlying, albeit weakened, traditional taboo on female pre-marital sexual relations [178].

Divorced and separated women may indeed be at particularly high risk of infection, given that they appear to be more likely to become involved in commercial sex work, as a consequence of their weak socio-economic status. Changes may be in the air, because of HIV-1 and AIDS, but until very recently, a number of widowed women would expect to remarry and thus effectively limit their chances of infection.

The consequences of these biases are therefore difficult to quantify. However, it would seem that they will tend to result in a degree of under-statement of HIV-1 prevalence within the study populations. There are insufficient data in the current study to assess whether the extent of any such under-statement is greater or smaller in the Honde Valley than in Rusitu Valley.

Level of Education

More educated women in Rusitu have been found to be more likely to be infected than less educated women, at least at the cut-off point between primary and secondary education (Table 4.5). There is a question therefore as to whether more educated women are more or less likely to attend the antenatal clinics where HIV-1 testing was conducted.

Comparison of the data on levels of education obtained at the antenatal clinics and in the HIV-1 and Fertility Survey indicates that women with secondary education are less likely to attend antenatal clinics in the study areas than women with lower levels of education. This was particularly the case in the Rusitu Valley. Forty per cent of the women attending antenatal clinics in the Honde Valley area had received secondary education, compared to 45 per cent of those in the study population, as a whole (difference not significant). In Rusitu, the equivalent figures were 26 per cent and 42 per cent *($p < 0.001$)*. This pattern almost certainly reflects lower fertility among women with more education (Chapter 6). If the more educated women not included in the sample populations have similar levels of HIV-1 infection to those who were seen, the overall HIV-1 prevalence results will tend to understate the true levels within the study populations, particularly in the Rusitu Valley.

Infertility

HIV-1 infection has been found to be associated with reduced fecundity in earlier studies [107, 164]. HIV-1 infection is closely associated with the presence of other sexually transmitted diseases, such as gonorrhoea and chlamydia [249], which can cause infertility [250, 251], and may itself have a further direct effect. At the same time, low fertility is also associated with use of modern contraceptives, including condoms. Other things being equal, condom use would be expected to reduce the risk of HIV-1 infection.

In the univariate analyses, women with low parity were found to be at higher risk of HIV-1 infection *($p < 0.1$)*, particularly in the Rusitu Valley *($p < 0.05$)*. Overall, the mean parities of infected and uninfected women were 2.05 and 2.39 children, respectively. However, when a control was introduced for the association between age and parity, this difference ceased to be significant.

In the Honde Valley, the mean parity of women aged 15-49 years in the HIV-1 and Fertility Survey was 2.62 children, with Apostolic women, who are under-represented in the sample population (see below), having higher parities (3.15) than non-Apostolics (2.39). These compare with an overall mean parity at the antenatal clinics of 2.29 live births. In Rusitu, the mean parity of women in the survey was 2.93 children, compared to 2.35 among women at the antenatal clinics. In both cases, therefore, there was a tendency towards greater inclusion of women with lower than average parity amongst the groups tested for HIV-1 infection, although in the Honde Valley case, this was principally due to the exclusion of Marange Apostolic women.

Two processes are likely to be involved here. First, there is clearly an age effect. Women with high parities are liable to be older and therefore less fecund. They are therefore less likely to become pregnant again and be seen at antenatal clinics. Older women who do become pregnant may prefer to rely on traditional practises rather than attendance at antenatal clinics - note: traditional birth midwives are known to be particularly active in the Rusitu Valley. This age effect may be concealing a degree of underlying sub-fecundity attributable to the presence of other sexually transmitted diseases. Low attendance by women of high parities might be expected to result in exaggeration of the level of HIV-1 prevalence in the general population - although some of this effect will be controlled for in the age-standardization adjustment - while selective exclusion of women who are sub-fecund due to STDs would result in a degree of under-statement. No reliable statistical data are available at present on the prevalence of STDs in the two study populations. STDs were recorded as one of the five leading forms of morbidity by health clinics in both areas. However, at least in the case of symptomatic STDs, any tendency to cause infertility would be reduced by early diagnosis and treatment. Condom use is currently low in each area (see Chapter 6) and seems unlikely to affect comparisons between the sample and study populations.

Religion

No data on religious affiliation was obtained during the collection of blood samples for HIV-1 testing at the antenatal clinics. This was because it was not recognized at the time that HIV-1 infection rates might vary significantly between religions. Furthermore, it was understood that women from all Apostolic sects avoided the use of modern medicine and did not attend for antenatal check-ups. It subsequently became apparent, that this was only usually the case for women from the Marange, Jekeniseni and some of the smaller sects. In fact, many Rusitu Valley women from these sects made use of the services provided at the local health clinics. Additional data is currently being sought, which includes data on HIV-1 infection by religion, but at present it is not possible to tell directly whether levels of HIV-1 prevalence vary between Christians and Apostolics or between Apostolic sects. The only information currently available is the data on mortality levels and trends which are reviewed in Chapter 5 and the sociological data presented in Chapter 3. Tentative interpretation of this information indicates that Marange Apostolics in the Honde Valley may, at least currently, be at lower risk of HIV-1 infection than Christians. Apostolics in the Rusitu Valley and those from other sects in the Honde Valley appear to be experiencing intermediate levels of risk (see Chapter 5, section 5.5). This impression would be consistent with results from a recent study in Chiredzi, in south-east Zimbabwe, where HIV-1 prevalence among male Apostolics was found to be 16 per cent compared to 32 per cent among non-Apostolic men *($p < 0.025$)* [252].

The implications of this for interpretation of the antenatal clinic HIV-1 prevalence data differ between the two study locations. In the Rusitu Valley, women from all religions are known to attend the clinics; there appears to be little difference in attendance rates between religious sects (Chapter 3), so that the data should be reasonably representative. However, in the Honde Valley, the Marange Apostolics, in particular, retain a strict adherence to faith-healing. If, as is supposed, HIV-1 infection is less common among women from this sect, who account for approximately 20 per cent of all women in the study area, the overall estimate for HIV-1 prevalence will be an over-estimate. At the extreme, if none of the Apostolic women living in the Honde Valley area were infected with HIV-1 and 18.4 per cent of other women were taken as being infected, the overall HIV-1 prevalence figure would be 13.2 per cent - ie: the same as that estimated for Rusitu and just over half the original estimate taken directly from the antenatal clinic results.

Clinic Catchment Areas

An additional implication of the exclusion of Apostolic women from the sample population in the Honde Valley is that it means that, on average, the women tested there lived further away from the Hauna growth point than those included in the main survey. Other things being equal, this might be expected to result in a lower prevalence of HIV-1 infection among those tested than is present among the study population, as the more distant areas are more rural and would normally be expected to have lower levels of infection [253]. However, this effect is probably overshadowed by the fact that both the clinic catchment areas extend well beyond the study areas and therefore include greater proportions of more rural people than the study populations. HIV-1 prevalence may therefore tend to be higher in the study populations than in the sample populations, but the effect should be similar in both the Honde Valley and the Rusitu Valley.

Overview of Selection Effects

Collection of HIV-1 seroprevalence data from sentinel sites located at antenatal clinics has been advocated by the World Health Organization (WHO), as being the most appropriate method of routine public health surveillance for HIV infection among low risk populations [180]. In recommending the use of sentinel surveys, the WHO acknowledged that selection biases could make results unrepresentative of the true position among general populations. However, it was felt that so long as the nature and extent of the biases did not vary significantly, data from sentinel surveys could be used to follow trends in HIV-1 prevalence and trace geographical patterns of spread.

It is clear from the above review of data from the current study, that such biases are indeed present in surveillance data from antenatal clinics, and that the implicit assumption that these biases vary little between populations may often be breached. In the current case, differences between the age-distributions and religious affiliations of antenatal clinic attenders and women in the general population result in overstatement of the true levels of HIV-1 infection among women living in the areas surrounding the clinics. To some degree this overstatement is probably offset by further differences in marital status, education and fertility levels, and by differences between the urban/rural profiles of the clinic catchment areas and the study areas. However, the impact of some of these factors appears to differ between the two study locations. In particular, the effects of a greater concentration of women in their twenties within the antenatal clinic populations and of the exclusion of religious groups, who probably have lower than average HIV-1 infection rates, are both more acute in the Honde Valley. The effect of greater under-representation of more educated women in the Rusitu Valley may also tend to narrow the apparent gap in HIV-1 prevalence levels between the two study populations.

Assessment of the relative levels of HIV-1 prevalence among women in the two study populations, based on the data from the antenatal clinics, is clearly problematic. It is believed that HIV-1 prevalence is higher in the Honde Valley, certainly if Apostolic women living in the area are excluded from consideration. However, the excess is rather lower than might be supposed if the unadjusted results are taken at face value.

4.4.4 AIDS Cases and AIDS Deaths in the Honde and Rusitu Valleys

Up to the survey date (April 1994), 22 individuals had been diagnosed at the Hauna clinic as having HIV-1 related illnesses, following the application of confirmatory blood tests. Of these, three had passed away. This data is of limited value, as blood tests have only recently been introduced and no equivalent information is available from clinics in Rusitu. However, it does show that HIV-1 infection has begun to have an impact on morbidity within the Honde Valley. One case was recorded as being a child, while the rest are understood to be adults, most being under 50 years of age. The adult cases were almost evenly split between males (10) and females (11). However, there are, of course, less men than women living in the study area (Chapter 2).

In the Rusitu Valley, three known AIDS cases were identified during the fieldwork. Two of these were a nurse, who worked at a nearby health clinic, and her husband, who had been based in another area, working in the army. The husband returned to the study area between June 1994 and April 1995 and died shortly afterwards. Soon after this, the nurse, who had appeared to be in good health during our first visit, also became sick and it seems that she died within a matter of a few months. The third case was a woman from the Kushingirira area, who agreed to be the subject of a key informant interview conducted by one of the survey enumerators (Angel Mudyanadzo). A summary of the information obtained in the interview is given in Table 4.7. It is not clear from the available information whether this woman was infected via her husband or as a consequence of her subsequent commercial sex work.

Eight deaths were recorded during the fieldwork in the Honde Valley and thirteen in the Rusitu Valley. All except one of the persons dying were adults, the exception being an infant in the Honde Valley. The quality of the information on cause of death is better in the Honde Valley, where two males (aged 32 and 50) and one female (also aged 50), were recorded as having died of tuberculosis. One malaria case was recorded in each area, whilst the leading cause of death in Rusitu was "stomach problems".

4.4.5 Possible Reasons for an Excess in HIV-1 Prevalence in the Honde Valley

The likely reasons for higher HIV-1 prevalence levels among non-Apostolics in the Honde Valley are essentially as set out in Appendix B. Namely, the larger army and police presence in the area and its proximity and accessibility to other known areas of high HIV-1 prevalence - ie: Rusape, Harare, Mutare, Chitungwiza etc. The initial impression that other STDs might be more common in the Honde Valley was not borne out by the results of the HIV-1 and Fertility Survey. Non-Apostolic women in the two areas reported similar levels of lifetime treatment for STDs. However, the larger growth point at Hauna and the rather higher overall level of development in the Honde Valley could also be factors.

Table 4.7 Key informant interview with a woman with AIDS in Kushingirira Village, Rusitu Valley

Summary of information provided	
Current age:	26 years
Marital status:	Divorced
Marital and sexual history:	Married in 1986, aged 18; no sexual relations before marriage or extra-marital sex whilst married. Husband became unfaithful which lead to conflict and eventually to divorce, after the birth of her third child, (1992). No information was obtained about the subsequent whereabouts and well-being of the husband. Since the divorce, the woman had become involved in commercial sex work at a nearby beerhall, where she also sold food.
Illness:	Began in December 1993. Continuous diarrhoea, weakness, vomitting, vaginal discharge, weight loss and swollen glands. She perceives herself as having AIDS, but has not had an HIV test.
Health seeking behaviour:	Visited the health clinic at Ngorima; given paracetamol and "other capsules". When these did not work, she was prescribed some injections. These were also ineffective, so she decided to go to Chimanimani Hospital. The nurses there recommended avoidance of hard work and eating nutritious foods. Also, to try not to worry too much about her illness. She said she had been following this advice and was feeling better, although she still suffers from continuous diarrhoea and flu. She continues to visit the Ngorima clinic for pain-killing tablets, but is having problems paying the charges.
Impact of illness:	Can no longer do any hard physical work, which is causing problems as she needs to work in the fields to grow food to eat. She is also unable to collect fruit to sell at the market; she therefore has no cash with which to buy soap, cooking oil and other essentials. She ceased to be sexually active when she first became ill in December 1993. This has also affected her economically, as she used to get some income through her commercial sex work at the beer hall. Her mother - who was also a commercial sex worker - and sister have been supportive. They help with looking after the three children. A few close female friends have also been helpful. She said that most of her neighbours laugh at her, saying she has AIDS. She is very concerned about who will look after her children when she dies.

Source: Fieldnotes (Angel Mudyanadzo), May 1994.

4.4.6 Implications of the Observed Levels of HIV-1 Prevalence

After controlling for differences in age-distribution between the sample and study populations, - but not for the other possible selection effects discussed here - overall estimates of HIV-1 prevalence of 18.4 per cent and 13.2 per cent were obtained for women aged 15-49 years, in the Honde and Rusitu valleys, respectively. However, the breakdown of HIV-1 prevalence levels by age highlights the fact that women in their twenties are at considerably greater risk of current infection - ie: 23 per cent to 35 per cent - than the women of childbearing ages as a whole. Serosurveys among women at antenatal clinics which do not provide breakdowns by age therefore conceal the true extent of the epidemic. In fact, if consideration is given to a hypothetical woman who has just reached her 15th birthday, the cumulative chances of her becoming infected at some point before she reaches the age of 50 years would probably exceed 40 per cent in both areas, given a mean survival period of 7 years after infection and assuming that the current level and age-pattern of infection was to persist [225].

4.5 Extent of Knowledge, Experience and Perceived Personal Danger of HIV-1 and AIDS in Rural Areas of Manicaland

4.5.1 Introduction

The remainder of this chapter focuses on the survey results on knowledge, reported experience and sense of personal danger of HIV-1 infection and AIDS among individual women living in the study areas. The reported levels of these factors will be reviewed and their socio-economic determinants investigated, in the context of findings from the parallel sociological studies. Finally, the results on reported action taken to avoid HIV-1 infection will be presented and the nature of the relationship between knowledge, perceived danger and protective action taken will be explored, subject to the confines of the data available from the study.

4.5.2 Knowledge and Beliefs about HIV-1 Infection and AIDS

The responses to the survey questions on knowledge and beliefs about HIV-1 infection and AIDS are summarized in Tables 4.8, 4.9 and 4.10, by level of education attained. The results show a clear and consistent upward gradient of knowledge with increasing level of education. It is noticeable that more educated women were less likely to give "don't know" responses and more likely to volunteer information - information which was not always correct - perhaps because they felt more confident.

Overall, there was quite a good level of knowledge, bearing in mind the rural study locations. However, the results reveal some important gaps and misconceptions. Many believe that symptoms develop over a short period, as they understand is the case with other STDs [67]. The role of other STDs as co-factors in the transmission of HIV-1 was not recognized. Key informant and focus group discussions highlighted the fact that the distinction between HIV and AIDS is often not appreciated and the commonly held belief that it is possible to tell by sight whether a person is infected. Even among the more educated women, 47 per cent were either unable to say how long it takes on average for a person with HIV-1 to develop AIDS or said they thought that it usually took less than one year. Lack of understanding in this area is clearly important because, for example, people may feel they can safely have sex with another person if that person appears to be in good health. A further point of interest in Table 4.8 is that sizeable minorities of less educated women were not clear that there is currently no recognized cure for AIDS. This may tend to weaken resolve to avoid taking chances by engaging in high risk activities.

Table 4.9 and Table 4.10 show the responses given to questions on possible ways of becoming infected with HIV-1. Table 4.9 shows the results for activities which are currently believed by medical experts to carry a significant risk of HIV-1 transmission, and Table 4.10 summarizes the responses for a number of incorrect modes of transmission. In the questionnaire these two sets of activities were intermingled (see Appendix F). Each woman was asked first to say how she thought HIV-1 could be transmitted. Where a possible mode of transmission was not mentioned spontaneously, the woman was asked whether she thought

Table 4.8 Knowledge about HIV-1 infection and AIDS, by level of education, among women aged 13-49

Response	No education %	Primary %	Secondary or higher %
Heard of AIDS	91.9	97.6	99.8
Risk Factors for AIDS:			
Sex with a prostitute	51.9	54.3	59.9
Many sex partners	65.8	71.9	82.3
Other STDs	0.0	1.2	2.1
Symptoms of AIDS:			
Fever	3.8	6.9	12.5
Sickness	12.7	18.4	26.2
Diarrhoea/weight loss	60.8	74.2	77.9
Skin complaints	19.0	22.4	27.8
Genital conditions	3.8	5.6	7.8
Time Taken for AIDS to Develop:			
Under 1 month	5.1	5.6	4.9
1 to 6 months	2.5	5.8	7.0
6 to 12 months	17.7	16.4	16.2
1 to 3 years	17.7	13.5	16.3
3 to 12 years	6.3	15.8	27.0
Over 12 years	0.0	0.5	0.8
Don't know	50.6	41.4	27.4
AIDS can be Cured:			
Yes	2.5	2.6	1.3
Don't know	19.0	17.6	9.1
Total number of women	86	623	527
Number of women who have heard of AIDS	79	608	526

Table 4.9 Knowledge of modes of transmission of HIV-1 infection, among women aged 13-49: correct modes

Response	No education %	Primary %	Secondary or higher %
Heterosexual Sex:			
Spontaneous yes	45.6	66.4	78.5
Prompted yes	48.1	29.8	19.0
Prompted no	0.0	0.2	0.2
Don't know	6.3	3.6	2.3
Homosexual Sex:			
Spontaneous yes	0.0	1.8	1.7
Prompted yes	27.8	26.6	38.4
Prompted no	13.9	16.9	15.2
Don't know	58.2	54.6	44.7
Blood Transfusions:			
Spontaneous yes	2.5	7.9	18.8
Prompted yes	38.0	51.8	54.4
Prompted no	25.3	22.5	21.9
Don't know	34.2	17.8	4.9
Sharing Needles:			
Spontaneous yes	5.1	19.2	36.1
Prompted yes	57.0	59.0	55.9
Prompted no	11.4	9.7	5.1
Don't know	26.6	11.8	2.7
Perinatally:			
Spontaneous yes	0.0	1.5	3.8
Prompted yes	83.5	88.0	92.2
Prompted no	5.1	3.3	1.7
Don't know	11.4	7.2	2.1
Via Breastfeeding:			
Spontaneous yes	0.0	0.3	1.3
Prompted yes	60.8	70.9	66.5
Prompted no	12.7	9.7	16.5
Don't know	26.6	19.1	15.6
Ritual Scarification:			
Spontaneous yes	7.6	20.7	32.7
Prompted yes	48.1	47.0	47.3
Prompted no	20.3	14.6	13.1
Don't know	24.1	17.4	6.8

Table 4.10 Knowledge of modes of transmission of HIV-1 infection, among women aged 13-49: incorrect modes

Response	No education %	Primary %	Secondary or higher %
Touch:			
Spontaneous yes	0.0	6.4	4.8
Prompted yes	22.8	21.5	15.0
Prompted no	40.5	49.5	71.3
Don't know	36.7	22.4	8.9
Sharing Utensils:			
Spontaneous yes	3.8	9.9	10.5
Prompted yes	32.9	24.2	14.8
Prompted no	31.6	42.4	63.1
Don't know	31.6	23.5	11.6
Mosquito Bites:			
Spontaneous yes	1.3	0.8	2.7
Prompted yes	20.3	33.1	34.0
Prompted no	43.0	44.9	52.5
Don't know	35.4	21.2	10.8
Total number of women	86	623	527
Number of women who have heard of AIDS	79	608	526

HIV-1 could be transmitted in this way. If she said "yes" or "no", this was recorded as "prompted - yes" or "prompted - no", respectively. Otherwise her response was recorded as "don't know". Many of the women may have made a guess when prompted, so that comparison of the proportions of "spontaneous - yes" and "don't know" responses by mode of transmission probably gives the most reliable information regarding the state of people's knowledge. High proportions of prompted responses probably indicate low levels of knowledge and awareness.

AIDS information campaigns in Zimbabwe have stressed the dangers of transmission of HIV-1 infection through body fluids. This may be the reason for the widespread belief that infection can be passed on perinatally and via breastfeeding from an infected mother to her infant. However, there were few "spontaneous - yes" responses and it seems that these particular risks were not well understood. In follow-up qualitative investigations, it was established that it is widely believed that the infant of an infected mother is certain to become infected. While few women in the survey reported having stopped breastfeeding through fear of passing on HIV-1 infection, this may be a point which should be clarified, in view of the wider health benefits of breastfeeding for infants and current World Health Organization recommendations [254].

The risk of infection through ritual scarification was not recognized by a significant minority of women, with lack of awareness of this risk being particularly high among less educated women, who, as has been noted, tend to be older. While it is understood that scarification, including the use of surgical incisions, is only rarely practised within the Honde and Rusitu valleys (Appendix D), it is not known whether those who do carry out these operations are taking precautions to avoid the use of contaminated instruments.

Large minorities of the women said they believed that HIV-1 infection could be passed on through touch, shared utensils or mosquito bites. This was the case even amongst the more educated - eg: 20 per cent of women with secondary education said they thought they could become infected through touching a person with AIDS. Misunderstandings in this area could be important because they may encourage feelings of fatalism that infection cannot be avoided, even in the absence of high risk sexual behaviour. They may also accentuate fears about having everyday contact with persons suspected of having AIDS and could lead to increased stigmatization and prejudice, at a time when practical and emotional support is badly needed.

4.5.3 Personal Experience of HIV-1 and AIDS

Table 4.11 sets out the results from a number of questions on women's personal experience of HIV-1 and AIDS, by study area. Most of the women stated that they knew of at least one person who had died or been sick with AIDS. Relatively few said that a member of their own household or a close relative had been affected. Similarly, the proportions of women caring for orphans were low and few of the parents were said to have died of AIDS. This picture is consistent with the idea that AIDS is a very recent phenomenon in the study areas, but could also be attributed to under-reporting due to stigma attached to the disease. Under-reporting may also arise from incomplete understanding of the nature of HIV-1 related mortality and, in particular, the link with tuberculosis. The survey questions did not make this link explicit. Local health workers have only recently started to carry out HIV-1 tests on patients with symptoms commonly associated with AIDS, so there are few medically diagnosed cases. Cases of AIDS which are diagnosed may not be publicised by the individuals or families concerned, again because of the possible stigma.

4.5.4 Perceived Personal Danger of HIV-1 Infection

Survey respondents were asked whether they felt in danger of infection themselves (DANGER) and, if so, the reasons they felt in danger. Women who perceive themselves to be in danger have been found more likely to report behaviour change in a previous study [101]. The responses to the questions in this area are set out in Table 4.12, by marital status of woman. In all, 42 per cent of women aged over 15 said they thought they were personally in danger of becoming infected.

The results indicate that divorced and separated women were most likely to feel themselves

Table 4.11 Personal experience of AIDS reported by women aged 13-49 years at the survey date

Response	**Honde Valley** %	**Rusitu Valley** %	**Both sites** %
Knows a Person with AIDS:			
Who died	55.8	60.5	58.3
Who is currently alive, but sick	19.3	15.5	17.3
From own household	2.9	4.1	3.6
From own village	36.4	45.0	40.9
Husband	0.2	0.3	0.2
Son or daughter	0.5	0.2	0.3
Other relative	14.0	14.6	14.3
Unrelated person	48.4	47.4	47.9
Caring for an Orphan, whose (last) Parent Died of:			
AIDS	1.0	0.3	0.7
Diarrhoea/weight loss	1.0	1.4	1.2
Other causes	5.4	5.5	5.5
Respondent Sick in Last Month:			
Fever	6.6	3.8	5.1
Sickness	1.4	1.3	1.3
Diarrhoea/weight loss	3.3	4.6	4.0
Skin complaints	1.0	0.6	0.8
Other symptoms	25.2	35.5	30.6
Total number of respondents	579	631	1,210

Table 4.12 Perception of own danger of HIV-1 infection among women aged 13-49 years

Response	Single %	Married %	Divorced/separated %	Widowed %
Respondent Feels Herself to be in Danger	24.6	45.4	52.9	35.3
Reason for Feeling in Danger:				
Woman has many partners	5.2	0.7	21.7	0.0
Regular partner has (had) many partners	20.0	57.2	39.6	50.0
Large numbers of friends and relatives dying of AIDS (**RISK** - Chapter 6)	51.3	14.7	33.3	33.3
Reason for Taking No Action to Avoid HIV infection:				
Abstinence	13.0	2.0	4.6	9.8
Already use condoms	0.2	0.7	0.0	0.0
Monogamous	0.4	14.3	2.3	2.0
Husband/partner refuses	0.0	5.1	2.3	0.0
Fatalistic	0.7	1.5	1.1	2.0
Does not know how to avoid	8.9	23.4	11.5	13.7
Does not know why	3.0	6.2	1.1	3.9
Other reasons	1.5	4.1	1.1	3.9
Taken action	72.2	42.8	75.9	64.7
Reasons Remarriage After Widowhood Inadvisable:				
Risk of HIV-1 transmission	18.9	8.7	2.3	3.9
Bad for children	35.2	55.7	36.8	62.7
Other reasons	15.0	12.6	12.6	5.9
Reasons Remarriage After Divorce Difficult:				
Risk of HIV transmission	10.7	8.5	4.5	5.9
No longer a virgin	7.0	6.1	3.2	1.9
Infertility	3.6	3.5	5.7	1.9
Total number of respondents	460	610	87	51

to be in danger of infection. This is consistent with the results of the HIV-1 seroprevalence surveys (section 4.4.2) and the sociological data, which suggests that these women are at high risk of becoming engaged in commercial sex work. Despite the stigma attached to this form of activity, more than a fifth of the divorced or separated women interviewed said they felt in danger because they had many different sexual partners.

High proportions of currently married women also considered themselves to be in danger of infection. In most cases (57 per cent), they said this was because they thought their husbands had other sexual relationships. The reality of this concern is borne out by the results of the male pocket-chart voting sessions, in which the majority of men indicated that they had had casual affairs within the previous month (Chapter 3). Similar fears have been expressed by married women in other studies [68, 101, 222].

Significant proportions of single and widowed women also reported feeling in danger, with many of those who did not feel at risk being women who had either not yet become sexually active or had now ceased to have sexual relations due to ageing. The most common reason for feeling in danger, among single women, was concern about the large numbers of friends and relatives who were dying of AIDS. A minority said it was because they had had several different partners and rather more feared that their partners had had other partners. The reasons for feeling at risk reported by widowed women were similar to those for married women. However, overall, the nature of the sense of risk experienced differed somewhat according to current marital status. These differences may help to explain the variations in the extent and pattern of actions taken to avoid infection.

Married women were least likely to report having taken any action to avoid HIV-1 infection and AIDS (57 per cent) and many said this was because they were monogamous, did not know what steps they could take or could not gain the co-operation of their husbands. In contrast, more than three-quarters of single, divorced and separated women reported having taken some form of action. The types of action said to have been taken will be discussed further in sections 4.7 and 4.8.

The women were also asked about the desirability of remarriage following widowhood or divorce. Widow remarriage was generally seen as more problematic than remarriage after divorce. The main difficulty regarding widow remarriage was felt to be that it could be bad for the woman's existing children. Remarriage would involve living with the new husband's family who may not accept responsibility for children from a previous marriage [213]. Children from the new marriage would be given preferential treatment. Currently married and widowed women were particularly conscious of these problems, perhaps because they were most likely to have children themselves.

Concern about possible danger of HIV-1 transmission - particularly when the late husband may have died of AIDS - was expressed by a number of women and most commonly by single women. Risk of HIV-1 transmission was also mentioned as a reason why remarriage might be problematic for currently divorced and separated women. Infertility was the most frequent reason given by divorced and separated women and absence of virginity was a relatively common reason given by single women. However, most women did not foresee major difficulties.

4.6 Socio-Economic Determinants of Knowledge, Experience and Risk Perception

4.6.1 Socio-Economic Determinants of Increased Knowledge about HIV-1 and AIDS

The questions and responses set out in Tables 4.8 to 4.10 were used to construct an index of knowledge about HIV-1 and AIDS (Appendix H1). Index scores range from 0, representing no knowledge, to 1, representing complete knowledge - ie: correct responses to all questions. Bivariate analyses were carried out to assess the strength of the relationships between a number of socio-economic factors and levels of knowledge about HIV-1 and AIDS. The results of these tests are given, by current union status, in Table 4.13.

There are strong associations between knowledge and many of the socio-economic factors examined. Increasing level of education and regular exposure to television, radio and

Table 4.13 *Bivariate analysis* of the socio-economic determinants of female knowledge about HIV-1 and AIDS, by long-term union status

Independent variable	**In a union**		**Not in a union**		**All women**	
	Co-eff	P > |t|	**Co-eff**	P > |t|	**Co-eff**	P > |t|
Education	**0.089**	0.000	**0.100**	0.000	**0.092**	0.000
Age	**-0.002**	0.000	**-0.003**	0.000	**-0.002**	0.000
Religion	**-0.079**	0.000	**-0.051**	0.000	**-0.069**	0.000
Location	**-0.013**	0.214	**-0.037**	0.004	**-0.021**	0.010
In(out)side growth point	**0.058**	0.000	**0.019**	0.209	**0.043**	0.000
Own spatial mobility	**0.118**	0.000	**0.052**	0.152	**0.096**	0.000
Radio and TV exposure	**0.080**	0.000	**0.042**	0.004	**0.065**	0.000
Reads newspaper	**0.097**	0.000	**0.070**	0.000	**0.087**	0.000
Union status	-	-	-	-	**0.013**	0.138
Partner's education	**0.077**	0.000	-	-	-	-
Partner's spatial mobility	**0.060**	0.000	-	-	-	-
Observations	734		476		1,217	

Notes:

i The index of knowledge about HIV-1 and AIDS is used here as the dependent variable. The basis of computation of this index is given in Appendix I.

ii The effects of woman's and partners spatial mobility are measured with reference to the indices computed in Chapter 3.

iii Religion here is represented as a dichotomy between Apostolics (1) and non-Apostolics (0).

iv Location is represented by a dichotomy: Honde Valley = 0; Rusitu Valley = 1.

newspapers were all associated with better knowledge, regardless of marital status. Non-Apostolic women were generally better informed, while older women, women living in the Rusitu Valley or away from the Hauna and Dzingire growth points all tended to be less well informed. For women in stable unions - married, cohabiting or long-term unions - spatial mobility is associated with better knowledge, as are partner's level of education and partner's spatial mobility. However, there is a high level of confounding between many of these variables.

When multi-linear regression is used to control for confounding, level of education emerges as the most important factor (Table 4.14). Regular newspaper reading continues to register an independent effect. Religion (not being an Apostolic), spatial mobility, media exposure and partner's spatial mobility are all significantly associated with increased knowledge for women currently in a union.

Analysis of knowledge index scores, by age and education level, reveals greater knowledge among women aged under 30 years (Figure 4.7). This is principally because of the increase in female secondary education since Independence (Chapter 3) and the strong association between level of education and knowledge about HIV-1 and AIDS. AIDS education in schools has been introduced relatively recently and can only have affected levels of knowledge among younger women. However, even older women with secondary education have relatively high index scores. The effect of education must therefore be primarily an indirect influence, working through processes of socialization, as well as through greater access to and understanding of messages received on radio, newspapers etc.

The relatively high knowledge among 13-14 year olds with primary or no education is encouraging and could reflect broader sex education programmes within schools. However, it should be noted that the proportion of 13 and 14 year olds with some secondary education is low. This probably reflects a situation where many children do not progress to secondary school until after their 15th birthday. Part of the explanation may also lie in the drought and the re-introduction of school fees in 1992 and the general tightening up in economic conditions in Zimbabwe since the introduction of the Economic Structural Adjustment

Table 4.14 *Multivariate analysis* of the socio-economic determinants of female knowledge about HIV-1 and AIDS, by long term union status

Independent variable	**In a union**		**Not in a union**		**All women**	
	Co-eff	**P > |t|**	**Co-eff**	**P > |t|**	**Co-eff**	**P > |t|**
Education	**0.061**	0.000	**0.085**	0.000	**0.069**	0.000
Religion	**-0.046**	0.000	**-0.023**	0.085	**-0.037**	0.000
Own spatial mobility	**0.061**	0.005	**0.022**	0.496	**0.061**	0.000
Radio and TV exposure	**0.036**	0.003	**0.016**	0.248	**0.028**	0.002
Reads newspaper	**0.038**	0.001	**0.029**	0.028	**0.036**	0.000
Partner's spatial mobility	**0.033**	0.015	**-**	-	**-**	-
Constant	**0.397**	0.000	**0.352**	0.000	**0.387**	0.000
Adjusted R_2	0.222		0.186		0.200	
F-statistic	35.07		21.63		61.45	
Observations	743		481		1,233	

Notes:

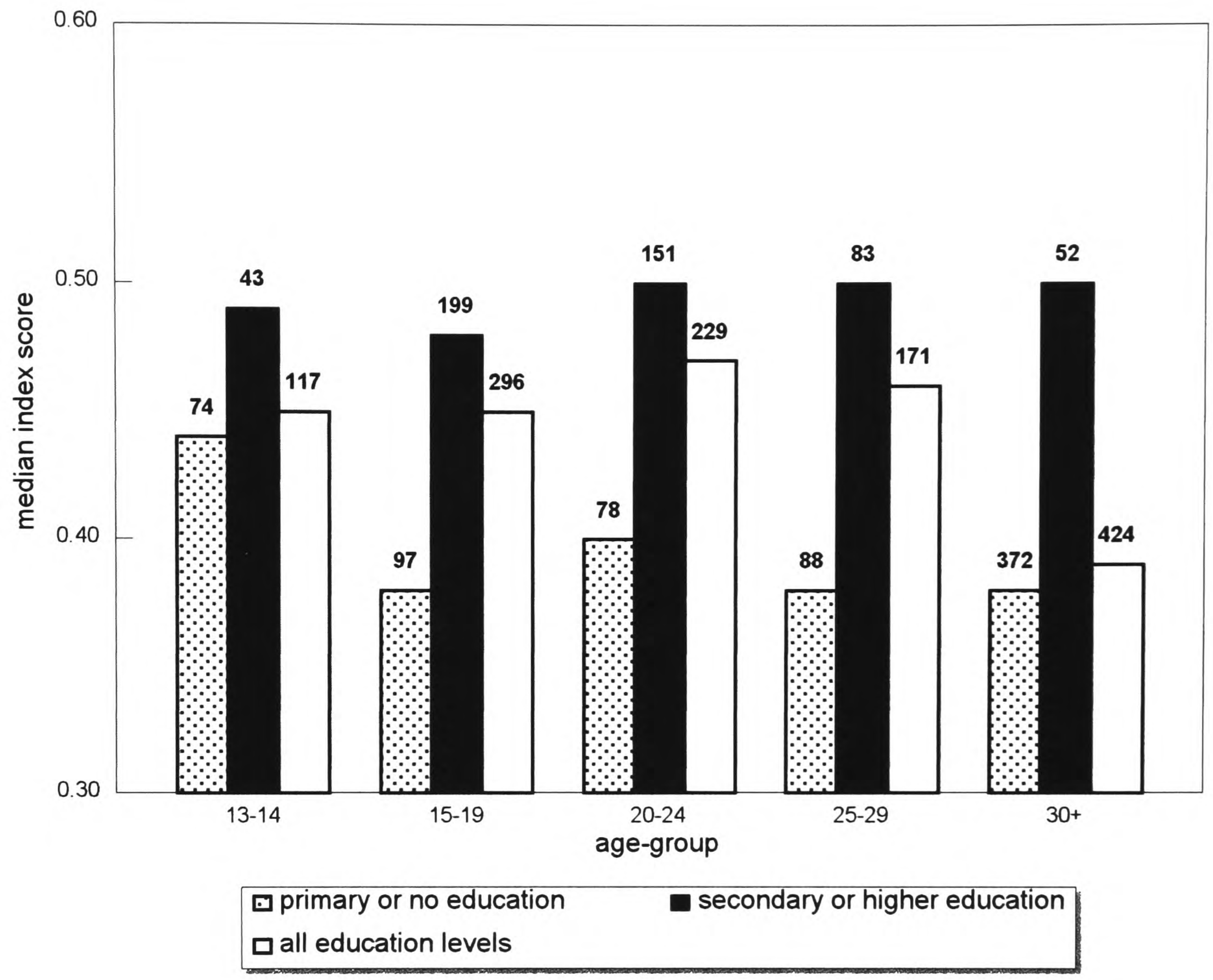
i The results shown derive from a stepwise multiple regression performed in STATA version 3. Parameters which contribute non-significant improvements to the model are dropped by a process of backward elimination. The effect of location was found to be non-significant after controlling for the remaining variables.

ii The index of knowledge about HIV-1 and AIDS is used here as the dependent variable. The basis of computation of this index is given in Appendix I.

iii The effects of woman's and partners spatial mobility are measured with reference to the indices computed in Chapter 3.

iv Religion here is taken as a dichotomy between Apostolics (1) and non-Apostolics (0).

Figure 4.7 Median index of female knowledge about HIV-1 and AIDS, by age and highest level of education attained



Programme. This may have affected female education disproportionately [204]. The overall results of the study would suggest that a reduction in female education would be damaging in reducing levels of knowledge about HIV-1 and AIDS.

4.6.2 Socio-Economic Determinants of Personal Experience of AIDS

An index of personal experience of AIDS has also been calculated (Appendix H2) using the results on knowledge of persons with AIDS shown in Table 4.11. Table 4.15 shows the results of a multi-linear regression analysis of possible socio-economic determinants of personal experience of AIDS, based on this index. Separate analyses are presented for women in different current marital union states. Generally, the fits of the models are poor. The strongest effect is seen for residence within ten minutes walk of the centre of a growth point. This effect is significant for single and married women and tends to increase the chances of close personal experience of AIDS. Marital status also emerges as a significant factor. For single women, residence in the Rusitu Valley and exposure to television and radio appear to be relative risk factors, whilst more educated widows may be more likely to know a close relative with AIDS or to be caring for an AIDS orphan. These results are difficult to interpret due to the uncertainties about reliability of reporting. However, it may be worth noting that the weak relationship between education and experience for widows is consistent with the higher risk of HIV-1 infection found among more educated women in the antenatal clinic based seroprevalence surveys (section 4.4.2).

4.6.3 Socio-Economic Determinants of Sense Personal Danger of HIV-1 Infection

The results of a multi-linear regression analysis of possible factors influencing sense of personal danger of HIV-1 infection are given in Table 4.16. Factors found to increase the likelihood of a woman's reporting a sense of danger were increasing age, not being an Apostolic, location in the Rusitu Valley and residence within a growth point. Currently married women were less likely to report themselves as being in danger of infection than non-married women. Education was not a significant factor either for women as a whole or for women in any current union state.

Table 4.15 *Multivariate analysis* of the socio-economic determinants of reported female experience of HIV-1 and AIDS, by current marital status

Independent variable	Single		Married		Divorced/separated		Widowed		All women	
	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|
Marital status	-	-	-	-	-	-	-	-	**0.014**	0.003
Education	**-0.002**	0.806	**0.007**	0.211	**0.021**	0.216	**0.039**	0.094	**0.004**	0.303
Religion	**-0.013**	0.099	**0.003**	0.713	**0.027**	0.262	**-0.027**	0.256	**-0.003**	0.610
Location	**0.022**	0.002	**0.011**	0.117	**0.020**	0.433	**0.007**	0.783	**0.016**	0.001
In(out)side growth point	**0.015**	0.078	**0.028**	0.001	**-0.016**	0.559	**0.026**	0.439	**0.019**	0.001
Radio and TV exposure	**0.028**	0.000	**-0.005**	0.521	**0.020**	0.458	**-0.012**	0.786	**0.010**	0.072
Constant	**0.047**	0.015	**0.094**	0.000	**-0.022**	0.745	**0.068**	0.367	**0.087**	0.000
Adjusted R_2	0.062		0.021		-0.011		0.016		0.023	
F-statistic	6.01		2.65		-		1.18		5.67	
Observations	464		615		87		55		1,218	

Notes:

i The results shown derive from a stepwise multiple regression performed in STATA version 3. Parameters which contribute non-significant improvements to the model are dropped by a process of backward elimination. The spatial mobility and age variables had no significant effect and have been excluded from the model.

ii The index of experience about HIV-1 and AIDS is used here as the dependent variable. The basis of computation of this index is given in Appendix I.

iii Location is represented by a dichotomy: Honde Valley = 0; Rusitu Valley = 1. religion is also taken as a dichotomy: non-Apostolics = 0; Apostolics = 1.

Table 4.16 *Multivariate analysis* of the socio-economic determinants of reported perception of own danger of contracting HIV-1 and AIDS among women aged 13-49 years at the survey date

Independent variable	**Single**		**Married**		**Divorced/separated**		**Widowed**		**All women**	
	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|
Marital status	-	-	-	-	-	-	-	-	**-0.197**	0.000
Age	**0.080**	0.000	**0.009**	0.483	**-0.016**	0.670	**-0.089**	0.081	**0.026**	0.002
Education	**-0.037**	0.365	**0.016**	0.687	**-0.196**	0.047	**-0.012**	0.926	**-0.015**	0.555
Religion	**-0.049**	0.293	**-0.198**	0.000	**-0.042**	0.736	**-0.257**	0.075	**-0.124**	0.000
Location	**0.063**	0.139	**0.113**	0.009	**0.184**	0.153	**-0.039**	0.796	**0.102**	0.000
In(out)side growth point	**0.101**	0.043	**0.108**	0.045	**0.331**	0.016	**0.344**	0.081	**0.127**	0.000
Radio and TV exposure	**0.072**	0.116	**-0.067**	0.190	**0.240**	0.083	**-0.033**	0.898	**0.017**	0.617
Constant	**0.210**	0.000	**0.531**	0.000	**1.077**	0.029	**1.736**	0.639	**0.698**	0.000
Adjusted R_2	0.052		0.049		0.102		0.084		0.093	
F-statistic	5.09		5.85		2.60		1.74		17.72	
Observations	449		561		85		49		1,142	

Notes:

i The results shown derive from a stepwise multiple regression performed in STATA version 3. Parameters which contribute non-significant improvements to the model are dropped by a process of backward elimination. The spatial mobility variables had no significant effect and have been excluded from the model.

ii The index of experience about HIV-1 and AIDS is used here as the dependent variable. The basis of computation of this index is given in Appendix I.

iii Location is represented by a dichotomy: Honde Valley = 0; Rusitu Valley = 1. religion is also taken as a dichotomy: non-Apostolics = 0; Apostolics = 1.

For single women, increasing age was a risk factor, presumably because this is associated with greater likelihood of sexual activity. For married women, religion was the single most significant factor, with Apostolic women being less likely to consider themselves as being in danger. For divorced and widowed women, the most significant factor was residence within a growth point.

4.7 Action Reported as Having Been Taken to Avoid HIV-1 Infection

Details of actions reported as having been taken to avoid HIV-1 infection are given in Table 4.17, by current marital status and reported sense of danger. For women who were not married at the time of the survey, abstinence was the most commonly reported action taken. Condom use was generally more likely to be reported by women who felt themselves to be in danger of HIV-1 infection. This was particularly so for single and divorced women. Monogamy was the most common action reported by married women.

Just under half of the women with a regular partner said they had discussed AIDS with that partner. Women who felt in danger were more likely to have done this. Among marital status groups, divorcees were most likely to report having discussed AIDS with their regular partner. A third of regular partners were believed to have taken some action to protect themselves from HIV-1 infection. In 42 per cent of these cases the action taken was monogamy. Women who did not feel themselves to be in danger were more likely to believe that their regular partner was monogamous.

Thirty-nine per cent of male partners who were said to have taken action were believed to use condoms with casual partners and 29 per cent with regular partners. Reported condom use with regular partners was particularly high among non-Apostolics in the Honde Valley. The overall level appears inconsistent with the low levels of use reported by the women themselves and in the pocket-chart voting sessions on this topic. Possible explanations for the apparent discrepancy could be that condoms are seen as being "used" by the male partner or confusion as to whom should be regarded as a "regular partner". Men who have wives in rural

Table 4.17 Action reported as having been taken to avoid HIV-1 infection by women aged 15-49 years

Response	**Single**		**Married**		**Divorced/separated**		**Widowed**	
	Danger %	No danger %	Danger %	No danger %	Danger %	No danger %	Danger %	No danger %
Steps to Avoid HIV-1 Infection:								
Condom use	15.0	2.0	8.7	3.4	32.6	7.5	11.1	3.2
Sticking to one partner	10.6	4.7	31.4	38.4	28.3	22.5	11.1	3.2
Avoiding bars	7.1	2.0	2.2	1.4	6.5	0.0	5.9	3.2
Abstinence	52.2	63.5	0.7	1.7	17.4	50.0	27.8	64.5
Other steps	8.0	4.1	2.2	3.4	6.5	6.5	5.6	0.0
No action	25.7	28.9	59.2	54.8	20.0	19.4	50.0	25.8
Discussed HIV/AIDS with Partner	63.9	34.5	58.8	38.1	69.2	69.2	50.0	0.0
Steps Taken by Partner to Avoid HIV-1 Infection:								
Condom use: regular partner	25.0	12.7	11.7	3.8	34.6	23.1	10.0	0.0
Condom use: casual partners	19.4	1.8	18.2	5.9	38.5	23.1	10.0	0.0
Sticking to one partner	2.8	12.7	11.3	19.0	7.7	7.7	0.0	0.0
Avoiding bars	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0
Abstinence	0.0	5.5	0.4	0.3	3.8	0.0	0.0	0.0
Other steps	5.6	0.0	0.4	2.4	0.0	0.0	0.0	0.0
No action	58.3	70.9	67.5	69.9	38.5	61.5	90.0	100.0
Changed Method of Contraception to Condoms Since Hearing About AIDS	16.7	1.8	7.7	2.4	15.4	0.0	10.0	0.0
Total number of respondents	113	342	277	291	46	40	18	31
Respondents with regular partners	36	55	274	289	26	13	10	3

Note: Regular partners in this context may include past partners. Marriage excludes other stable unions.

areas may also have wives or steady girlfriends in the towns where they work, who could also be considered to be "regular partners". Condom use within casual partnerships was most widely believed to be practised by the regular partners of married and divorced women.

A number of women reported changing their method of contraception to condoms since hearing about AIDS. Women who said they felt at risk of AIDS were more likely to say they had done this - Chapter 6.

The effects of greater knowledge, experience and sense of personal danger on different actions taken to avoid infection with HIV-1 were investigated using multi-linear regression. The results are presented, by current marital state, in Table 4.18. In all cases, increased knowledge was associated with higher levels of reported action taken to avoid infection. For single women, greater knowledge was associated with increased tendency to report monogamy or abstinence, with abstinence declining with age, and condom use and monogamy increasing. Among married women, increased knowledge was associated with condom use and monogamy. Personal experience and sense of personal danger of AIDS were also associated with increased likelihood of reporting monogamy. For divorcees, knowledge about HIV-1 and AIDS was associated with increased abstinence; abstinence was less likely among women who felt in danger but condom use was more likely. Half of the widows interviewed said they were abstaining from sexual intercourse. Those widows who did not report abstinence were more likely to say they felt in danger of HIV-1 infection. Very few widows reported condom use or monogamy.

4.8 Discussion: Relationship between Knowledge, Perceived Danger and Action Taken to Avoid HIV-1 Infection

4.8.1 Validity and Reliability of the Data on Behaviour Change

The data presented on actions taken to avoid HIV-1 infection and AIDS are reliant on self-reporting by female respondents in interview situations. In these circumstances, respondents

Table 4.18 (1) *Multivariate analysis* of the determinants of reported action to avoid contracting HIV-1 and AIDS, by current marital status

Independent variable	**Condom use**		**Monogamy**		**Abstinence**		**No action**		**Discussed with partne**	
	Co-eff	P > |t|	**Co-eff**	P > |t|	**Co-eff**	P > |t|	**Co-eff**	P > |t|	**Co-eff**	P > |t|
Single Women										
Knowledge about HIV-1	**-0.016**	0.849	**0.203**	0.038	**0.519**	0.008	**-0.506**	0.006	**-0.363**	0.405
Experience of HIV-1	**-0.029**	0.831	**-0.083**	0.595	**0.057**	0.852	**-0.121**	0.672	**0.471**	0.416
Feels in danger of HIV-1	**0.108**	0.000	**0.047**	0.083	**-0.082**	0.127	**-0.034**	0.496	**0.268**	0.020
Education	**-0.013**	0.543	**0.010**	0.690	**0.042**	0.385	**-0.036**	0.428	**0.147**	0.271
Religion	**-0.046**	0.040	**-0.028**	0.285	**0.033**	0.518	**0.038**	0.438	**0.012**	0.931
Age	**0.046**	0.000	**0.019**	0.074	**-0.084**	0.000	**0.030**	0.131	**0.092**	0.093
Constant	**1.814**	0.000	**0.008**	0.921	**0.328**	0.035	**0.441**	0.003	**0.508**	0.189
Adjusted R_2	0.112		0.022		0.053		0.024		0.074	
F-statistic	10.45		2.71		5.22		2.80		2.18	
Observations	455		455		455		455		90	
Positive responses	24		28		277		128		42	
Married Women										
Knowledge about HIV-1	**0.223**	0.004	**0.439**	0.005	**0.058**	0.114	**-0.649**	0.000	**1.128**	0.000
Experience of HIV-1	**0.124**	0.301	**0.778**	0.001	**-0.030**	0.599	**-0.947**	0.000	**0.756**	0.001
Feels in danger of HIV-1	**0.040**	0.047	**-0.114**	0.005	**-0.011**	0.267	**0.097**	0.020	**0.122**	0.002
Education	**0.010**	0.614	**0.011**	0.785	**-0.002**	0.812	**-0.004**	0.927	**0.057**	0.118
Religion	**-0.005**	0.823	**-0.059**	0.165	**0.004**	0.715	**0.038**	0.393	**-0.125**	0.002
Age	**-0.003**	0.606	**-0.003**	0.806	**0.000**	0.929	**-0.002**	0.862	**-0.014**	0.268
Constant	**1.977**	0.000	**-0.039**	0.758	**-0.026**	0.384	**1.057**	0.000	**0.178**	0.139
Adjusted R_2	0.027		0.042		-0.004		0.061		0.215	
F-statistic	3.63		5.16		0.64		7.18		26.69	
Observations	569		569		569		569		563	
Positive responses	35		199		7		324		271	

Notes:

i The results shown derive from a stepwise multiple regression performed in STATA version 3. Parameters which contribute non-significant improvements to the model are dropped by a process of backward elimination.

ii See Appendix 1 for details of the construction of the indices of knowledge and experience of HIV-1 and AIDS.

Table 4.18 (2) *Multivariate analysis* of the determinants of reported action to avoid contracting HIV-1 and AIDS, by current marital status

Independent variable	**Condom use**		**Monogamy**		**Abstinence**		**No action**	
	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|	Co-eff	P > |t|
Separated and Divorced Women								
Knowledge about HIV-1	**-0.052**	0.870	**0.457**	0.199	**0.781**	0.038	**-0.877**	0.006
Experience of HIV-1	**0.153**	0.753	**-0.271**	0.616	**-0.034**	0.952	**0.029**	0.952
Feels in danger of HIV-1	**0.214**	0.020	**0.084**	0.401	**-0.357**	0.001	**0.076**	0.394
Education	**-0.137**	0.103	**0.131**	0.158	**-0.087**	0.366	**-0.037**	0.645
Religion	**-0.160**	0.100	**-0.040**	0.709	**-0.039**	0.729	**0.117**	0.221
Age	**-0.079**	0.010	**-0.031**	0.348	**0.003**	0.940	**0.072**	0.017
Constant	**0.874**	0.004	**0.205**	0.529	**-0.413**	0.228	**0.383**	0.187
Adjusted R_2	0.121		0.062		0.110		0.218	
F-statistic	2.95		1.94		2.75		4.94	
Observations	86		86		86		86	
Positive responses	18		22		28		20	
Widowed Women								
Knowledge about HIV-1	**0.035**	0.906	**0.709**	0.013	**-0.208**	0.732	**-0.652**	0.272
Experience of HIV-1	**-0.331**	0.489	**0.527**	0.231	**1.092**	0.261	**-1.482**	0.119
Feels in danger of HIV-1	**0.046**	0.572	**0.053**	0.477	**-0.410**	0.017	**0.377**	0.023
Education	**0.116**	0.094	**0.042**	0.502	**-0.082**	0.553	**0.025**	0.850
Religion	**-0.099**	0.184	**0.129**	0.062	**-0.142**	0.346	**0.107**	0.464
Age	**-0.017**	0.522	**0.046**	0.068	**0.036**	0.509	**-0.020**	0.708
Constant	**1.826**	0.000	**-0.550**	0.025	**-0.227**	0.666	**1.369**	0.010
Adjusted R_2	0.035		0.195		0.096		0.060	
F-statistic	1.29		2.94		1.85		1.51	
Observations	49		49		49		49	
Positive responses	3		3		25		17	

Notes:

i The results shown derive from a stepwise multiple regression performed in STATA version 3. Parameters which contribute non-significant improvements to the model are dropped by a process of backward elimination.

ii See Appendix 1 for details of the construction of the indices of knowledge and experience of HIV-1 and AIDS.

are often believed to exaggerate the action they are taking, so as not to lose face with or discourage the interviewers. Evidence of behaviour change reported in similar surveys may be dismissed on these grounds or because trends in HIV-1 prevalence have continued to rise. In fact, a degree of behaviour change can be compatible with continuing increases in HIV-1 seroprevalence in the early stages of an epidemic: see for example, the simulations shown by Rowley and Anderson [16]. Furthermore, it may be worth bearing in mind that self-reported increases in the uptake of contraceptive methods were erroneously dismissed in the early days of family planning programmes, for very similar reasons [255, 256]. Nonetheless, it is important to bear this in mind and to treat the data on behaviour change collected in the study with great caution. A good level of internal consistency and plausibility in the nature of responses would provide some comfort, but would not eliminate this uncertainty entirely, because women might be expected to provide responses which they felt were consistent with their own circumstances.

A second area of uncertainty regarding the data on behaviour change is due to the overlap between actions which might be taken to protect against AIDS and actions which might, in any event, be taken for family planning or health purposes. For example, abstinence might be practised prior to marriage or for birth spacing or maternal and child health reasons. Condoms might be used for family planning purposes or as a means of avoiding other sexually transmitted diseases. This has two important implications for interpretation of the data. First, the fact that no action has been reported as taken to avoid HIV-1 infection may not be a problem. The 13 per cent of single women who said they had taken no action because they were already abstaining from sexual intercourse could fall into this category (Table 4.12). The second point, is that some pre-existing practises may be reported as new actions taken to avoid AIDS, particularly if the kinds of reporting bias discussed above are present in the data. Some 60 per cent of single women reported abstinence as an action taken to protect themselves from infection. Given that these are rural areas and there was a traditional taboo on sex before marriage for women in *shona* culture [257], it is hard to believe that none of these women would have been abstaining in the absence of an AIDS epidemic. This problem makes it difficult to assess the extent of any genuine change in behaviour which has resulted from increased knowledge and concerns about the hazards of

HIV-1 infection and AIDS. One avenue, which could be explored, is examination of the data obtained in the Calender section of the questionnaires, which includes information about sexual activity and contraceptive use - for family planning and STD control, separately - over the five years prior to the survey date. This type of data may also assist (a little) in assessing the extent of another serious problem with data on behaviour change - ie: the question of consistency of application. A woman may report that she uses condoms with her regular partner, but it could be that this is only when he has a symptomatic STD, immediately following a birth or when they wish to delay the next pregnancy. There may be other times when she does not use condoms and is not protected from possible HIV-1 infection. Similar questions arise with abstinence and monogamy.

The problems discussed above are substantial and raise considerable doubts regarding the reliability and usefulness of the data on sexual behaviour. The following discussion on the possible relationship between knowledge, risk perception and actions taken to avoid HIV-1 infection must therefore be regarded as highly tentative. Even so, it is hoped that it may provide a few helpful clues as to the nature of the behaviour changes which are beginning to occur.

4.8.2 Viability of Alternative Preventive Actions

There are many social pressures which are experienced by women, which combine to put them at risk of HIV-1 infection and each of the principal marital states can be experienced by a woman at some stage in her life. However, it may still be helpful to consider the viability of some of the main protective actions that can be taken by women in each marital state. This is because there are important differences in the social expectations placed upon women when they are single, married, divorced or widowed.

Single women are subject to pressure from men to commence sexual activity prior to marriage and may be increasingly so, in circumstances where older men seek younger partners in the hope that these will be less likely to be infected with HIV-1 [140]. However, they may be able to invoke traditional taboos on sex before marriage and delay marriage [139] or maintain that condoms should be used as a form of birth control. Condoms are seen as more acceptable within casual relationships, but problems may develop when signs of longer-term commitment and intentions are demanded. Nevertheless, single women would seem to have at least some potential room for negotiation, particularly when the dangers and consequences of HIV-1 infection are recognized.

Abstinence and condom use are unlikely to be viable long-term protective measures for most married women. For older women, particularly those in polygynous marriages, terminal abstinence may provide protection, but abstinence during pregnancy and post-partum abstinence can provide only short-term protection for other married women. Monogamy on the part of a wife is expected, but provides no protection if the husband is infected by a previous or concurrent partner.

Divorced and separated women may have a number of options. They may decide to remarry or enter into another form of long-term monogamous relationship, in which case their situation will be as described above. If this is not possible or not desired, their socio-economic position would seem to present few alternatives to commercial sex work. Women who engage in commercial sex work may be able to negotiate use of condoms with their clients, especially if there is peer-group support for this strategy. However, the evidence we found at the Nyahode beer hall near Dzingire suggested that the possibility of condom use is often simply used as a bargaining chip in negotiating higher fees for sexual relations. Abstinence would only seem to be a viable option if a woman is able to achieve economic independence. This is rare in rural areas, where divorced women are unable to gain access to land or property.

The position of widows may be slightly easier. Widows tend to be older, so that abstinence may be a more viable option. Social pressures to remarry a kinsman of the late husband [178, 257] or another man were already waning, even in rural areas, and may be relaxed further in the context of a major AIDS epidemic. Economic independence may also be more of a possibility than is the case for divorcees. A widow may be given access to an area of land by her late husband's family or may achieve this by agreeing to be "inherited" by one of her own sons [178]. However, it should be noted that widows, particularly younger widows, are increasingly likely to have been infected with HIV-1 prior to their husbands' deaths. Actions taken after widowhood may be more likely to protect any subsequent partners than the women themselves.

4.8.3 Nature of Risk Perception

The data summarized in Table 4.12 suggest that reasons for feeling in danger of HIV-1 infection vary according to marital status. To an extent, they reflect some of the issues just discussed. While all the reasons given might be expected to provide strong motivation to take action to avoid infection, some actually represent barriers to the taking of effective action - eg: it is difficult to see what effective action a married woman can take, on her own, if her husband continues to have unprotected sex with other partners.

4.8.4 Reported Actions Taken by Marital Status and Sense of Danger of HIV-1 Infection

Relatively few single women said they felt in danger of HIV-1 infection (25 per cent). The most frequent reason given was large numbers of friends and relatives dying of AIDS. The most common reason for not taking any action was abstinence. Nearly three-quarters of single women reported themselves as having taken some form of action to avoid infection. By far the most common action reported was abstinence (Table 4.17). This was more likely to be reported by women who did not feel in danger than by women who did, which may suggest that many of these single women would have been abstaining anyway, even in the absence of AIDS. Given that many of these women are also very young this seems to be quite plausible. Abstinence among this group was positively associated with greater knowledge about HIV-1 and AIDS. Among single women who were not abstaining, those who said they felt in danger were more likely to report use of condoms, monogamy and avoidance of bars and beer halls (Table 4.17). Older single women were less likely to report abstinence as a strategy and more likely to report either monogamy or condom use, which again appears to be quite plausible.

Forty-five per cent of currently married women said they felt in danger of HIV-1 infection, with the predominant reason given being fear that husbands had unprotected sex with other partners. Half of the married women said they had taken no action to avoid infection. The most common reasons for not taking any action were monogamy, "husband refuses" and "doesn't know how to avoid" (Table 4.12). All of these reasons can be seen as reflecting a sense of powerlessness to prevent a husband from having other partners, becoming infected and passing on the infection to his wife, and appear to be both consistent and plausible. Among women who said they had taken action to avoid infection, monogamy was the most common measure adopted. In almost all cases, this seems likely to have been a practise the women were adopting in any case. Few reported any other form of action. Condom use was more likely to be reported by women who said they felt in danger (Table 4.17), although the difference was barely significant (Table 4.18). Increased knowledge about HIV-1 and AIDS was associated with a greater likelihood of reporting condom use as a protective measure. However, there is no hard evidence of married women being able to take effective action to protect themselves from infection.

Divorced and separated women were the group most likely to report a sense of danger of infection (53 per cent). The reasons given were mixed, with unfaithful regular partners and large numbers of friends and relatives dying being the most commonly given. However, more than one fifth said they felt in danger because they had multiple partners themselves. The true proportion for whom this is the case could be higher, as other women may not have divulged this information to the interviewers. However, a high proportion (over 80 per cent) said they had taken action to protect themselves from HIV-1 infection. For those who acknowledged a danger of infection, condom use was the most commonly reported action (Table 4.17) and abstinence was less likely to be reported (Table 4.18). As was noted previously, condom use would seem to be a credible step for women engaged in commercial sex work, but may be one which is not strictly adhered to. To an extent this picture may therefore be one of cause and effect: women who are unable to abstain from sexual relations tend to place increased reliance on condoms, which they may not fully trust or may be unable to use on a consistent basis. For those who said they did not feel in danger, abstinence was the most common action reported, which may again be, in part, a rationalization of a pre-existing practise. However, abstinence was more likely to be reported by women with greater knowledge of HIV-1 and AIDS (Table 4.18), so that the epidemic may have had some effect. Monogamy was reported by sizeable minorities of women regardless of perceived danger. These findings are again internally consistent and plausible, given the circumstances of divorced and separated women. However, the principle active strategy - ie: condom use - may not be applied consistently and, given that many of these women have high numbers of partners, it would seem that they continue to be at extremely high risk of infection. On the other hand, if it is true that some divorced women are able to maintain abstinence from sexual relations, these women will of course be at low risk of infection.

Just over one third of the widows interviewed said they felt in danger of HIV-1 infection. Half of these said this was because their regular partner had had other partners and one third were concerned because friends and relations were dying (Table 4.12). Just over a quarter currently had a regular partner and those that did were more likely to feel in danger of HIV-1 infection, but less likely to report having taken protective action. However, the latter differential was principally because many of the widows with no regular partner reported abstinence as an action taken to avoid infection (Table 4.17). This could reflect reduced rates of widow remarriage due to AIDS, but may again represent subsequent rationalization of decisions originally taken for other reasons - eg: to protect children's well-being. Among widows who were sexually active, reported condom use and monogamy were higher where women felt in danger of infection, but the numbers of such women are small and the differences are not significant (Table 4.18). These results are consistent with the view that some widowed women are better placed to avoid sexual relations and HIV-1 infection than women in other marital states. However, others continue to be at high risk.

4.9 Summary and Conclusions

4.9.1 Status of the HIV-1 and AIDS Epidemics in the Honde and Rusitu Valleys

i Numbers of reported AIDS and tuberculosis cases have risen rapidly throughout

Zimbabwe since the late 1980s; case rates currently peak in the 20s for females and 30s for males;

ii Sentinel surveillance data at antenatal clinics indicate that HIV-1 prevalence levels have continued to rise during the early 1990s. The data is patchy, but suggests there may have been some regional differences in the timing of onset of rapid increases in prevalence and a recent levelling off in prevalence in certain areas of the country. Selection biases in the data may distort comparisons, particularly between urban and rural areas; nevertheless it seems there may have been a slight tendency towards earlier and perhaps more extensive spread within urban areas. Prevalence levels in rural areas are especially high compared to those seen in other sub-Saharan African countries;

iii HIV-1 prevalence among women attending antenatal clinics in the Honde Valley and the Rusitu Valley has reached high levels. Prevalence is probably slightly higher in the Honde Valley than in the Rusitu Valley. Much of the spread appears to have taken place within the last five years;

iv Age, marital status and level of education were found to be associated with risk of HIV-1 infection among women; religion, other STDs, labour migration and level of development of the home area may also be local risk factors;

v Relatively few cases of HIV-1 related morbidity and mortality have been diagnosed to date. In part, this is because routine screening of suspected cases has only recently been implemented at local health clinics. A number of the cases which were recognized were individuals from urban areas, who had returned to their rural homes when they became sick or died;

vi Numbers of cases of AIDS, tuberculosis and other HIV-1 related diseases appear likely to increase sharply over the next five to ten years, in both study areas.

4.9.2 Impact of the HIV-1 Epidemic and Associated Education Campaigns on Individual Women Living in the Honde and Rusitu Valleys

i Basic knowledge about HIV-1 and AIDS is reasonably good, but a number of important gaps in understanding remain which should be addressed. These include unawareness of the link between other STDs and HIV-1 infection, lack of clarity regarding the distinction between HIV-1 infection and AIDS and knowledge of the potentially long and asymptomatic incubation period for AIDS, misconceptions about the risks of infection from touch, shared household utensils, mosquito bites, perinatal transmission, including the extent of the risk through breastfeeding, and the potential risk via traditional scarification practises;

ii Increased level of education is strongly associated with improved knowledge about HIV-1 and AIDS. Religion appears to be an obstacle to good understanding, particularly in the Honde Valley. More effective means are needed for communicating information to less educated and Apostolic women. Knowledge about HIV-1 and AIDS among children who may shortly become sexually active is quite good, reflecting the presence of sex education programmes within local schools. However, any drop in school enrolment, due to deteriorating economic conditions and increases in school fees, implemented as part of the current Economic Structural Adjustment Programme, could jeopardize attempts to provide universal education about HIV-1 from an early age;

iii Personal experience of AIDS, in terms of illness among close relatives or the adoption of orphans, is currently low and has so far had little discernable effect on behaviour. Knowing someone with AIDS has been found to be a determinant of behaviour change in earlier studies [101], so that the lack of an effect here may be due to the absence, as yet, of large numbers of HIV-1 related deaths within the study areas;

iv Many women felt themselves to be in personal danger of becoming infected with HIV-1. This was particularly the case among married and divorced women and among women living near to the growth points. Apostolic women were less likely to say they felt in danger;

v Many women stated that they had taken action to protect themselves from HIV-1 infection. Detailed analysis of action taken is complex, in part because of possible reporting biases, but also because a number of interacting factors are involved. These include: level of knowledge about HIV-1 and AIDS; the nature and strength of any sense of personal danger, which may, in part, reflect traditional beliefs regarding the roles of ancestors and witches in relation to illness; socio-cultural pressures, which may vary, for example, according to current marital status, and can place obstacles to taking effective action, but which may vary over time; pre-existing practises originally adopted for other reasons, but which may be seen as measures which reduce the risk of HIV-1 infection; and questions regarding the consistency and effectiveness of actions which are taken;

Against this background, only very tentative interpretations can be offered. On this basis, it might be suggested that some behaviour changes are occurring among single and divorced women and widows. The responses given appear to be internally consistent and plausible, given what is understood about the social circumstances of these women;

vi The true extent of any genuine change cannot be assessed in view of the reporting biases, which are believed to be present. One thing which is clear, is that changes in male attitudes and behaviour are required, if the risks of infection to women in rural areas are to be reduced;

vii There is evidence of modest changes in methods of contraception as a result of the HIV-1 epidemic, with condoms being the preferred new method. This may have implications for future fertility and will be considered again in Chapter 6.

CHAPTER 5

An Assessment of the Impact of the HIV-1 Epidemic on Mortality in Rural Manicaland

Rock paintings, Ngomakurira, Zimbabwe, 1995.

5

An Assessment of the Impact of the HIV-1 Epidemic on Mortality in Rural Manicaland

5.1 Aims of the Chapter

The aims of this chapter are as follows:

i. To describe recent trends in early childhood and adult mortality in rural areas of Manicaland; and

ii. To assess the early impact of the HIV-1 epidemic on mortality in these areas.

In view of the finding that women from some Apostolic sects are under-represented in the HIV-1 prevalence studies carried out at antenatal clinics (Chapter 4) and qualitative information that they may be at reduced risk of HIV-1 infection, due to more restrictive sexual behaviour patterns amongst their husbands (Chapter 3), particular attention will be paid to differentials in mortality between Apostolics and non-Apostolics.

5.2 Organization of Chapter

Details of the data obtained for the study and of the data collection procedures followed were described in Chapter 2. The data utilized in the present chapter and the data analysis methods employed are described in section 5.3. The next section (section 5.4) sets out the results of this data analysis and an interpretation of these results is offered in section 5.5. The final section (section 5.6) draws out a number of conclusions regarding the relative recent mortality experiences of the Honde Valley and Rusitu Valley populations and the early impact of the HIV-1 epidemic.

5.3 Methods

5.3.1 Indicators of Mortality Used in the Study

A number of indicators of mortality have been calculated from the data collected during the fieldwork phases of the study. These are prevalence and incidence of orphanhood, infant mortality rates, and one year age-specific death rates. Also, the age distributions, by sex, of the populations are studied for evidence of the impact of any recent changes in mortality. Death registration statistics and 1992 Census estimates of early childhood and adult mortality and of the population structures in the districts containing the Honde and Rusitu Valleys are also examined, in order to place the survey results in a broader local context.

5.3.2 Selection and Calculation of Mortality Indicators from Data Collected in the Study

Maternal and Paternal Orphanhood - Prevalence and Incidence

Orphanhood prevalence and incidence rates were calculated to provide some indication of the relative levels and trends in adult mortality in the two study populations. In recent decades, indirect techniques, which link data on orphanhood with the use of model life tables, have been used widely to obtain estimates of age-specific mortality rates and life expectancies at adult ages [258-261]. However, these techniques rely on the assumption that parents survival chances are not associated with the risks of mortality experienced by their children. In the context of an HIV-1 epidemic, in which a third or more of children born after a woman becomes infected are likely to be infected themselves - with many dying within a period of two to three years - this assumption clearly fails. Given the high levels of HIV-1 prevalence within the two populations studied here (Chapter 4), it was therefore decided not to apply these techniques, but rather to examine the recent trends in orphanhood in the light of those projected by mathematical model simulations [28, 78, 91]. The latter reflect pre-HIV-1 levels of childhood and adult mortality and the increases which might be expected over time in an HIV-1 epidemic, given a range of underlying demographic, biological and behavioural conditions. They are therefore able to take into account reductions in the prevalence of orphanhood due to increases in infant and early childhood mortality attributable to vertical HIV-1 infections, as well as the rises which follow from HIV-1 related causes of adult mortality.

The orphanhood prevalence rates which will be shown in section 5.4.2 were calculated using data from the questions on maternal and paternal survivorship included in the 1994 Household Survey and the 1995 Childhood Survey, and by applying maximum likelihood methods [262]. Dates of parental death were also obtained in the Childhood Survey, and orphanhood incidence rates were calculated by age and time period, to provide information on recent trends.

An alternative approach to the study of adult mortality in an HIV-1/AIDS context could be analysis of data on sibling survivorship using indirect techniques [263]. The survival chances of brothers and sisters may be less closely inter-linked than those of parents and children or husbands and wives. High levels of HIV-1 transmission between spouses - particularly from husbands to wives - are likely to invalidate the assumptions of the widowhood method [264]. The sibling survivorship approach therefore appeared to offer the greatest promise and appropriate questions were included in the Household Survey. The mortality estimates obtained are presented and discussed in Appendix G. Problems were encountered in applying the method in the current context, due to under-reporting of older siblings and lack of specificity of the data to the study populations. However, the results indicate that adult mortality may have been slightly higher in the past in the Rusitu Valley than in the Honde Valley.

Infant Mortality Rates

Infant mortality rates are studied in preference to early childhood mortality rates, because they are believed to be more sensitive to the initial effects of an HIV-1 epidemic, although it should be noted that the impact on childhood mortality may ultimately be greater. The impact of short-term factors, such as major droughts or measles epidemics - so called "period effects" - should also be more clearly distinguishable in infant mortality data. Period early-childhood mortality rates will include children whose risk of HIV-1 infection in a growing epidemic varies with age, depending on the incremental risk of infection through breastfeeding. If the latter is small, younger children will be more likely to be infected than older children in the early years of an epidemic. Thus, period childhood mortality rates may obscure the full extent of the emerging impact of an escalating HIV-1 epidemic. Because of censoring at the date of the survey, cohort early childhood mortality rates can only be calculated for cohorts born five or more years in the past. They are therefore insensitive to very recent changes in early childhood mortality. The infant mortality rates shown in section 5.4.3 were calculated from the birth history data obtained during the 1994 HIV-1 and Fertility Survey. For each child reported by a respondent, the date of birth was recorded and confirmed by reference to a Child Health Card wherever possible (Appendix C). The child's current survival status was then recorded and age at death was sought for those who had died. The infant mortality rate for a period ***(x, x+1)*** years before the survey date was calculated by dividing the number of children born in that year who failed to survive from birth to the age of one, by the total number of children born in the year. All births in the most recent period prior to the survey date were taken as having occurred six months previously. An estimated (annualized) infant mortality rate for the period was computed by taking three-quarters of infant deaths to have occurred within the first six months after birth. This assumption is based on findings on neonatal and post-neonatal mortality reported for the 1994 Zimbabwe Demographic and Health Survey [195].

<u>Age-Specific Death Probabilities</u>

Age-specific death probabilities were computed for the year 1994-95 to provide further information on recent levels and patterns of childhood and adult mortality. In the 1995 Childhood Survey, the current survival status of all household members recorded in 1994 was sought. Seven hundred and forty-five of the original 929 households were visited (80.2 per cent). The repeat survey was principally concerned with collecting further data on orphanhood and 132 households (14 per cent) were excluded as they had contained no children at the time of the 1994 visit. 14 of the remaining omissions were due to out-migration from the study areas. Households containing no children in 1994 principally comprised elderly individuals or couples, and recently married couples yet to start families. The elderly and young adults are therefore slightly under-represented in the results of these calculations and an element of selection bias could be present in the age-specific death probabilities presented in section 5.4.4. For example: while maternity-related mortality is not believed to be high in Zimbabwe, by sub-Saharan African standards, the exclusion of women who have lower fertility could mean that the age-specific death probabilities tend to exaggerate female adult mortality amongst the population as a whole. In the households re-visited, survivorship data was obtained for 92 per cent of the individuals listed in the 1994 Household Survey. The great majority (94 per cent) of those for whom no data is available were omitted due to enumerator error - particularly in the early stages of the Childhood Survey in the Honde Valley - rather than because their survivorship status was not known to respondents.

The age-specific death probabilities were calculated by sub-dividing the population according to age at the time of the Household Survey and dividing the numbers who had died in each age-group by the size of the population observed. Appropriate minor adjustments were made to compensate for the time period between the two surveys' being one month less than a year, on average, for the Rusitu Valley households. Monthly totals of registered deaths indicate that the missing period, during April and May, is one of average mortality in Chimanimani - 53 out of 290 deaths registered in 1991 and 1993 occurred during these months with peaks in mortality appearing in December and January, early in the rainy season - note: 1992 was an exceptional year due to the major drought and the use of mobile units to register births and deaths during May, and has therefore been excluded from this assessment. The comparison between mortality in the Honde and Rusitu valleys made on this basis is believed to be unaffected by seasonal fluctuations and is therefore thought to be valid.

Model life-table estimates for age-specific death probabilities have been computed by the Zimbabwe Central Statistical Office (ZCSO) for 1987 [184, 265]. These are for Zimbabwe as a whole, including urban as well as rural areas - District or Provincial level data are not available. Mortality is generally higher in rural areas of Zimbabwe than in urban areas [173]. However, continued improvements in access to health services and education would, *ceteris paribus*, be expected to have reduced death rates between 1987 and 1994. These estimates are therefore believed to provide a useful picture of the levels and pattern of age-specific mortality at the time immediately prior to the rapid spread of HIV-1 in the country. Therefore they have been used as the basis for a comparison with the data obtained for the study areas. In part because the ZCSO estimates are calculated for five year age intervals and partly because the period of observation in the current study is short and the population sizes and numbers of deaths observed are small, estimated age-specific death probabilities have been calculated for ten year age intervals $({}_{10}q_x)$. In the case of the ZCSO figures, this has been done by computing the ratios of the numbers of survivors at 10 year age intervals set out in the life tables. The probability of dying between exact ages 65 and 75, ${}_{10}q_{65}$, has been used as an approximation for the average ten year death probability for individuals aged over 55 years in 1994. For the empirical values, estimates of ${}_{10}q_x$ have been obtained using the crude approximation ${}_{10}q_x = 1\text{-}S_x^{10}$, where S_x is the proportion of individuals aged $(x, x+10)$ at the time of the 1994 survey, who were still alive one year later. As very young infants are believed to have been under-enumerated in the 1994 Household Survey, empirical values for the youngest age-group are taken as estimates of ${}_{4.5}q_{0.5}$. The ZCSO based comparison here is calculated from the life table, using the same assumption as was employed in obtaining the estimate of infant mortality for 1994-95 - ie: that three-quarters of infant deaths occur before the age of 6 months.

Statistical Methods

χ^2 tests and tests for the significance of differences between proportions - using the Normal approximation to the Binomial distribution - have been applied to assess the significance of recent changes in mortality and differentials between levels in the two study sites and between religious groups [192, 266]. The STATA package was used to carry out logistic regressions to examine some of the key socio-demographic determinants of infant mortality [267].

5.4 Results

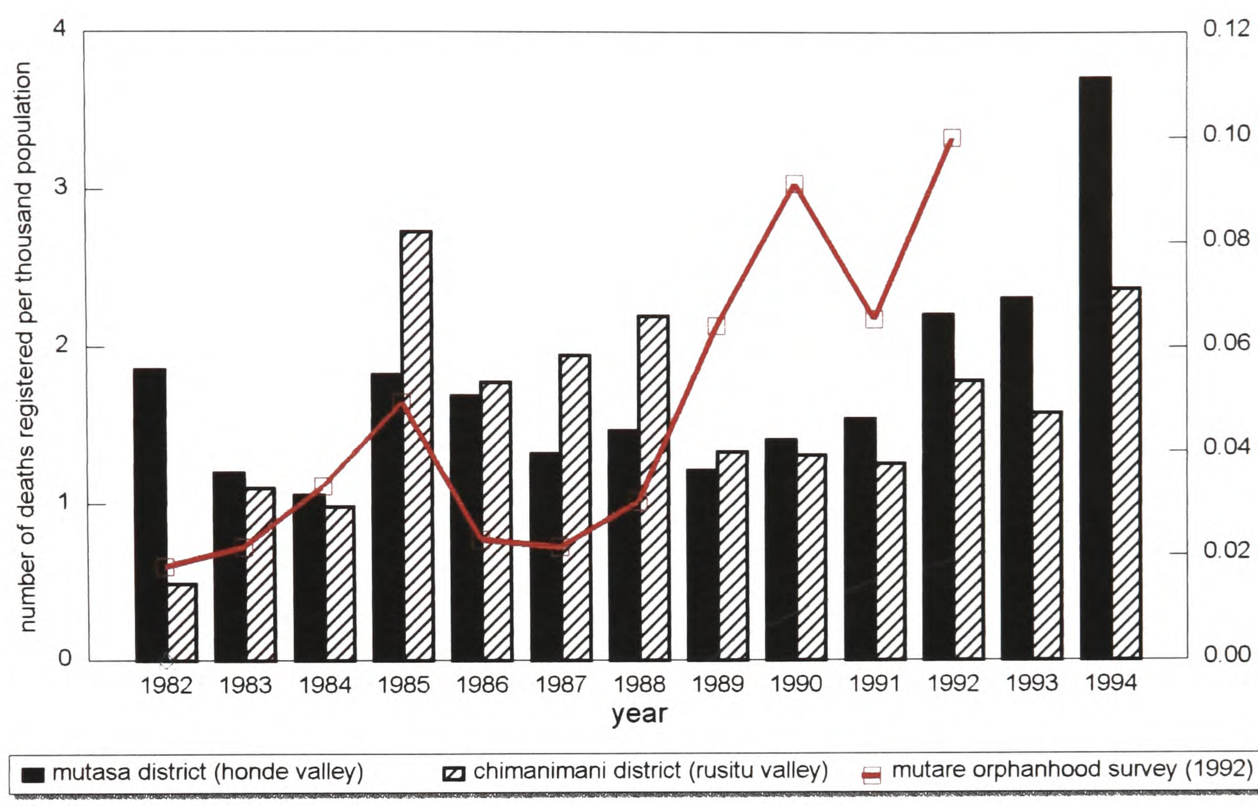
5.4.1 Death Registration Data for the Mutasa and Chimanimani Districts of Manicaland

The numbers of deaths registered per thousand population in the Mutasa and Chimanimani districts of Manicaland each year since 1982 are shown in Figure 5.1. While levels of registration may be low, this kind of data has been advocated for assessing demographic trends [268, 269], provided it can be assumed that coverage does not fluctuate substantially from year to year.

In the current case, death registration coverage is thought - on the basis of comparison with 1992 Census estimates - to be of the order of 17 per cent in Mutasa and 16 per cent in Chimanimani. Coverage in Chimanimani is particularly erratic because mobile units have been used on a number of occasions in recent years to improve registration. In particular, these units were deployed in 1992 during the drought and again in 1994 in the run up to the 1995 General Election, when efforts were being made to increase voter registration. There appears to have been an increase in mortality since the late 1980s in Chimanimani, but it is impossible to tell how much of this is real and how much is due to increased coverage. The data for Mutasa is understood to be unaffected by the use of mobile units and reveals some interesting features. In particular, the measles epidemic in 1985 [270, 271] is clearly identifiable. The numbers of deaths registered in Mutasa have increased steadily since the late 1980s, with the *per capita* registration between 1990 and 1994 being significantly greater than *per capita* registration in the equivalent period five years earlier ($p < 0.001$).

A breakdown of the deaths registered in Chimanimani in 1993 shows that 93 per cent were adult deaths and only 3 per cent deaths among infants. This suggests that the data principally reflect trends in adult mortality. There is no particular incentive to register infant and child deaths, but registration of adult deaths may be needed to access social welfare benefits or life insurance policies. The breakdown also reveals 10 adult deaths (6 per cent) identified as being attributable to AIDS and a further 30 as being due to tuberculosis (12), pneumonia (8), diarrhoea (8) or venereal diseases (2); all illnesses commonly associated with HIV-1 infection

Figure 5.1 Numbers of deaths registered by the Mutasa and Chimanimani district registry offices in Manicaland per thousand head of population: 1982 to 1994



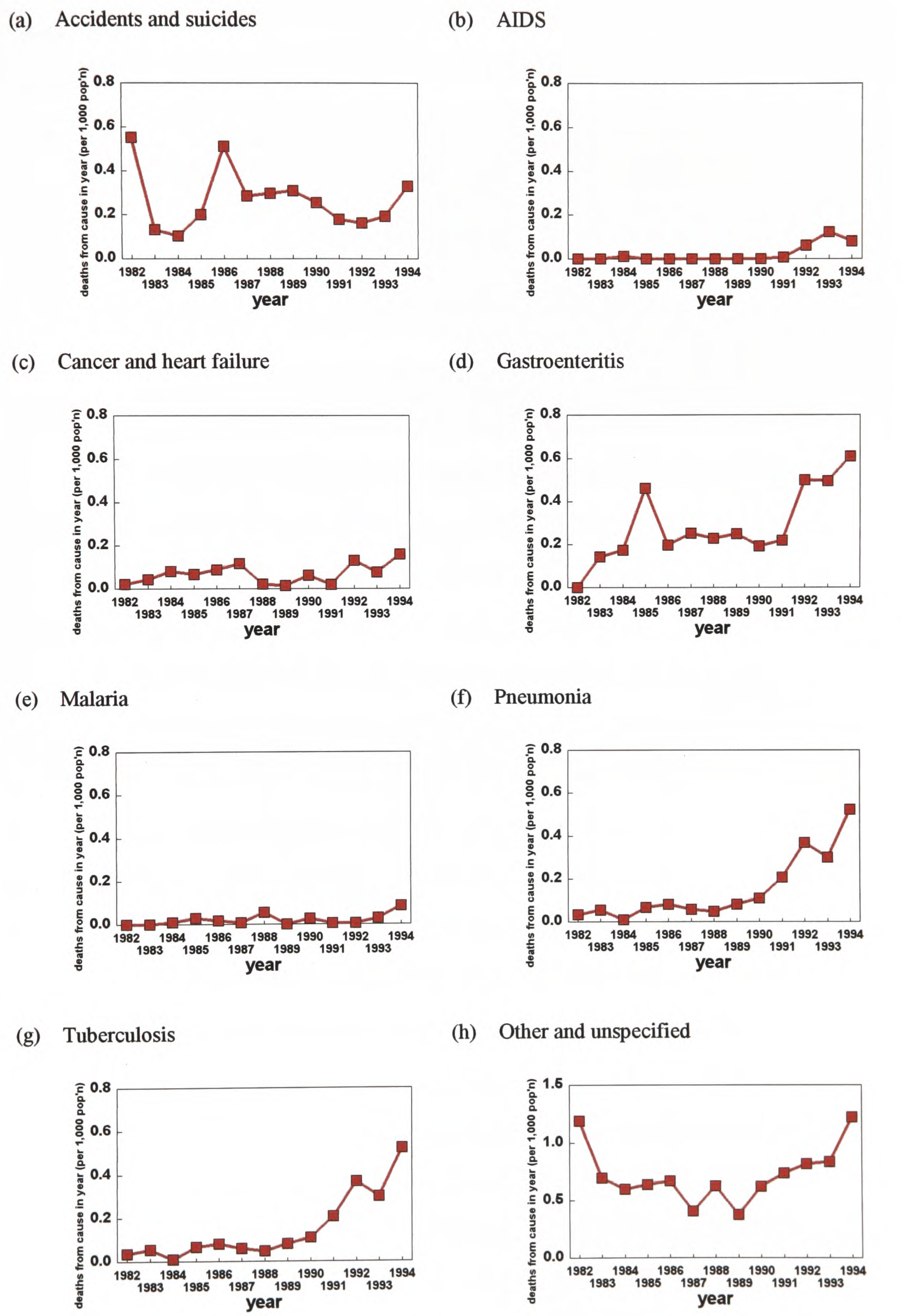
Note: Annual base populations have been estimated by assuming constant rates of growth between the censuses in 1982 and 1992 and the same rates of natural increase between 1992 and 1994 as were recorded in 1991-92. Nil net migration was assumed between 1992 and 1994. Coverage of deaths in the registration system is estimated at around 10-20 per cent. Years of parental death in the Mutare Orphanhood Survey, 1992, are given for comparison [136].

[220, 238, 272]. Six deaths due to violence or road traffic accidents were recorded, together with 12 adult deaths from malaria. However, "other causes" (70) was the largest single category. Under-reporting of AIDS as a cause of death is believed to occur, as doctors may wish to spare relatives the stigma which can be attached to having had an AIDS case in the family. In many instances the immediate cause of death is recorded on death certificates, rather than an underlying cause, such as infection with HIV-1 [15, 139]. The observed proportion of deaths due to AIDS is therefore likely to be an under-estimate. All the AIDS cases recorded - and 80 per cent of those attributed to potentially HIV-1 associated causes - were among men. However, 70 per cent of the other adult deaths registered were also males. While male adult mortality rates are generally higher in Zimbabwe than those among women [194], the data suggest lower coverage of female deaths in the Chimanimani district registers.

Trends in numbers of registered deaths for Mutasa District are shown by cause in Figure 5.2, for the period 1982 to 1994. AIDS begins to feature in the registered deaths in 1991, but the numbers of cases recorded are low in relation to those ascribed to other causes. However, the numbers of deaths entered in the registers attributed to tuberculosis, gastroenteritis and pneumonia have all increased sharply since 1990 and HIV-1 infection may be an underlying cause of many of these. Deaths from other and unspecified causes have also increased. In view of the reporting problems noted above, some of these may also be HIV-1 related. As in Chimanimani, the vital registration system in Mutasa appears to incorporate a higher coverage of adult deaths than infant deaths. In 1994, for example, 95 per cent of deaths recorded were to adults compared to 3 per cent among infants. The Mutasa District Registry Office did not provide a breakdown of the registered deaths by sex.

The third set of data illustrated in Figure 5.1 shows the incidence of orphanhood recorded in a recent survey in areas immediately surrounding Mutare, the provincial capital of Manicaland [136]. Again a peak in mortality is visible around 1985, although some of this may be due to heaping on years ending in the digits 5 and 0, as there is also a subsequent unexplained peak in 1990. These data suggest a rather earlier increase in (adult) mortality. However, the areas covered are generally more urban than the Honde and Rusitu valleys, or indeed the majority of Mutasa and Chimanimani districts.

Figure 5.2 Registered deaths per head of population in Mutasa District, 1982 to 1994, by cause



Note: Annual base populations estimated by assuming constant growth rates between 1982 and 1992 (6.9 per cent) and 1992 and 1994 (2.5 per cent).

Figure 5.3 shows the trends in numbers of deaths registered in each district of Manicaland since 1982. In some cases, marked fluctuations occur from one year to the next, possibly reflecting variations in coverage or local differences in patterns of disease and their impact. However, in all cases, there is at least some suggestion of an upward trend since the late 1980s.

5.4.2 Adult Mortality

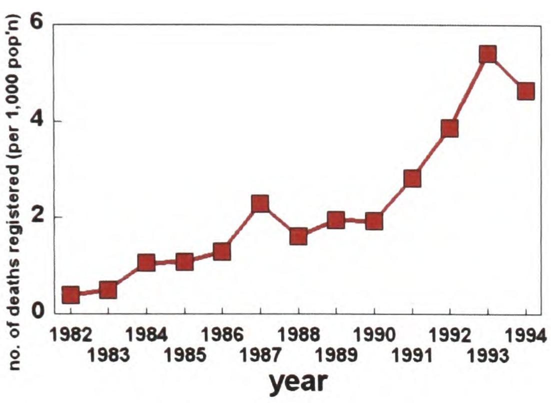
Orphanhood Levels by Site and Religion

Estimates of paternal and maternal orphanhood levels at the time of the 1994 and 1995 surveys are shown in Table 5.1. Maximum likelihood estimates from a model which allows for the effects of missing data are also shown. Problems of under-enumeration have been noted in previous studies [137, 243, 259, 273] and the estimates given are believed to be on the low side (Appendix C). Orphans from Apostolic families may be particularly susceptible to under-ascertainment due to the prevailing childcare practises.

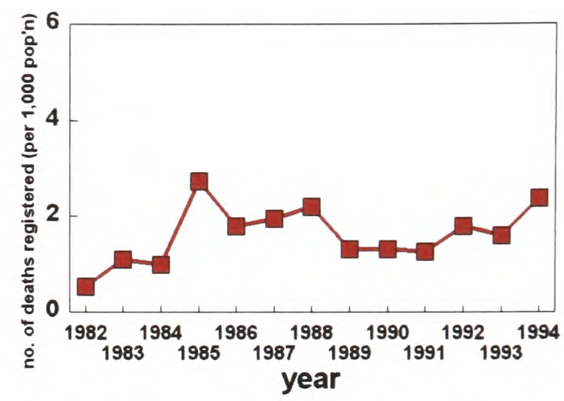
Notwithstanding these difficulties, the estimates are thought to give useful clues as to the *relative* levels of adult mortality within the Honde and Rusitu valley populations. The Maternal orphanhood may be marginally higher in the Honde Valley. While numbers of deaths are small, it is interesting to note that maternal orphans are more common among non-Apostolics in the Honde Valley, but less so in the Rusitu Valley. Comparisons of levels of maternal orphanhood are affected by differences in fertility. Higher fertility usually results in an older mean age at childbirth, $\boldsymbol{M}$, which, *ceteris paribus*, would imply greater maternal orphanhood. Fertility is generally slightly higher in the Rusitu Valley ($\boldsymbol{M}$ = 27.22 years) and is relatively low among non-Apostolics in the Honde Valley ($\boldsymbol{M}$ = 26.25). Other things being equal, maternal orphanhood might therefore be expected to be slightly lower in Honde and particularly among the non-Apostolics living there. The reverse actually appears to be the case.

Figure 5.3 Numbers of deaths registered by district registry offices in Manicaland: 1982 to 1994

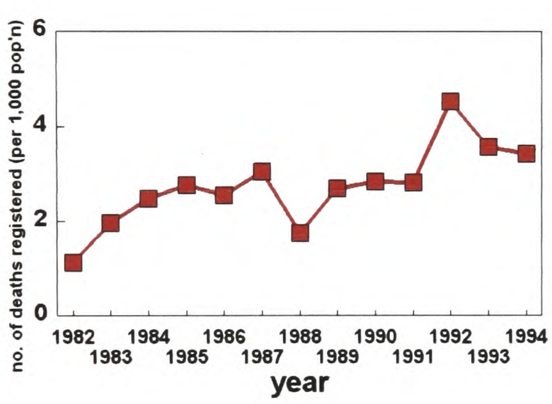
(a) Buhera



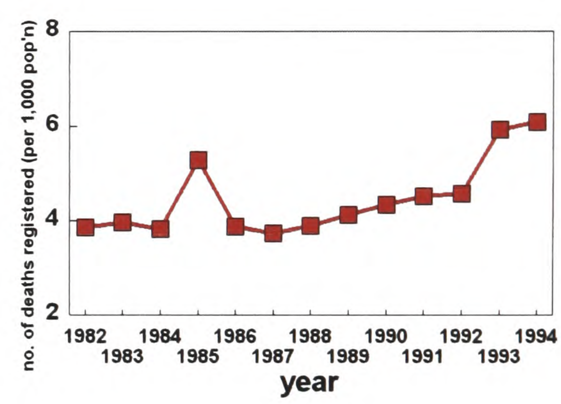
(b) Chimanimani



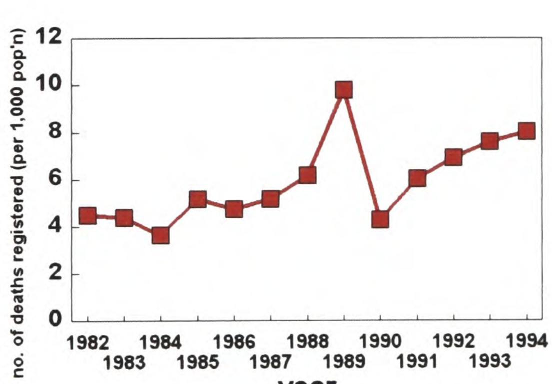
(c) Chipinge



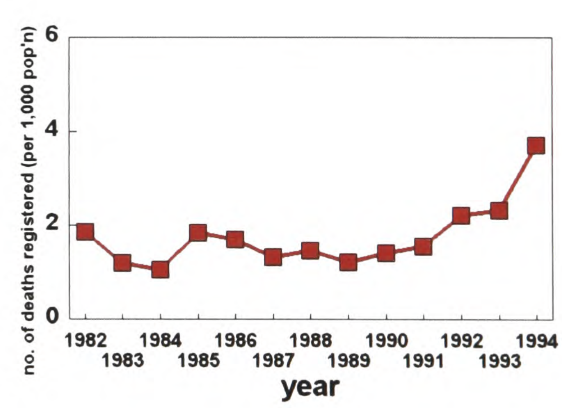
(d) Makoni



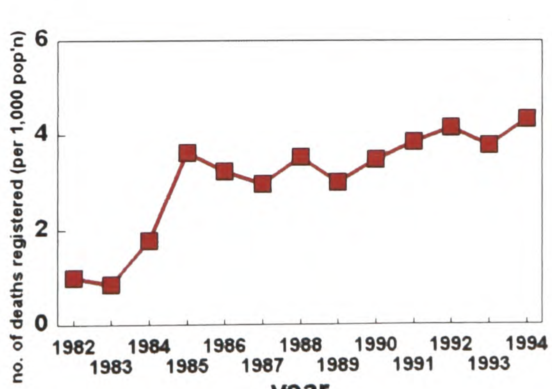
(e) Mutare



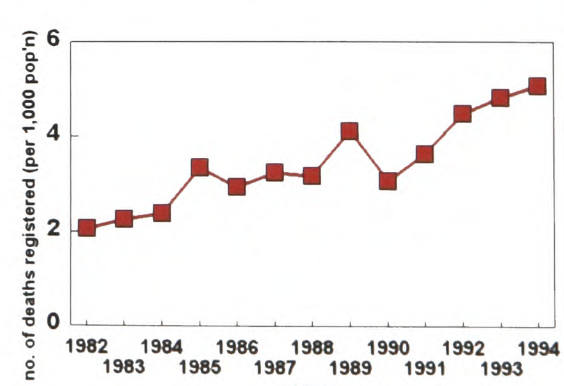
(f) Mutasa



(g) Nyanga



(h) Manicaland (combined)



Note: Annual base populations estimated by assuming constant growth rates between 1982 and 1992 and 1992 and 1994.

Table 5.1 Levels of orphanhood among children aged 0-14 years and 0-15 years estimated in the 1994 and 1995 surveys, respectively: heterogeneity between religions

Population	Children	1994 Survey % orphaned				1995 Survey % orphaned			
	Number	Survey %	MLE %	95% Confidence Interval %	%	Survey %	MLE %	95% Confidence Interval %	%
PATERNAL ORPHANS									
Honde Valley									
Apostolics	328	**3.5**	**4.0**	2.5	6.5	**4.9**	**5.5**	3.5	9.0
Other religions	685	**7.8**	**8.1**	6.4	10.7	**10.1**	**11.1**	8.9	14.4
All religions	1,013	**6.4**	**6.8**	5.1	9.3	**8.4**	**9.3**	7.2	12.7
Rusitu Valley									
Apostolics	437	**13.5**	**11.0**	8.5	14.9	**13.5**	**14.8**	11.6	20.1
Other religions	885	**8.1**	**8.9**	7.3	11.3	**11.9**	**12.1**	10.1	15.2
All religions	1,322	**9.9**	**9.6**	7.7	12.5	**12.4**	**13.0**	10.6	16.8
MATERNAL ORPHANS									
Honde Valley									
Apostolics	328	**2.0**	**1.7**	0.8	3.5	**2.4**	**2.4**	1.2	4.9
Other religions	685	**3.0**	**2.6**	1.7	4.0	**3.7**	**3.7**	2.5	5.5
All religions	1,013	**2.7**	**2.3**	1.4	3.8	**3.3**	**3.3**	2.1	5.3
Rusitu Valley									
Apostolics	437	**2.6**	**2.6**	1.6	4.4	**3.7**	**3.7**	2.3	6.1
Other religions	885	**1.7**	**1.7**	1.1	2.7	**2.4**	**2.4**	1.6	3.7
All religions	1,322	**2.0**	**2.0**	1.3	3.3	**2.8**	**2.8**	1.8	4.5

Notes:

i Survey estimates ignore children for whom information on parents survival status was not recorded (missing). Children with parents recorded as having died in 1994 but alive in 1995 are excluded.

ii Maximum likelihood estimates are derived using the information on "missingness" of data but ignoring errors in misclassification of orphan status.

A similar pattern by religious group, is seen in the paternal orphanhood results, with the excess among non-Apostolics in Honde Valley being statistically significant (Table 5.1). However, the overall level is significantly higher in the Rusitu Valley than in the Honde Valley and this appears to have been the case since at least the early 1980s (Figure 5.4f).

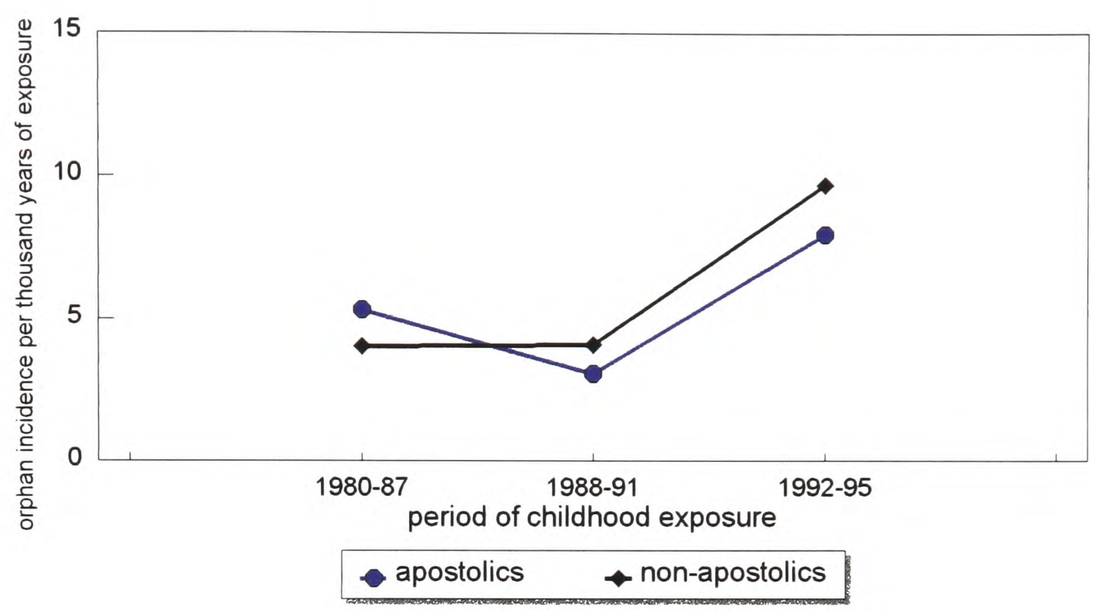
Variations in the age-gap between children's natural fathers and mothers represent an underlying influence on the relative levels of paternal and maternal orphanhood. Figure 5.5 shows the high percentages of children whose parents ages differ by ten years or more among Apostolics in the Honde Valley and among children from households of all religions in the Rusitu Valley. Large age-gaps appear to be closely associated with the practise of polygyny in the two areas. Given the higher male than female adult age-specific mortality rates which prevail locally [194], these large age-gaps would, *ceteris paribus*, be expected to result in larger excesses of paternal orphanhood over maternal orphanhood among Apostolics than among non-Apostolics, particularly in the Honde Valley.

Recent Trends in Orphanhood Incidence

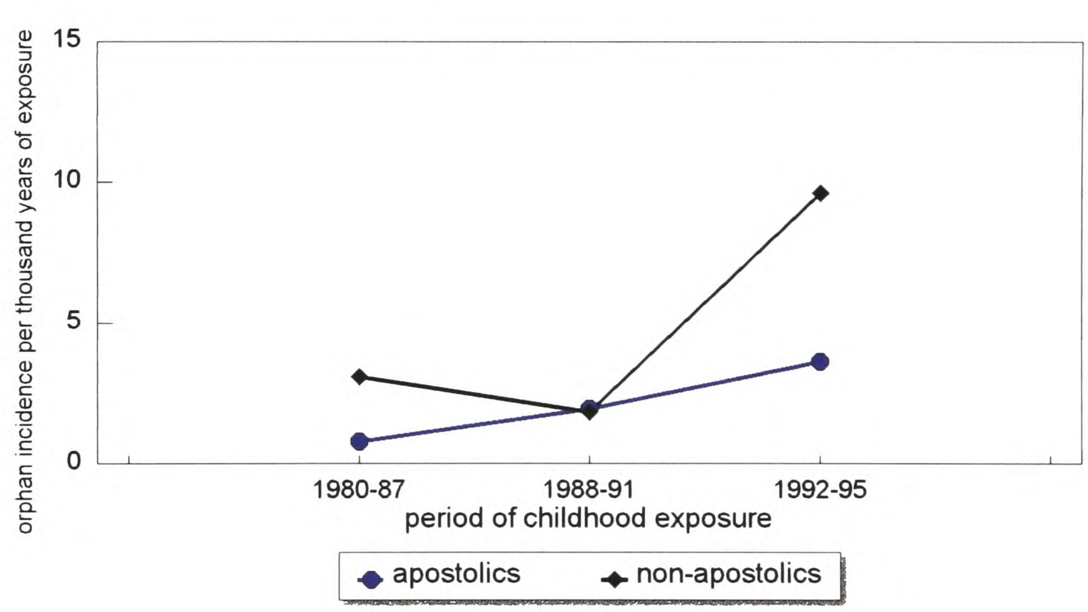
Figure 5.4 illustrates recent trends in the incidence of orphanhood - expressed per thousand years of exposure - among 0-7 year olds in the Honde and Rusitu valleys. Generally, the graphs show little change between 1980-87 and 1988-91. However, a consistent pattern of increase is apparent since 1991. Table 5.2 shows the increases in incidence of parental deaths between 1980-87 and 1988-95 - the latter period includes just the first three months of 1995. Significant increases in parental deaths occurred in both areas. Non-Apostolics were particularly affected in each area. In the Honde Valley, the increase in paternal deaths was significant $(p < 0.05)$. Since 1991, the strongest increases in parental deaths in the Honde Valley are again seen amongst non-Apostolics and among fathers (Table 5.3). Similar increases are seen in Rusitu, but Apostolics and mothers are actually more affected. The reason for the less significant increase in paternal orphanhood in the Rusitu Valley may be the higher historical level of paternal mortality - ie: compared to both paternal mortality in the Honde Valley and to maternal mortality in Rusitu (Appendix G). A larger absolute increase would be required to yield a significant result. The reverse could be said for maternal

Figure 5.4 **Orphanhood incidence among children aged 0-7 years, by form of orphanhood, period, location and religion**

(a) Incidence of *any* parental death: both locations



(b) Incidence of *any* parental death: Honde Valley



(c) Incidence of *any* parental death: Rusitu Valley

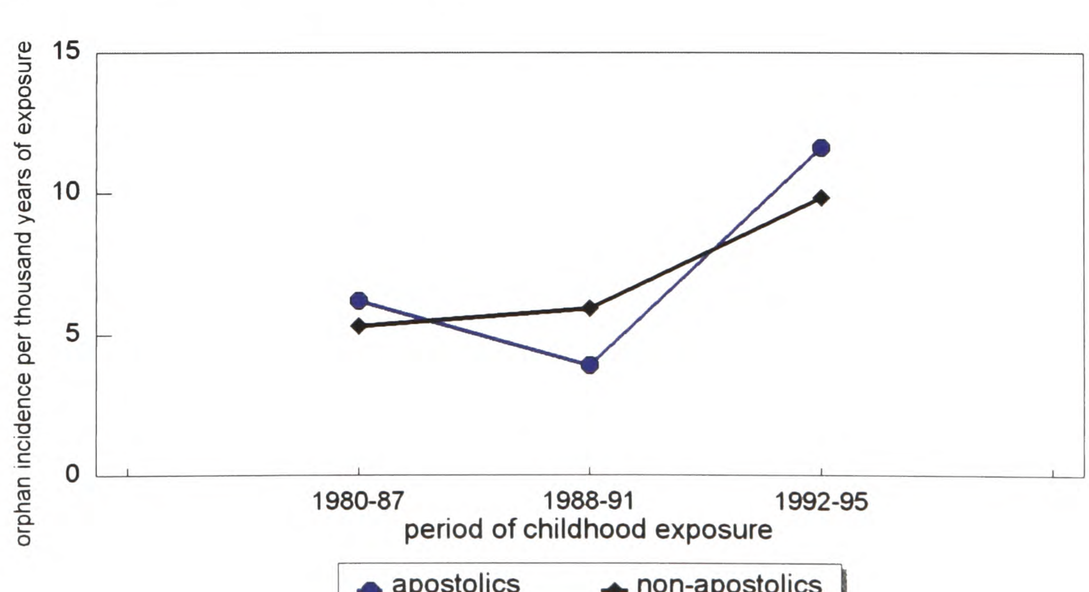
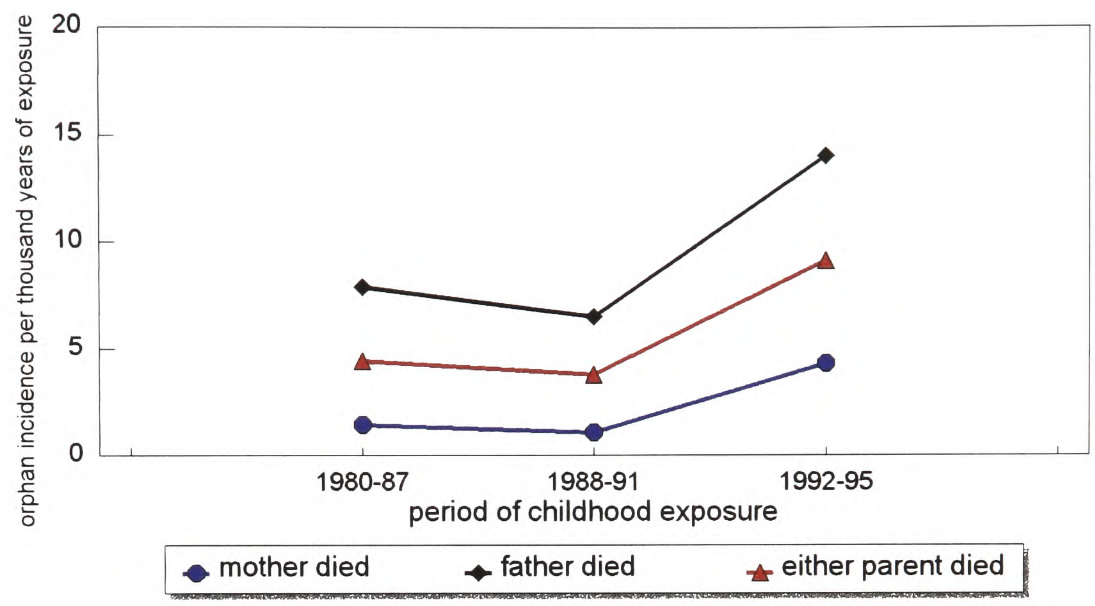
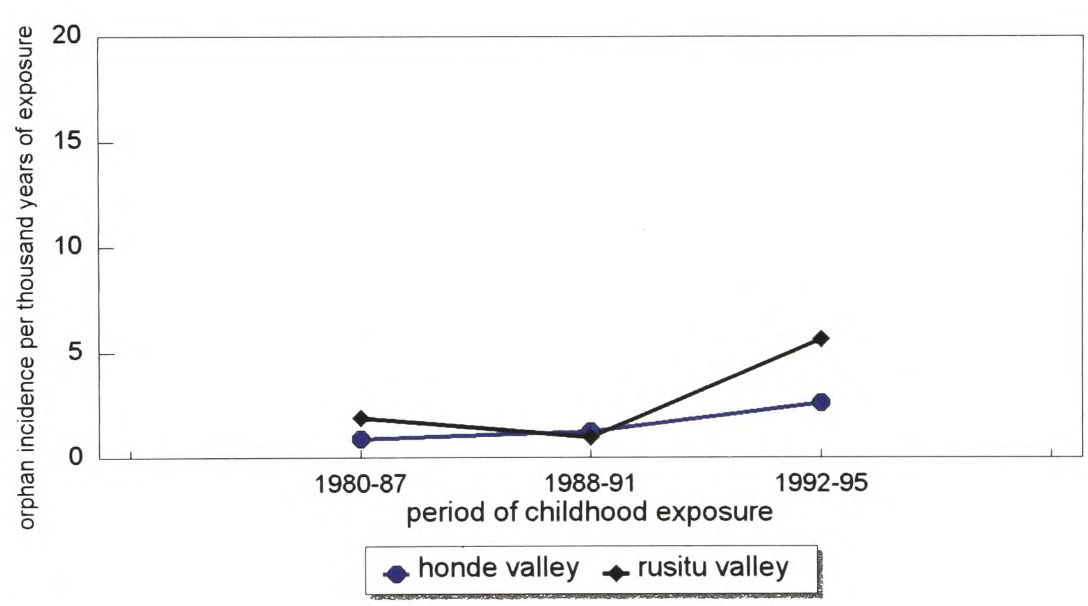


Figure 5.4 **Orphanhood incidence among children aged 0-7 years, by form of orphanhood, period, location and religion**

(d) Incidence of parental death by type: both locations



(e) Incidence of *maternal* death, by location



(f) Incidence of *paternal* death, by location

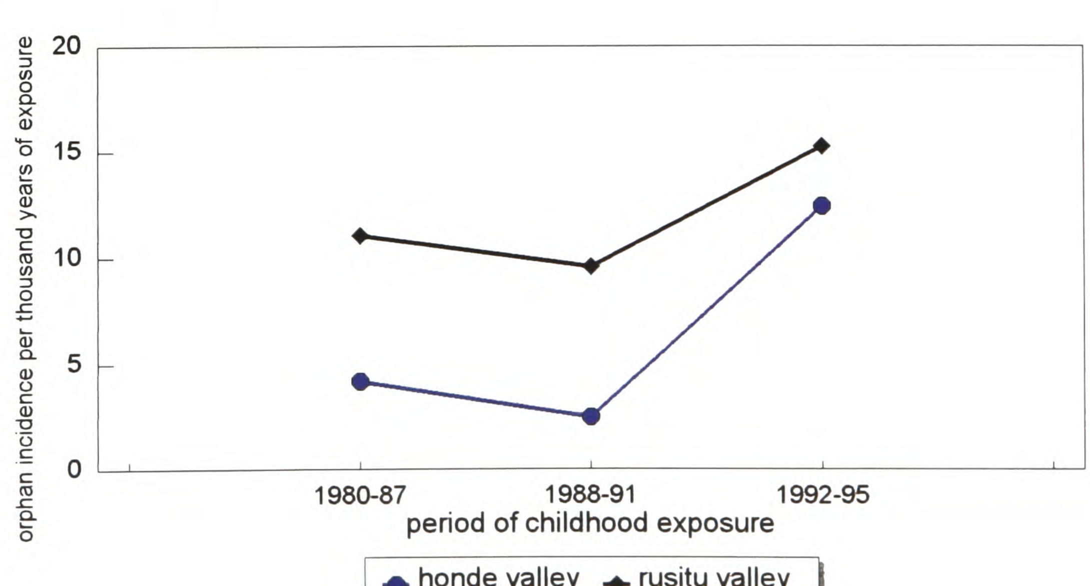


Figure 5.5 Polygny and age-gaps between natural fathers and mothers: Honde and Rusitu Valleys, 1994

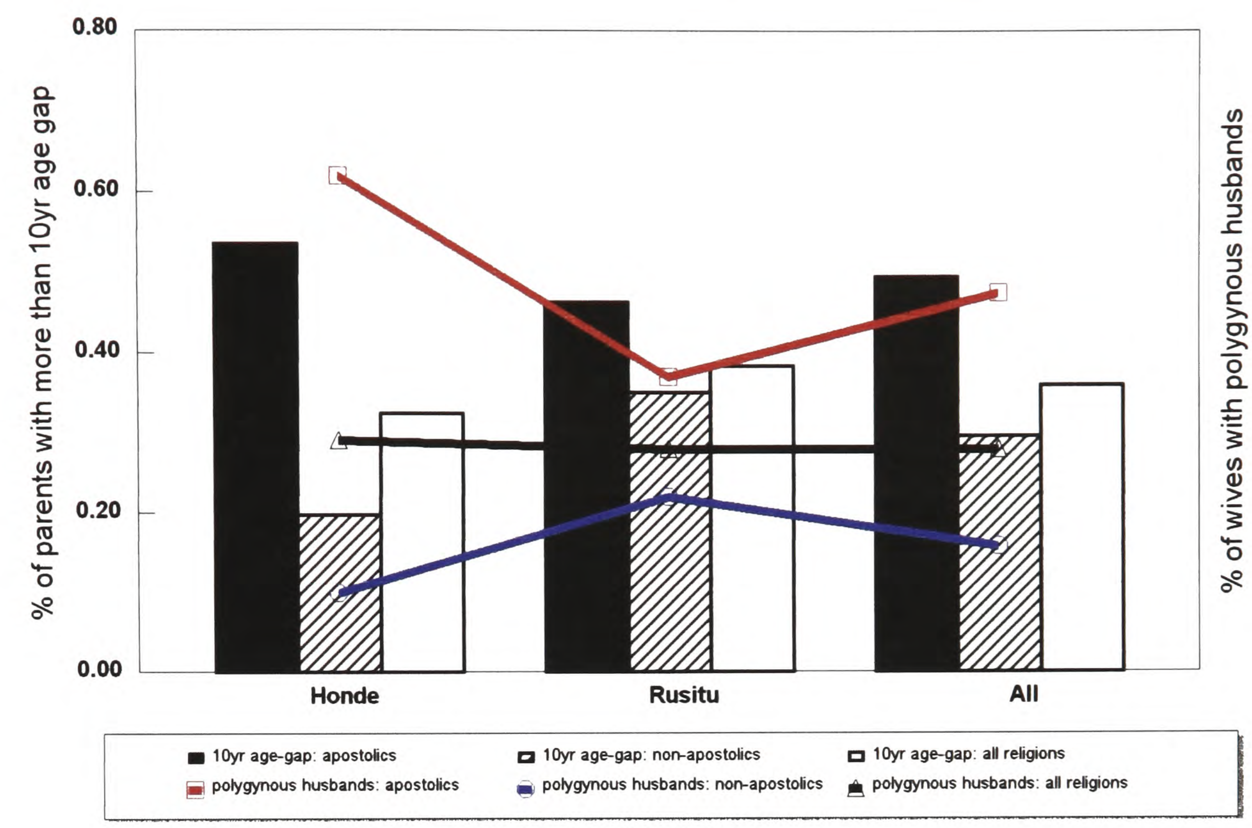


Table 5.2 Increases in the incidence of orphanhood events among children aged 0-7 at last birthday, between 1980-87 and 1988-95

Population group		**Increase in incidence**	**Confidence Interval** Lower bound	Upper bound
Honde Valley				
Either parent:	Apostolics	**2.35**	-1.10	5.79
	Non-Apostolics	**5.16** *	1.00	9.31
	All religions	**3.98** **	1.00	6.97
Maternal orphans:	All religions	***1.91***	-0.85	4.68
Paternal orphans:	All religions	**6.36** *	0.80	11.93
Rusitu Valley				
Either parent:	Apostolics	**1.11**	-5.44	7.67
	Non-Apostolics	**4.86** *	0.67	9.04
	All religions	**3.63** *	0.09	7.17
Maternal orphans:	All religions	***3.03***	-0.30	6.36
Paternal orphans:	All religions	**4.16**	-2.42	10.74
Combined locations				
Either parent:	Apostolics	**1.24**	-2.76	5.23
	Non-Apostolics	**5.09** ***	2.14	8.03
	All religions	**3.83** **	1.47	6.20
Maternal orphans:	All religions	**2.55** *	0.33	4.77
Paternal orphans:	All religions	**5.26** *	0.86	9.66

Notes:

i Orphanhood events include deaths of a natural father or mother, as indicated.

ii Differences in incidence rates are expressed per thousand years of exposure as a child within the age range.

iii *, ** and *** indicate results which are differ significantly from zero at the 95%, 99% and 99.9% levels, respectively.

iv Figures shown in *italics* indicate increases based on fewer than 20 parental deaths in the two periods combined.

Table 5.3 Increases in the incidence of orphanhood events among children aged 0-7 at last birthday, between 1988-91 and 1992-95

Population group		**Increase in incidence**	**Confidence Interval** Lower bound	Upper bound
Honde Valley				
Either parent:	Apostolics	***1.70***	-2.16	5.56
	Non-Apostolics	**7.80** ***	3.69	11.90
	All religions	**5.63** ***	2.65	8.61
Maternal orphans:	All religions	***1.34***	-1.32	4.01
Paternal orphans:	All religions	**9.93** ***	4.60	15.25
Rusitu Valley				
Either parent:	Apostolics	**7.69** **	1.83	13.54
	Non-Apostolics	**3.92**	-0.16	8.00
	All religions	**5.16** **	1.81	8.50
Maternal orphans:	All religions	**4.66** **	1.53	7.79
Paternal orphans:	All religions	**5.65**	-0.26	11.56
Combined locations				
Either parent:	Apostolics	**4.89** *	1.22	8.56
	Non-Apostolics	**5.61** ***	2.71	8.50
	All religions	**5.34** ***	3.06	7.63
Maternal orphans:	All religions	**3.21** **	1.10	5.32
Paternal orphans:	All religions	**7.51** ***	3.45	11.57

Notes:
- i Orphanhood events include deaths of a natural father or mother, as indicated.
- ii Differences in incidence rates are expressed per thousand years of exposure as a child within the age range.
- iii *, ** and *** indicate results which are differ significantly from zero at the 95%, 99% and 99.9% levels, respectively.
- iv Figures shown in *italics* indicate increases based on fewer than 20 parental deaths in the two periods combined.

mortality, where pre-existing levels appear to have been low, so that a small absolute increase shows up as significant. Indeed, given the generally low levels of maternal orphanhood, trends may easily be distorted by reporting or processing errors in the data.

A number of other possible sources of bias may be present in the data on trends in orphanhood shown in Figure 5.4 and analyzed in Tables 5.2 and 5.3. Children orphaned in the past may be more likely to have died - and therefore not be seen in the surveys - than non-orphans. If this were the case, orphanhood incidence rates for the earlier period will tend to be understated and any increases in incidence will be exaggerated. In the context of an HIV-1 epidemic this is a particularly important consideration. Orphans whose parents died of HIV-1 related causes may themselves be infected and may thus be subject to excess mortality. Some rather inconclusive data exists on this from the 1994 and 1995 surveys. This indicates that childhood mortality was generally low, but that it may indeed be slightly higher among orphans than non-orphans - 3.7 as against 3.1 deaths per thousand years of exposure. However, the difference was not statistically significant, possibly because of the small numbers of deaths and the short period of exposure. It is perhaps also worth noting that AIDS is not believed to have been common in rural areas of Zimbabwe between 1980 and 1987 [238, 274], so that the risk of a child aged 0-7 years at this time being infected is low. HIV-1 may have become a more important factor since 1988, but the shorter time interval between the 1988-91 and 1992-95 periods, during which the most rapid increases in orphanhood appear to have taken place, limits the potential impact of major distortion in the trends due to excess mortality among orphans.

Comparison of trends in orphanhood between population sub-groups should be less affected by differences in coverage than comparisons of absolute levels. However, distortions may still occur due to misreporting of ages and/or dates of parental death. For example: systematic shifting of dates of parental deaths into periods closer to the survey date would accentuate any increases in orphanhood trends. If this problem is greater among particular population sub-groups it will also invalidate comparisons in trends. Data on age-reporting obtained in the study, especially that for children (Figure C.1), is believed to be relatively good (Appendix C). However, there was no means of assessing the quality of the data on dates of parental death, which were obtained in the Childhood Survey. One point to bear in mind is the lower level of education found among Apostolics in the Honde Valley. This being the case, Apostolics may be particularly prone to misreporting ages and dates. While the numbers of cases obtained are considered to be too small to permit proper assessment of age-reporting among Honde Valley Apostolics alone, it was found that children without Child Health Cards had a similar age-distribution to those for whom these were available (Appendix C).

Finally, it should be recorded that no adjustment was made in the calculation of orphanhood incidence rates to remove children whose parents had died from the computation of subsequent periods of exposure. Such adjustments will increase the orphanhood incidence rates shown and accentuate differences between groups with higher and lower rates. As the numbers of orphaned children are quite small and concentrated in the most recent periods, the effects of the adjustments would also be small. Given that interest was focused on examination of relative trends in orphanhood incidence by population group, rather than the absolute levels, it is believed that the absence of this adjustment does not distort the findings of the study.

5.4.3 Infant Mortality

Socio-Economic Determinants of Infant Mortality

Data on infant mortality is available from the birth histories on a total of 2,730 children born in the 20 years prior to the HIV-1 and Fertility Survey - 1,248 in the Honde Valley and 1,482 in the Rusitu Valley. Table 5.4 shows the effects of a number of common socio-cultural determinants of infant mortality over this period within the two populations [275, 276]. For each location, the effects of these variables are shown among children ever born and for births in the five years up to the survey date. The top section of the table shows the results of single variate analyses, whilst the bottom section gives the results of a multivariate analysis, carried out using log-linear regression. The same variables are included for both sites to facilitate comparison and to allow for the fact that the strength of association with some variables may

Table 5.4 Socio-economic determinants of infant mortality in the Honde and Rusitu Valleys

Independent variable	**All births**				**Births in the last 5 years**			
	Honde Valley		Rusitu Valley		Honde Valley		Rusitu Valley	
	Obs	P>Chi2	Obs	P>Chi2	Obs	P>Chi2	Obs	P>Chi2
Bivariate Analysis								
Mother's education	1,401	**0.016**	1,670	**0.005**	448	**0.141**	491	**0.209**
Father's education	1,222	**0.765**	1,311	**0.006**	398	**0.715**	413	**0.918**
Growth point	1,377	**0.092**	1,651	**0.940**	440	**0.763**	485	**0.193**
Religion	1,401	**0.000**	1,670	**0.313**	448	**0.334**	491	**0.102**
	Obs	**OR**	Obs	**OR**	Obs	**OR**	Obs	**OR**
Multivariate Analysis								
Mother's education:								
None	131	**1.00**	214	**1.00**	25	**1.00**	43	**1.00**
Primary	846	**0.74**	835	**0.50**	238	**1.96**	246	**3.13**
Secondary (or above)	221	**0.62**	243	**0.41**	127	**0.91**	118	**2.31**
Father's education:								
None	82	**1.00**	113	**1.00**	20	**1.00**	17	**1.00**
Primary	697	**0.78**	715	**0.60** **	186	**0.39**	172	**1.09**
Secondary (or above)	419	**0.99**	464	**0.45** *	184	**0.63**	218	**0.96**
Religion:								
Non-Apostolic	739	**1.00**	800	**1.00**	213	**1.00**	243	**1.00**
Apostolic	459	**2.60** ***	492	**1.05**	177	**0.95**	164	**0.51**
Growth point:								
Inside	365	**1.01**	120	**0.74**	130	**0.91**	44	**1.50**
Outside	833	**1.00**	1,172	**1.00**	260	**1.00**	363	**1.00**
Observations	1,198		1,292		390		407	
Chi2 (6)		22.67		17.12		4.40		4.95
P > Chi2		0.001		0.009		0.623		0.551

Notes:

i The multivariate results derive from logistic regression analyses carried out using STATA version 3.

ii Growth point is used as a marker for urbanization. A score of 1 indicates household within 10 minutes walk of the central market place in the Hauna (Honde) or Dzingire (Rusitu) growth point. A score of zero indicates a household further away from the growth point - ie: more rural.

iii *, ** and *** indicate results which are individually significant at the 95%, 99% and 99.9% levels.

be insufficiently strong to show up as statistically significant, given the small population sizes involved. Non-significant associations must, of course, be regarded as highly tentative.

Some interesting contrasts can be seen between the results for the two areas. In the single variate analyses for all births, religion has the strongest effect in the Honde Valley. Mother's education is also significant, while residence within the growth point - used here as an indicator of level of urbanization - has a weak effect. Paternal education shows no influence - current partner's education is used as a proxy for paternal education. In the Rusitu Valley there is no religion effect, mother's education is significant, but father's education is the single most influential factor. None of the variables shows a significant effect for births in the past five years in either study site.

When logistic regression is used to control for confounding between "independent" variables, the effect of residence within the growth point in the Honde Valley disappears, possibly reflecting differences in education levels and the concentration of Apostolics within households based away from Hauna. Religion shows up as highly significant, with children of Apostolic women being at much greater risk of infant death. Maternal education appears to have some effect, with children of less educated women being at increased risk. However, the effect is no longer significant, after controlling for religion. In contrast to the Honde Valley, the infants of Apostolics in Rusitu are at no greater risk than those of Christians and adherents to strictly traditional beliefs. Both mother's and father's education show an effect, with absence of education being significantly associated with increased infant mortality. Residence within the Dzingire growth point shows a modest but non-significant negative influence on mortality.

The results for the most recent five years show a rather different picture - especially in the Honde Valley. The numbers of births are necessarily smaller, so that the effects of the variables are more difficult to detect. Nonetheless, it is noteworthy that the influence of religion in the Honde Valley, once so strong, has now disappeared completely. No single variable is significant. Children whose mothers have attended primary school actually appear to be at greater risk than those whose mothers have received no education, although secondary education continues to show an effect. However, paternal education may be becoming a more important influence. Similarly, in Rusitu, none of the variables shows a significant association. Paternal education is no longer significant but children of Apostolics appear to be at lower risk. The advantages of children of more educated women and of children living in more urban households both appear to have been eroded.

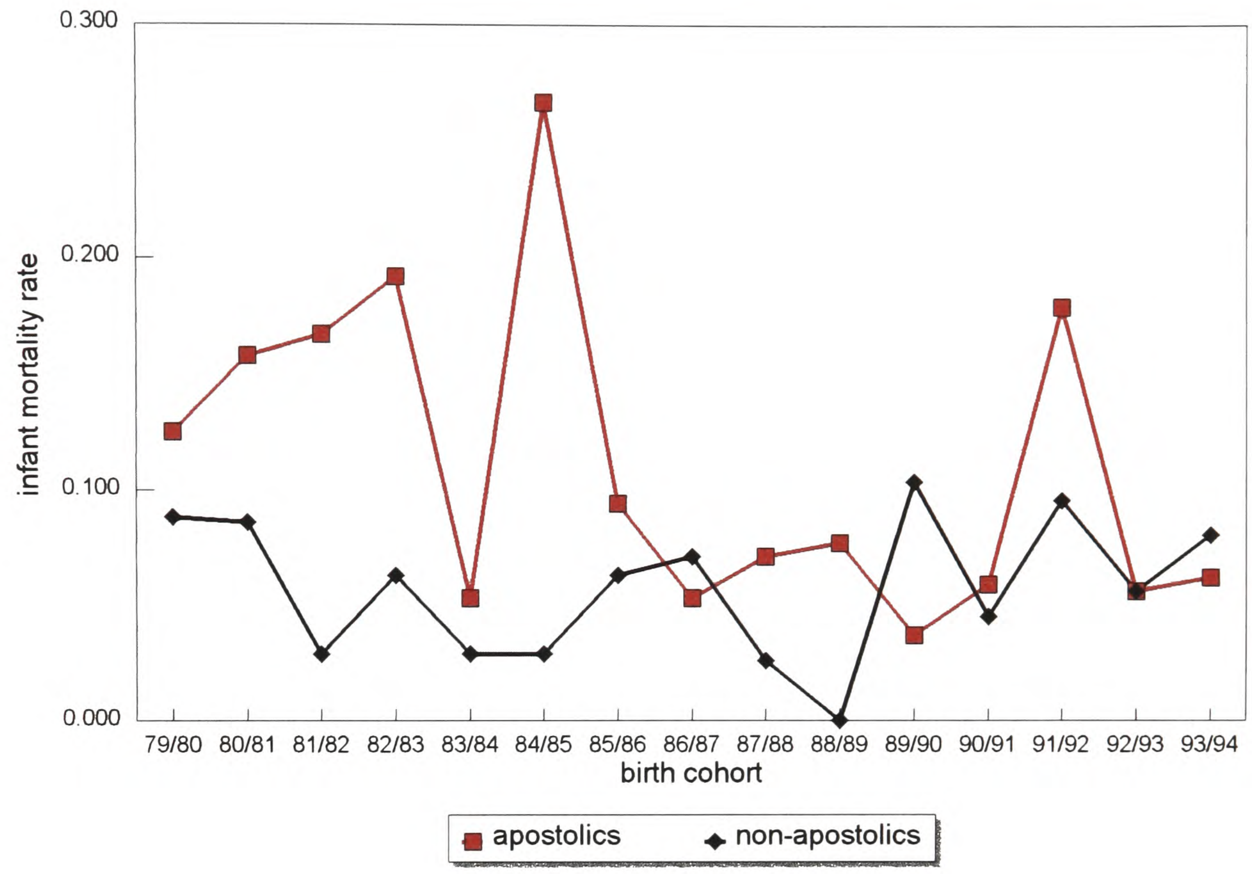
Recent Trends in Infant Mortality Rates

Figure 5.6 shows infant mortality rates, by birth cohort and religion, for each study location, for the 15 years prior to the HIV-1 and Fertility Survey. Sub-divided in this way, the numbers of deaths each year are extremely small (often less than five). Nevertheless, one or two points seem worth noting. An excess in infant mortality rates among Apostolics in the early 1980s is evident in the Honde Valley but this appears to have been eroded by the beginning of the subsequent decade. Apostolics seem to be more affected by period effects, such as the measles epidemic in 1984/85 and the 1992 drought. In the Rusitu Valley, the figures also show higher infant mortality among Apostolics in the first half of the 1980s, but the excess is more modest than is the case in the Honde Valley. If anything, non-Apostolics were more affected by the adverse conditions in 1984/85 and 1992.

Figure 5.7 shows the infant mortality rates by 5-year period and reveals the principal underlying trends. The periods 1975-79 and 1980-84 are aggregated, as the numbers of births in these years to women interviewed in the survey are small - approximately 100 per annum - and to limit the effects of date misreporting in the past, when education levels were not so good as they have become since Independence. Improvements can be seen between the 1970s and the late 1980s. To the extent that infants who were born and died further in the past are more likely to be forgotten (Appendix C), these improvements are understated in the survey results. The reduction in infant mortality in the 1980s is most pronounced in the Rusitu Valley, but this improvement appears to have been largely reversed in the early 1990s ($p < 0.05$ in each case). In contrast, the Honde Valley results, which are higher overall, suggest a slower early decline and a more modest upturn in infant mortality. Disaggregation of the trends by religious grouping reveals an interesting difference between Apostolics and non-

Figure 5.6 Infant mortality rates, by single year birth cohort, location and religion

(a) Honde Valley



(b) Rusitu Valley

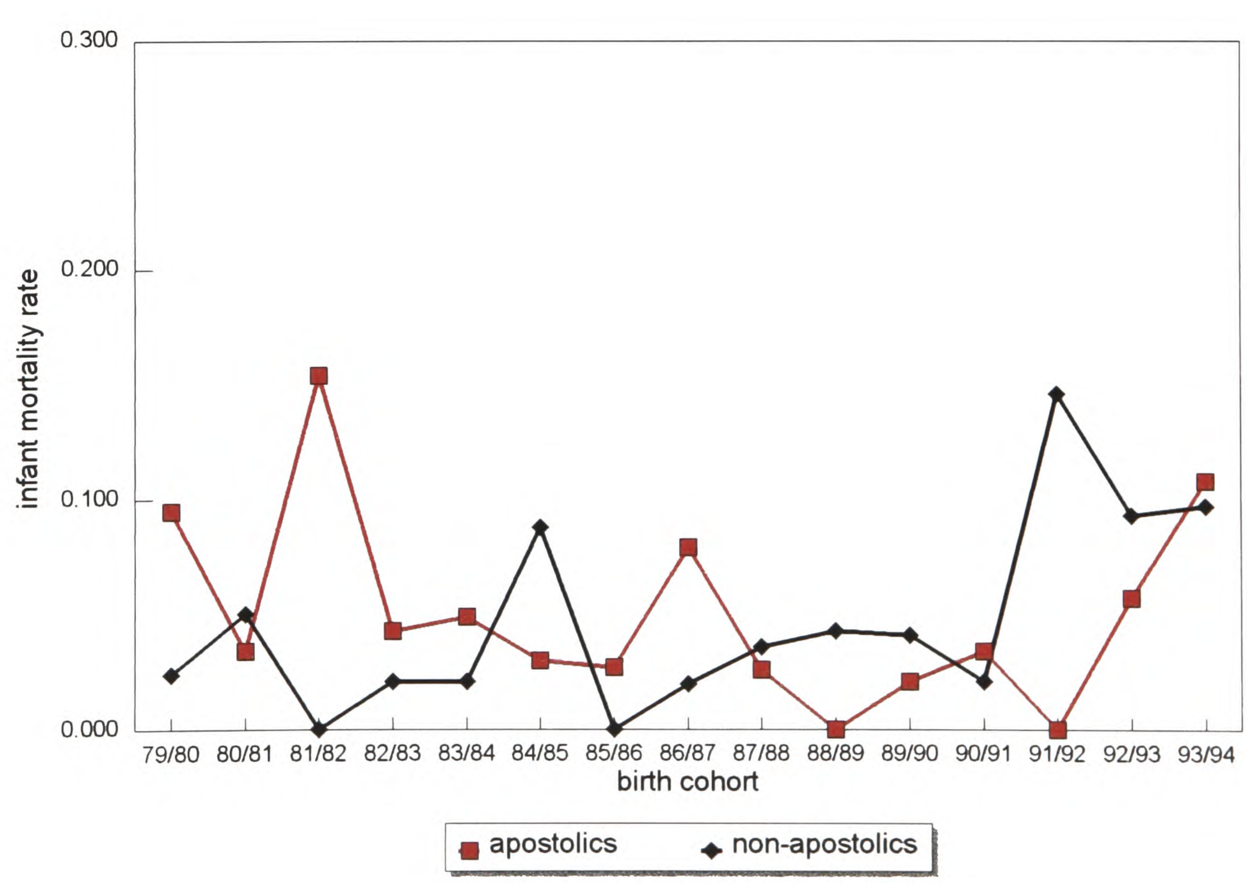
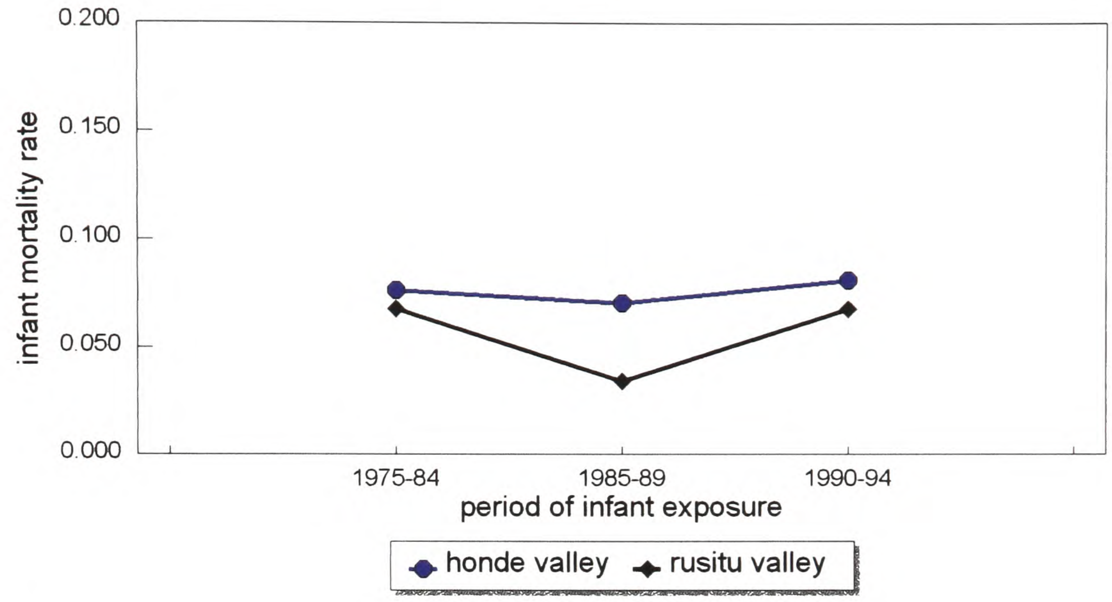
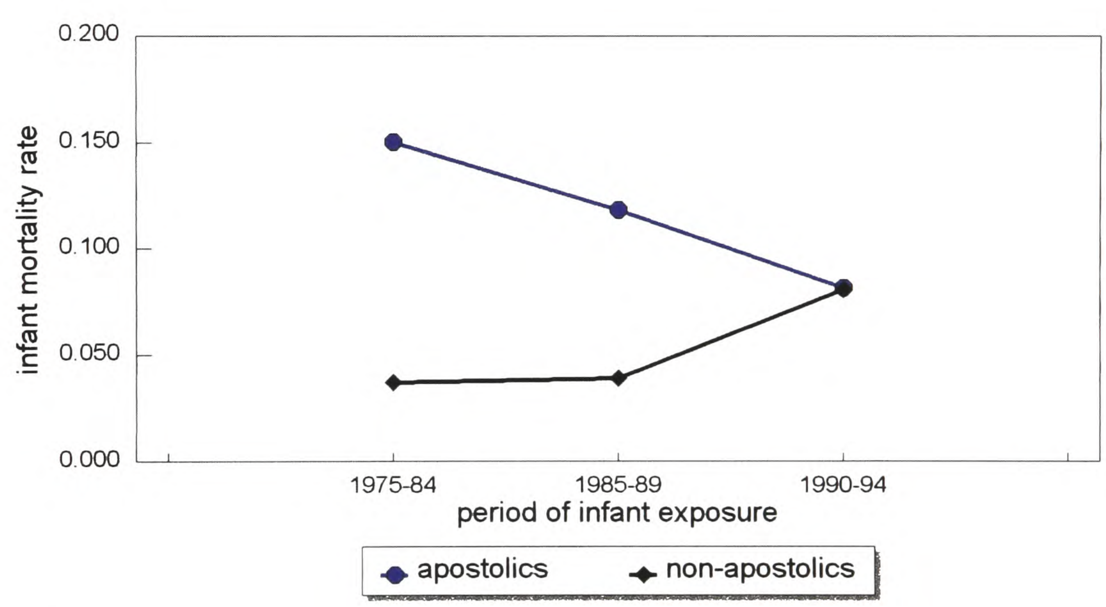


Figure 5.7 **Infant mortality rates, by period, location and religion**

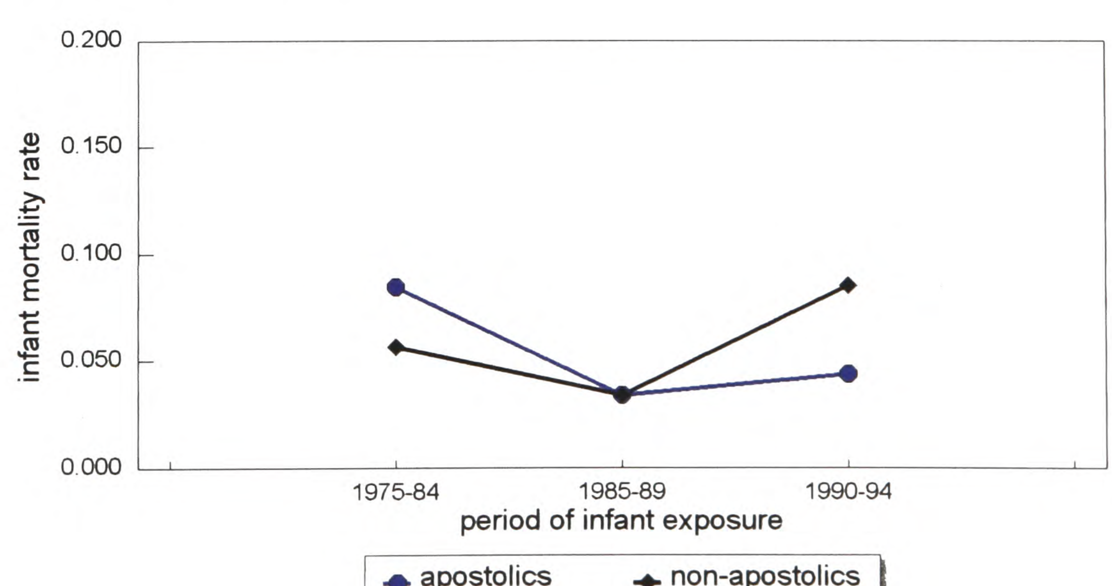
(a) Honde and Rusitu Valleys: all religions



(b) Honde Valley, by religious group



(c) Rusitu Valley, by religious group



Apostolics in each of the two areas. The difference is most distinct in the Honde Valley, where infants born to Apostolic women have experienced steady declines in mortality *($p < 0.01$)*, but other infants appear to have been subject to slowly increasing death rates *($p = 0.055$)*. In the Rusitu Valley, Apostolics saw the biggest falls in the early 1980s *($p < 0.05$)*, but there were no further improvements in the early 1990s. Non-Apostolics, who had lower infant mortality in the late 1970s and early 1980s, experienced an increase after 1990 *($p < 0.05$)*. They currently appear to have higher rates than their Apostolic neighbours.

Finally, sex differentials in infant mortality are explored in Table 5.5. The figures indicate higher infant mortality among females than among males, although the differences are not statistically significant and cease to be evident after 1985. This is surprising as males generally appear to experience higher infant death rates than females in Zimbabwe as a whole [173]. It therefore supports the proposition, put forward in the discussion of sex ratios at birth in Appendix C, that boys who die may be particularly prone to omission in the birth histories. Again noting that none of these differences are statistically significant, it is none the less interesting to see, in the light of the earlier discussion on child sex preference, that Apostolic infants in the Honde Valley are the one group in which males consistently experience higher infant mortality than females.

5.4.4 Age-Specific Death Probabilities, 1994-95

The total numbers of deaths recorded between the 1994 Household Survey and the 1995 Childhood Survey were small (50 in all - 27 in the Honde Valley and 23 in the Rusitu Valley), due to the modest population sizes and the short time interval between the two surveys. However, the overall crude death rates are at broadly comparable levels to those found in the 1992 Zimbabwe National Census [194]. The crude death rate in the Honde Valley was 12.59 per thousand compared to 10.93 in Mutasa District, whilst a figure of 8.69 was recorded in the Rusitu Valley, as against 10.36 in Chimanimani District in the Census. Census based figures are widely regarded as under-estimates and crude deaths rates are thought to provide an unreliable basis for comparisons, due to differences in underlying population structure [277]. In the current case, the Census was carried out in the midst of a

Table 5.5 Infant mortality rates, by sex, location and religion

Religion	**Honde Valley**		**Rusitu Valley**	
	1975-84	1985-94	1975-84	1985-94
All Religions				
Males	92 (217)	80 (338)	69 (288)	45 (418)
Females	113 (256)	76 (341)	99 (272)	47 (403)
Apostolics				
Males	230 (74)	133 (135)	86 (105)	36 (192)
Females	220 (91)	98 (143)	143 (112)	48 (166)
Non-Apostolics				
Males	21 (143)	44 (203)	60 (183)	53 (226)
Females	55 (165)	61 (198)	69 (160)	46 (237)

Note: Infant mortality rates expressed per thousand live births. Numbers of live births in each period are shown in brackets.

severe drought. The figures recorded may therefore be somewhat higher than "normal" and the relative levels of mortality seen between districts could be unrepresentative.

Age-specific death probability estimates, $_{10}q_x$, calculated from this data are shown in Figure 5.8. Broad age intervals are used in view of the small numbers involved. Equivalent results from the 1987 Zimbabwe Intercensal Demographic Survey [184, 265] are given for comparison. The first graph indicates that levels of childhood and late adult mortality are similar in the study areas in 1994 to those seen in Zimbabwe as a whole in the mid 1980s. However, a marked excess of mortality can be seen amongst young and middle-aged adults. In the Honde Valley, this is apparent in each age-group in the 15-44 year range *($p < 0.001$)* and significant increases are also present in Rusitu between the ages of 25 and 44 years *($p < 0.001$)*. Controlling for religion (Figure 5.8(b)) reveals that these excesses in adult mortality are concentrated among non-Apostolics, although adult death rates have also been high among Apostolics in the Honde Valley *($p < 0.001$)*.

Figure 5.9 compares the age-specific death probability estimates found in the study locations, by gender, with those estimated from the ZCSO data as at 1987. Statistically significant surpluses of mortality *($p < 0.001$)* were recorded for adult men (15-44 years) in both areas. For women, the survey results were also significantly higher in the Honde Valley *($p < 0.001$)*, but were lower in the Rusitu Valley *($p < 0.01$)*.

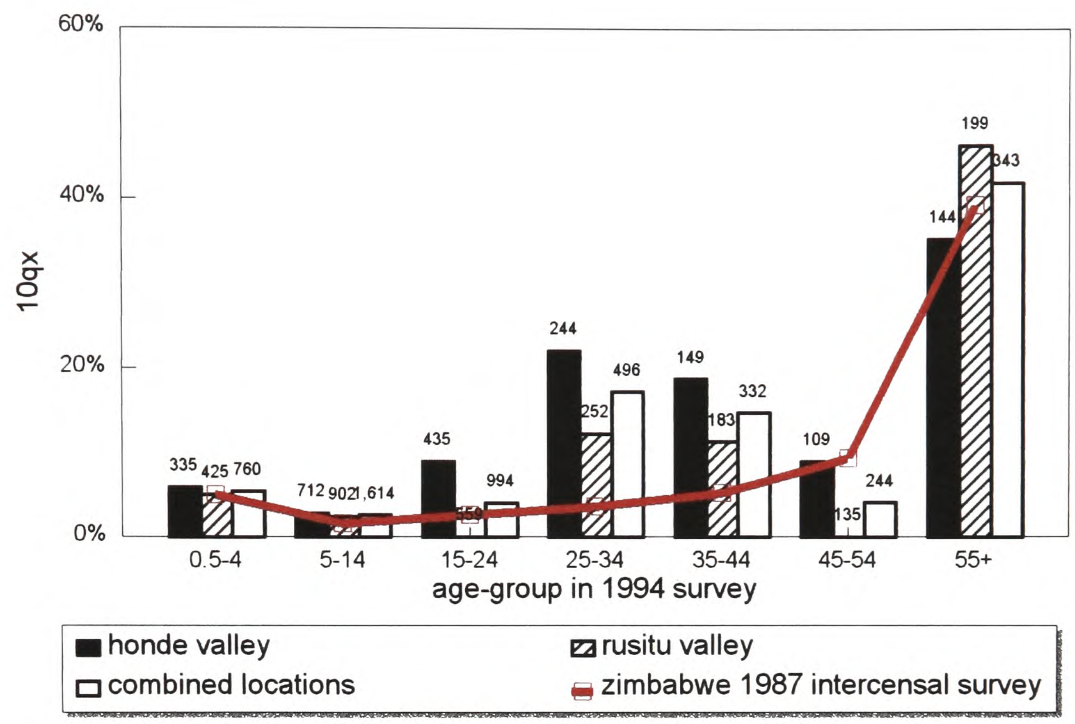
5.4.5 Population Structure

The structures of the Honde and Rusitu valley populations are shown, by age and sex, in Figure 5.10. Data for *rural* areas of Zimbabwe from the 1987 Intercensal Demographic Survey are given for comparison [184].

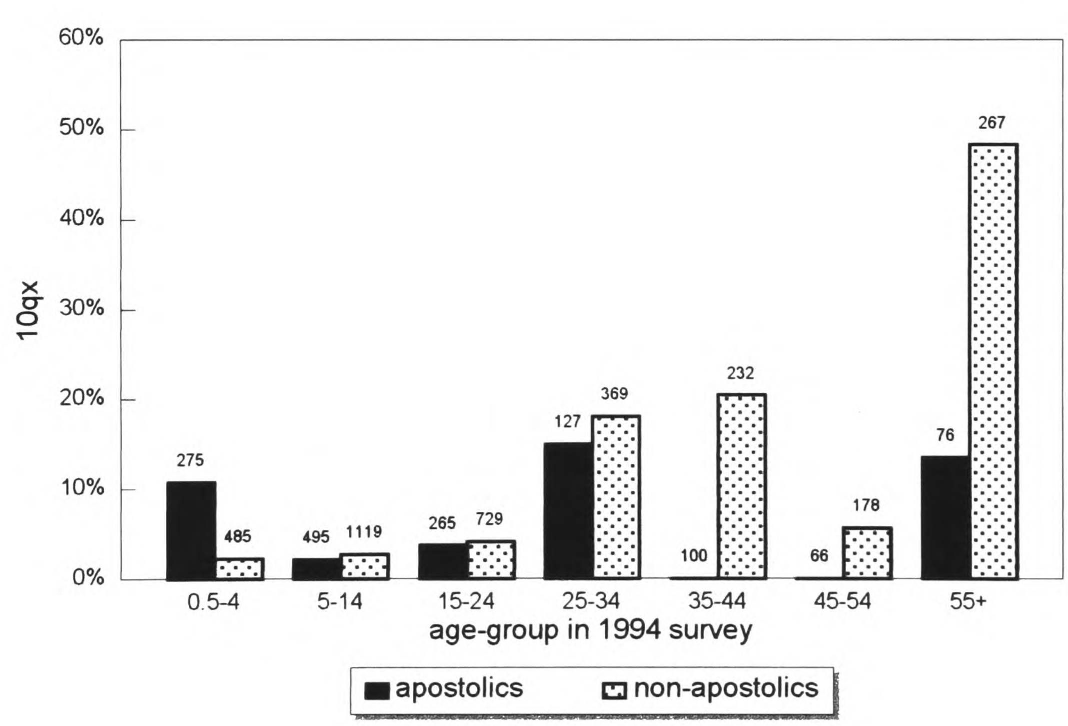
In each area, the current survey results for females are broadly similar to those recorded in 1987 and reflect patterns commonly associated with labour out-migration from rural areas - ie: deficits of younger adults and very young children. However, there are shortfalls in the proportions of females aged under 10. For males, there appear to be small deficits of adults

Figure 5.8 Probabilities of dying, by age-group, location and religion, 1994-95

(a) By study location



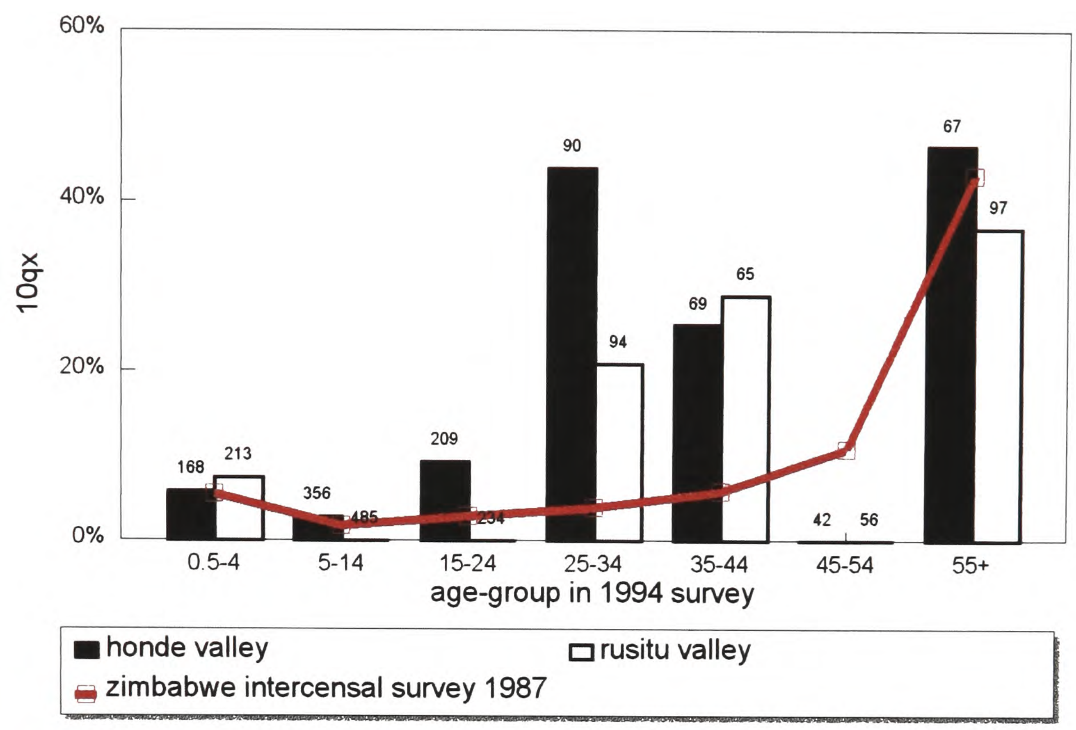
(b) By religion



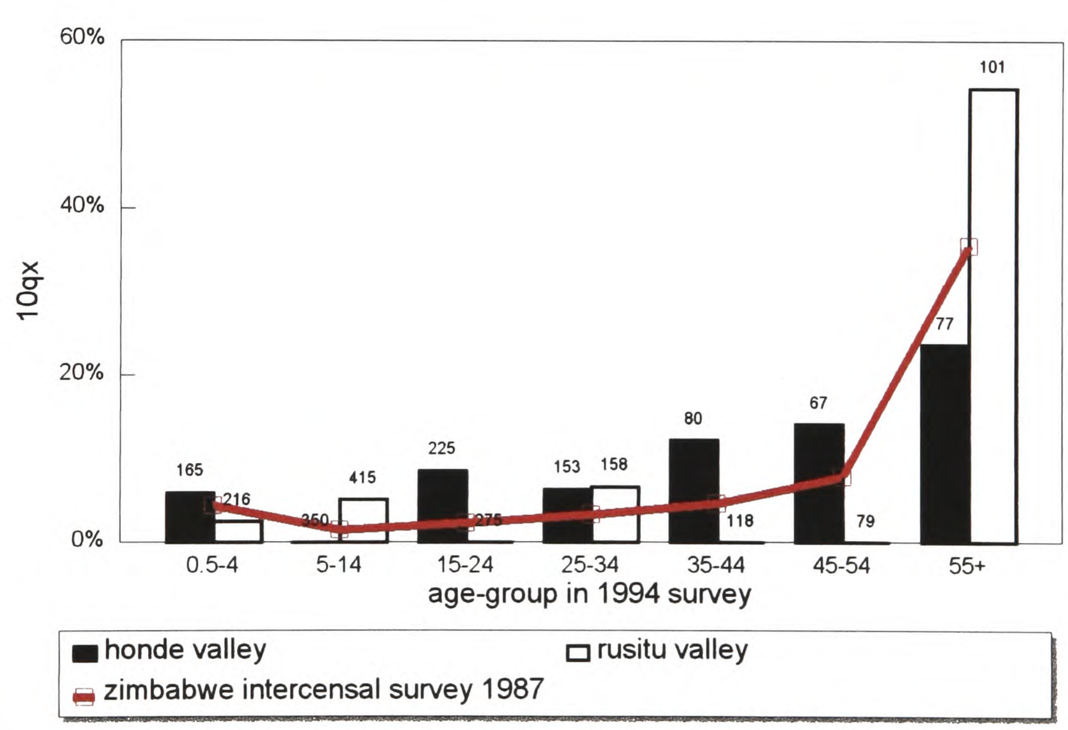
Notes:
i Numbers of individuals in each age-group are indicated at the top of the bars.
ii For the 0.5-4 age group, 4.5qx is given.

Figure 5.9 Probabilities of dying, by age-group and sex, 1994-95

(a) Males, both sites



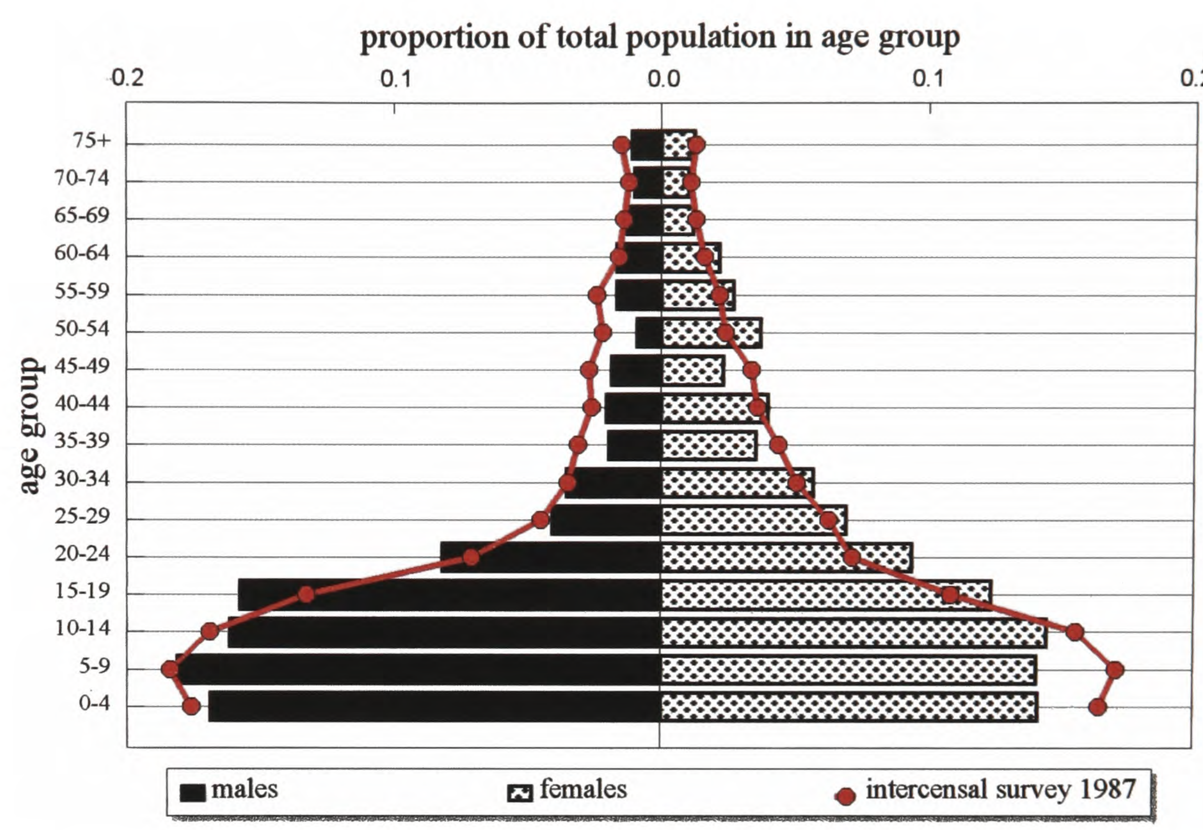
(b) Females, both sites



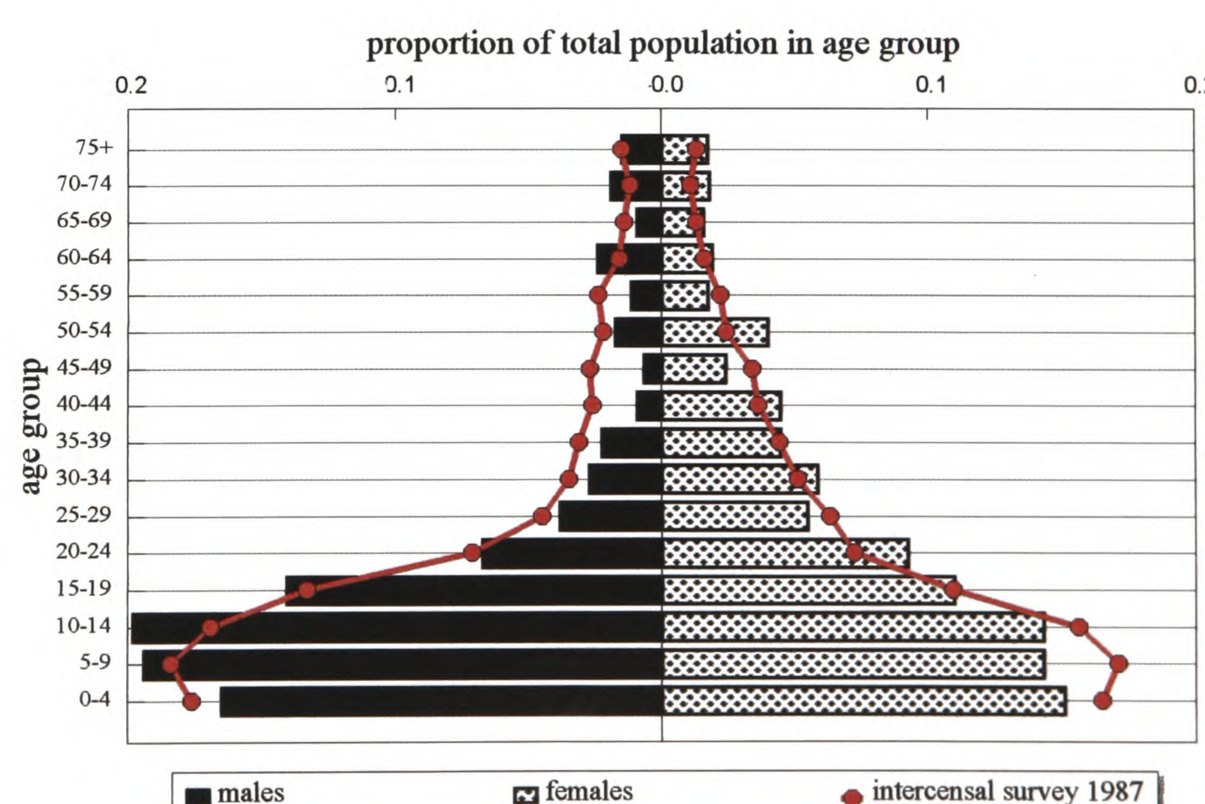
Notes: i Numbers of individuals in each age-group are indicated at the top of the bars.
ii For the 0.5-4 age group, 4.5qx is given.

Figures 5.10 Population age and sex structure: Survey results (*de jure*) compared with 1987 Intercensal Survey findings for rural areas of Zimbabwe

(a) Honde Valley



(b) Rusitu Valley



in the age range 25-59 years, particularly in Rusitu. During the 1995 Childhood Survey, it was discovered that a number of predominantly male Mozambican adolescents had been staying in the Honde and Rusitu valleys in 1994, many of whom had now returned home after the recent elections in that country. These would seem to explain some of the excesses seen in the 10-14 and 15-19 year age-groups. Precise numbers of these children are not available, so they cannot be satisfactorily excluded from the population pyramids. However, it can be fairly safely assumed that the proportions of the populations in the mid-adult age ranges would increase slightly if these children could be removed.

At the same time, a counter-active bias could be present due to the selective exclusion of older adults from the population pyramids. This results from problems of obtaining age estimates for some of the older individuals, particularly those living in the Honde Valley. Age data was not available for 2.6 per cent of the individuals enumerated and the interviewers indicated that most of these were elderly people. A few households comprised of elderly individuals and couples are also believed to have been omitted from the Household Survey. The proportions of the population shown for people aged 60 and over are therefore understated in the figures and those shown for younger age-groups are slightly exaggerated.

Similar problems are likely to have been encountered in the 1987 Intercensal Demographic Survey. Their level and the manner in which they were addressed is not known, so that the extent of any distortion in the comparison between the two sets of results is difficult to gauge. However, both effects are relatively small and, whilst worthy of note, their respective impacts on the overall shape of the population pyramids seem unlikely to be great and to be self-cancelling, as far as the proportions aged 15-49 and under 10 years are concerned.

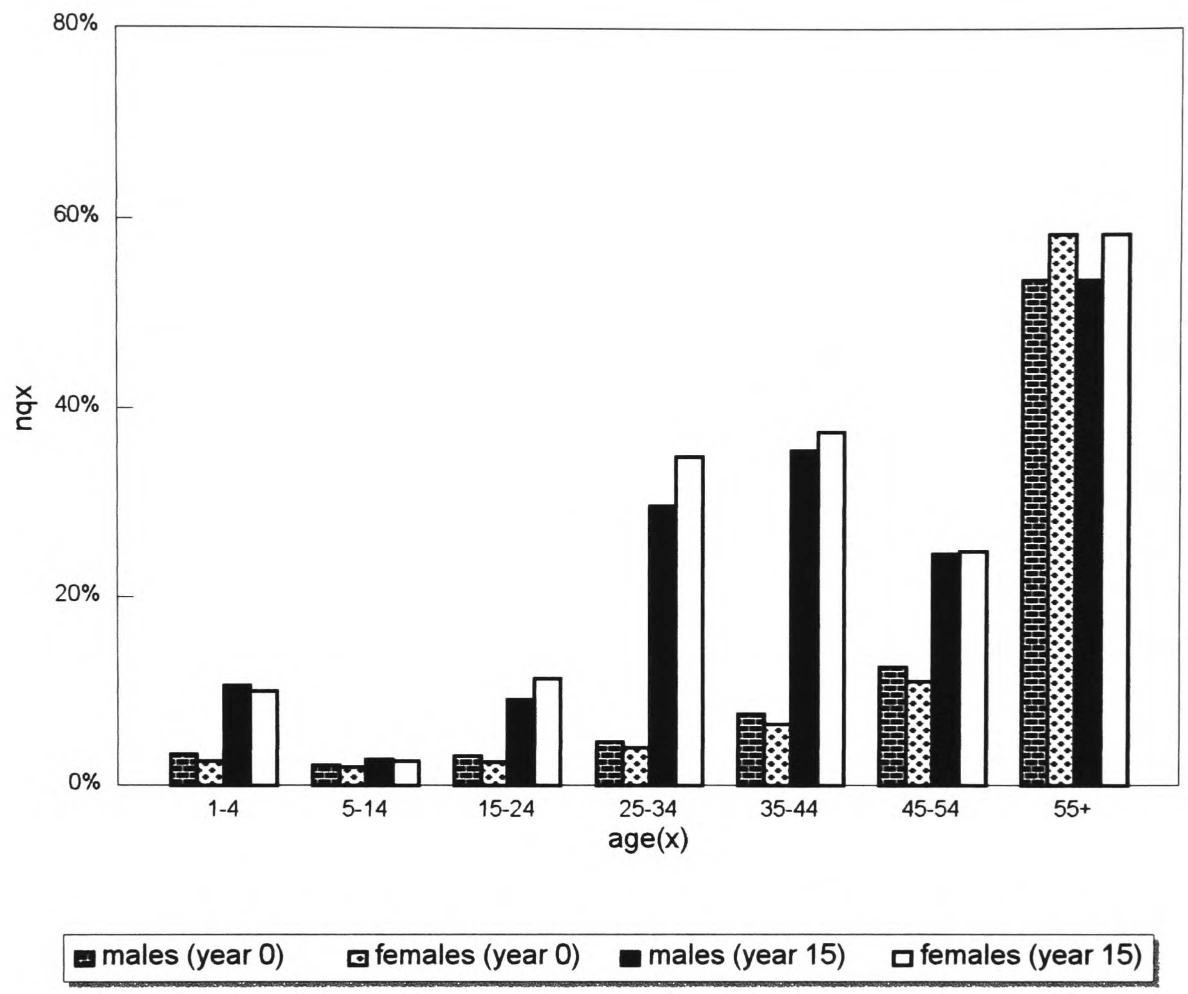
5.5 Interpretation Of Results

5.5.1 Expected Impact of HIV-1 on Mortality as Projected in Mathematical Model Simulations

Results from a number of projections using mathematical models which are able to reflect the principal underlying demographic and epidemiological determinants of the demographic consequences of HIV-1 epidemics in sub-Saharan settings have now been published [25, 28, 29, 78, 85, 91, 278, 279]. In some of these projections, data from the 1987 Zimbabwe Intercensal Demographic Survey and the 1988 Zimbabwe Demographic and Health Survey have been taken to represent underlying, pre-HIV-1 demographic characteristics - ie: age-specific birth and death rates, and the age and sex distribution of the population. Settings for biological and behavioural parameters were applied, which were intended to reflect conditions in sub-Saharan African populations, based on what was considered to be the best and most relevant information available. A range of settings have been tested for some of the parameters about which least is currently known. For example: behavioural patterns and the length of the incubation and infectious periods for HIV-1. The timing and extent of the demographic changes have been shown to be sensitive to adjustments in these parameter settings. For instance, a shorter incubation period can result in a faster, more acute, but ultimately smaller impact on population growth rates [78, 91]. Taken together with the HIV-1 prevalence results obtained in this study, the results of the projections provide a useful set of yardsticks for assessing the impact of the epidemic on the study populations to date.

The principal findings of the projections can be summarized as follows. Increases in adult and early childhood mortality can be expected 5-15 years after the onset of a major epidemic. These result in a distinctive pattern of age-specific mortality, with peaks between the ages 25-44 years and 1-4 years - see Figure 5.11. Ultimately, the greater reduction in life expectancy tends to be seen among women, as they are believed to be at higher risk of infection per heterosexual partnership [280] and more sexually active at younger ages [85]. However, social and spatial dimensions of the spread of HIV-1 infection may mean that men are more affected in the early years of an epidemic (Chapter 7). As a consequence of the increases in adult

Figure 5.11 Probabilities of dying, by age-group, projected in a mathematical model simulation, for years 0 and 15 of a major HIV-1 epidemic



Note: Parameter settings are as in Simulation II, Gregson, Garnett and Anderson, 1994 [85].

mortality, levels of maternal orphanhood can be expected to rise from an initial level of 3-4 per cent to 30 per cent or more, in extreme cases, after 15-20 years [78, 91]. Significant increases should become evident within 10 years of the rapid onset of an epidemic. The mean age of orphans will fall in the early years of an epidemic from just over 10 years to around 8 years, before recovering to slightly below the starting point [78]. The changes in mortality have an impact on population growth and structure. Under the parameter settings tested, population growth tends to decline sharply before recovering somewhat. Shortages of children in the 0-9 year age range are projected, due to vertical transmission of HIV-1 infection, while the increases in adult mortality translate into deficits in the 30-49 year age range. Modest changes are projected in the dependency ratio, but the economically active population - ages 20 to 60 years, say - tends to comprise higher proportions of younger, perhaps less trained and experienced, adults. As epidemics progress, the sex ratio in the economically active age range tends towards an increasing deficit of women.

5.5.2 Other Factors Affecting Recent Trends in Mortality and Population Structure in Rural Manicaland

A number of other factors must be borne in mind when examining recent trends in mortality and population structure in the Honde and Rusitu valleys. First, fertility declines have been found to be under way in both areas (Chapter 6) and these are not reflected in the published mathematical model simulation results. Second, there have been a number of changes, besides the recent spread of HIV-1, which may have affected patterns of mortality. These include the introduction of a World Bank sponsored Economic Structural Adjustment Programme (ESAP), the severe drought in 1992 - although historically droughts are not believed to have caused major increases in mortality in Zimbabwe [281] - and possible variations in the extent of other diseases, such as malaria, cholera, tuberculosis and measles. Extension of the use of life insurance policies may have affected coverage in the death registration system. Changes in labour migration could result in shifts in the age and sex distributions of the study populations. Finally, behaviour change, including reductions in rates of partner change or increases in condom use, may be beginning to slow the spread of HIV-1 infection into rural areas.

In the following section, the data presented on recent mortality levels, trends and impact will be reviewed for indications of the expected early effects of an HIV-1 epidemic. This will be done bearing in mind that these other factors may also have contributed to the patterns and trends seen in the data, and the various problems encountered in the data collection and analysis processes, which were described previously.

5.5.3 The Early Impact of the HIV-1 Epidemic on Mortality and Population Structure in the Honde and Rusitu Valleys of Manicaland

<u>Review of Evidence by Source and Type of Data</u>

The figures on numbers of deaths per annum, taken from the vital registration records maintained by the district registry offices, indicate steep rises in mortality in recent years. Biases due to variations in coverage may be present in the Chimanimani data. Even so, these do indicate that between 6 per cent and 24 per cent of the adult deaths registered in 1993 were HIV-1 related. Under-reporting of AIDS deaths is likely, so that the true figure may be rather higher. In Mutasa, a small number of AIDS deaths have been recorded since 1991. Since around this time, major increases have been seen in the numbers of registered deaths attributed to diseases believed to be associated with HIV-1 infection. The contribution of HIV-1 infections to the overall increase in registered deaths *could* therefore be much greater.

The drought appears to have had a modest effect in 1992. A small excess above trend is detectable in the Chimanimani data, but at least a part of this is likely to reflect increased coverage due to the use of mobile units to increase birth registration. Similarly, in Mutasa, the drought, followed perhaps by excess malaria at the beginning of 1993, could have contributed to the increase in registered deaths. However, the upward trend appears to have started before the drought and has been sustained afterwards. Increased registration due to increasing education levels and more widespread use of life insurance policies or welfare schemes could have occurred. Even so, it seems implausible that this would have made more than a modest contribution to the observed trends. Equally, the ESAP which began to be introduced in 1990 could only have had a minor effect so early in its implementation.

Redundancies among relatives living in towns will have hit many families through the loss of remittances and, in some cases, the return home of the individuals concerned. But, fees for health treatment, first enforced in 1991 [282], were not raised again until mid 1994. They are also waived for those earning less than Z$150 per month, who include most people living in rural areas. Given the high HIV-1 prevalence figures found in the study and in other neighbouring areas (Chapter 4) and the close correspondence between the sharp upward trends in death registration and in the incidence of orphanhood in Mutare [136] and the rise projected in the mathematical model simulations, it seems difficult to dismiss HIV-1 infections as being the principal underlying influence. The fact that the upward trend is steepest and is evident earliest in Mutasa, where HIV-1 prevalence levels have been found to be highest, adds strength to this impression, as does the finding that a number of AIDS deaths have been recorded in both areas. The Chimanimani figures also indicate that the impact of HIV-1 on mortality may be concentrated on adult males. However, major selection effects appear to be present in the data, so too much should not be read into this finding taken in isolation.

Comparison of the levels of maternal orphanhood recorded in the study with those projected in the mathematical model simulations indicates that female adult mortality has so far been little affected by the HIV-1 epidemic. However, this may be due to under-estimation of maternal orphans in the study, for the reasons given earlier [262]. Given the recent increases (Figure 5.4), past levels of orphan incidence would have had to have been lower than is conceivable, according to the results of the projections - based on ZCSO estimates of age-specific mortality rates for the mid-1980s - a finding which also indicates possible under-ascertainment. Paternal orphanhood is higher in both areas, due to a combination of large gaps between the ages of natural parents and higher male age-specific mortality rates. Both maternal and paternal orphanhood are less common and have risen least steeply among Apostolics (see below). Rises in maternal and especially paternal orphanhood have been seen in both areas in the past 4-5 years, indicating increases in adult mortality. No cause of death data is available, but anecdotal reports of increasing numbers of AIDS cases were received. The pattern of increase also appears to be consistent with that indicated by the vital registration data, with the strongest rise in orphanhood being in the Honde Valley, where HIV-1 prevalence is currently believed to be higher.

In the Honde Valley, paternal orphanhood has been most affected, which suggests that husbands may be first to become infected with HIV-1 and subsequently pass on the infection to their wives. This idea is supported by sociological data from the study, which indicates that men away from home for work reasons or whose wives are currently abstaining from sexual intercourse, frequently visit commercial sex workers and thus risk infection with HIV-1 (Chapter 3). This interpretation would imply that condoms were not widely used in the recent past, even in casual affairs, although the situation may have changed somewhat in the last 2-3 years. In Rusitu, the absolute increases in paternal orphanhood exceed those in maternal orphanhood but are less statistically significant because of higher pre-existing male adult mortality. The picture of a significant recent increase in maternal orphanhood is consistent with the finding of a low average age among orphans in Rusitu - 9.0 years compared to 10.0 years for maternal orphans in the Honde Valley. It could indicate greater local female involvement in commercial sex work or excess mortality due to non-HIV-1 related causes. Another possibility is return migration of family members falling sick, who had previously lived in towns where the HIV-1 epidemic is more advanced [133]. The latter was mentioned as being a feature of the epidemic, to date, by key informants in the Rusitu Valley area.

The apparent disappearance of religion as a leading determinant of infant mortality in the Honde Valley is interesting and will be discussed further in the following sub-section. The relatively weak effects of maternal and paternal education on infant mortality in the last five years must be mainly due to the small population sizes and short periods of observation. At the same time, they are also consistent with increasing numbers of infant deaths in Honde Valley due to vertical transmission of HIV-1 from infected mothers. As has been seen (Chapter 4), women with higher levels of education may be at greater risk of infection with HIV-1. If this is the case, infant mortality among the children of such women would be expected to increase disproportionately, off-setting the gains generally associated with better education. However, the overall increase in maternal orphanhood is not strong and the effect of education on risk of HIV-1 infection becomes non-significant when a control for age is introduced. This interpretation must therefore be regarded as highly tentative for the time being.

Looking at the recent trends in infant mortality, reversals in the earlier downward pattern of change are apparent among non-Apostolics in the Honde Valley and within both the main religious groupings in Rusitu - note: recent increases in infant mortality were recorded in the 1992 Census for Zimbabwe, nationally [173], and for Mutasa and Chimanimani Districts [194], in particular, and in the 1994 Demographic and Health Survey [195] (Figure C.5). One reading of this could be that it indicates that the incremental benefits of the improvements in rural health systems introduced during the 1980s have now been exhausted. Against this background, the 1992 drought and the introduction of the ESAP could have brought about the recent upturns in infant mortality. Given the modest increase in maternal orphanhood in the Honde Valley, it seems unlikely that HIV-1 has yet had much of an effect on infant mortality here, although non-Apostolics may have been affected. However, the larger increase in maternal orphanhood in the Rusitu Valley, the steeper increase in infant mortality and the erosion of "normal" socio-economic determinants of infant mortality, all point towards a possible early impact of the HIV-1 epidemic on female and infant mortality within this area.

The age-specific death rates provide perhaps the most unambiguous evidence for the existence of a significant impact of HIV-1 infections on adult mortality in the study areas. The excess of mortality, concentrated among adults in the 15-44 year age range, mirrors that projected in the model simulations (Figure 5.11) and the pattern found among HIV-1 infected individuals in the Medical Research Council study in Uganda [77, 133]. The pattern is distinctive and not one which would normally be associated with droughts or the effects of economic structural adjustment programmes. Furthermore, the excess in mortality is greatest in the Honde Valley, as would be expected, and is more significant among males than females in both study locations. The latter point, together with the absence of any noticeable excess of early childhood mortality, lends weight to the view that the impact of HIV-1 on mortality in these areas is recent. The low female adult mortality during 1994-95 in the Rusitu Valley seems at odds with the earlier finding of increasing maternal orphanhood, although this may be because the latter result is based on data for a longer period. This apparent inconsistency serves as a useful reminder that the numbers of deaths recorded, particularly when sub-divided by gender and location, are extremely small and subject to random fluctuations. Even the more plausible findings must be treated with caution.

Finally, the population pyramids set out in Figure 5.10 appear to be consistent with the picture which has emerged of a small but discernable early impact of the HIV-1 epidemic upon mortality, concentrated among males. The projected shortfalls in the proportions of the population accounted for by male adults of older working ages and by children under the age of 10 are evident. These could also be attributed to greater male labour migration out of these locations than was generally the case in rural areas of Zimbabwe in 1987 and to further declines in fertility or more severe under-reporting of infants and young children in the survey. All of these factors may be involved and it is difficult to distinguish their various effects. Equally, there is no evidence in the comparison of the age-structure for females in Rusitu with the ZCSO data for a shortfall in female adults due to AIDS deaths. This could be because the effect is currently weak or because there are differences in female migration patterns.

The Special Case of Apostolics

The qualitative sociological data and some of the statistical data obtained in the study revealed some interesting differences between the Apostolics, and especially the predominantly Marange Apostolics of the Honde Valley, and the Christians and stricter adherents to traditional *shona* religion (Appendix D). Some of these may have implications for the spread of HIV-1 infection amongst Apostolics and for the relative effects of AIDS and other causes of death on their recent mortality experience. These will now be explored briefly.

No data on religion was collected during the HIV-1 prevalence surveys in the Honde and Rusitu valleys. However, the HIV-1 and Fertility Survey and Childhood Survey questionnaires did include questions on religion and the use of health and antenatal clinics. The results indicated that most of the Marange Apostolics did not use these services (Chapter 3). Similar findings were obtained during the sociological studies, where it was said that this was because

Marange Apostolics maintained a strict belief in the faith-healing powers of their *murapi* (healers). Non-Marange Apostolics also believe in faith-healing but were found to be more pragmatic, so that they commonly used the modern health services as well. The smaller numbers of Marange Apostolics in the Rusitu Valley did report use of health clinics, although this tended to be done in a covert manner. As a result of this, the HIV-1 prevalence results for the Honde Valley only reflect the level of infection among non-Apostolics in the area. No direct data is therefore currently available on HIV-1 prevalence among Apostolics. In Rusitu, Apostolics are believed to have been included in the tests, but the records do not permit the derivation of separate estimates by religious group. The relative levels of HIV-1 prevalence by religion are therefore unknown at present.

The qualitative data also indicates that there may be some differences between Apostolics and non-Apostolics with regard to sexual behaviour patterns. Whereas, prior to the HIV-1 epidemic, non-Apostolics appear to have been tolerant of extra-marital affairs on the part of husbands, these are taboo for Apostolic men. The fact that male Apostolics are also barred from consuming alcoholic drinks supports the view that this taboo is generally adhered too. The Marange Apostolics seem to be particularly strict on these matters. However, fear of discovery by the "seeing" powers of the *mupropheta* (prophets) probably acts as a deterrent to members of all Apostolic sects. Under these conditions it might be supposed that the HIV-1 epidemic would spread more slowly within Apostolic populations than within non-Apostolic populations. On the other hand, if male Marange Apostolics do become infected, the epidemic would be expected to spread more quickly among women, due to the greater prevalence of polygyny. In the absence of specific HIV-1 prevalence data, it is therefore of interest to assess whether there is any evidence in the mortality data for a slower epidemic among Apostolic groups.

In the Honde Valley, maternal and paternal orphanhood levels are lower among Apostolics than for non-Apostolics. This is surprising, as lower education levels, more rural home environments, reluctance to use modern medical facilities, higher fertility and wider age-gaps between husbands and wives might all be expected to result in higher rates of orphanhood. Recent rises in orphanhood have been witnessed, but these have been less steep than those experienced by non-Apostolics. The mean age of maternal orphans is 10.3 years, compared to 9.9 years for non-Apostolic orphans. If it is accepted that HIV-1 infections have been the primary cause of the increase in orphanhood among non-Apostolics, all these results point towards a smaller impact upon Apostolics. In Rusitu, the picture is less clear. Maternal and paternal orphanhood are both *higher* for Apostolics. Given that the Apostolics here do make use of modern health services, that members of other religions also practise polygyny - so that age differences between spouses are generally wide - and that the urban-rural differential between religious groups is less marked, there would be less reason to expect an advantage in mortality for non-Apostolics. However, the (medium term) upward trend in orphan incidence has been slightly more pronounced among non-Apostolics and, once again, the average age of maternal orphans, 8.7 years, is lower than for Apostolics, 9.4 years. These indicators imply that overall orphanhood levels are higher among Apostolics due to pre-HIV-1 factors and that HIV-1 infections may again be more of a factor among non-Apostolics.

The results of the logistic regression indicate that religion was the over-riding determinant of infant mortality differentials in the Honde Valley in the 1970s and 1980s, with the children of Apostolics being at greatest risk. However, this disadvantage has been removed over the past 10 years, perhaps because of compulsory immunization introduced after the 1985 measles epidemic and a degree of surreptitious use of health and family planning services by some Apostolic women - note: not all Honde Valley Apostolics belong to the Marange sect, so that some of these others may also have benefitted from increased education and access to health services. The greater susceptibility of their infants to epidemics and drought related illnesses suggests that many Apostolics still do not make use of the modern health care services. Given the scale of these other changes, it is difficult to tell whether rising numbers of deaths due to HIV-1 infections have slowed the recent gains due to increased immunization etc. In the Rusitu Valley, Apostolics also closed the (smaller) gap in infant mortality between themselves and other religions during the early 1980s. They experienced a levelling off in the early 1990s, which was perhaps unsurprising, as the rates achieved in the late 1980s were low. In contrast non-Apostolics experienced an increase in infant mortality since 1990. This picture could also be interpreted as being consistent with a greater HIV-1 effect among non-Apostolics.

The age-specific death probabilities for Apostolics in the Honde Valley show a significant excess of mortality in the 15-44 year age range, compared to the levels seen nationally in 1987. However, this excess was considerably smaller than that experienced by Christians in the same area. The age-specific death probabilities are based on small numbers of deaths and should therefore be interpreted with caution. As they stand, they imply some infiltration of HIV-1 infections within the Apostolic population, but a less widespread epidemic than is present within the non-Apostolic community. In the Rusitu Valley, there were no deaths among Apostolics between the 1994 and 1995 visits.

In summary then, it would seem that the stricter behavioural code identified during the focus group discussions is commonly adhered to by male Apostolics in both areas, with the effect that, to date at least, the impact of the HIV-1 epidemic appears to have been less severe than that experienced by other religious groupings. However, the data indicate that the epidemic has only recently begun to affect mortality rates, even among non-Apostolics. The spread within Apostolic populations may be more recent and/or slower and therefore less easily detected through a study of recent mortality trends. The findings do not therefore preclude the possibility of an eventual major epidemic within these particular population sub-groups.

5.6 Summary and Conclusions

5.6.1 Recent Trends in Mortality in Rural Manicaland

i. A number of different data sources and indicators of mortality have been used in the course of this review. The data includes information from independent external sources, as well as findings from primary or internal sources;

ii. The vital registration data from Mutasa and Chimanimani shows upward trends in numbers of registered deaths since the late 1980s, although the latter is modest and may be distorted by fluctuations in the level of coverage;

iii. Maternal orphanhood levels are low, but recent increases are apparent. Paternal orphanhood has also risen in the last five years. Non-Apostolics seem to have been most affected in both study sites; the average age of maternal orphans is low among non-Apostolics in each area;

iv. Recent improvements in infant mortality have been reversed in Rusitu and among non-Apostolics in the Honde Valley. Common determinants of infant mortality, such as mother's and father's education appear to have had only weak effects in both areas in the last 5 years;

v. Significant increases in adult age-specific death probabilities are evident in both areas for the period 1994-95. The effect is greatest in the Honde Valley, among men and among non-Apostolics;

vi. The population pyramids reveal possible deficits of males aged 15-49 years and of young children. Excess migration may be a contributor to these deficits.

5.6.2 The Impact of the HIV-1 Epidemic on Mortality and Population Structure

i. Individually, each of the indicators used is subject to possible biases and alternative interpretations. Population sizes are often small and periods of observation short. However, taken together, and in the light of mathematical model projections of the nature of the demographic changes most likely to result from HIV-1 epidemics in sub-Saharan Africa, it is possible to piece together a coherent and essentially consistent picture. Even so, some of the details must be considered tentative;

ii. The HIV-1 epidemics in rural areas of Manicaland appear to be recent - most infections occurring since 1990 - and to have spread rapidly. The incubation period from infection to the development of AIDS may be longer than that observed among commercial sex workers in Kenya [238, 283]. If this is the case, the HIV-1 epidemic could have reached the Honde and Rusitu valleys a little earlier than this;

iii. The signs are that mortality increases due to the HIV-1 epidemic are now being seen. In particular, the limited cause of death data which are available, the age-patterns of mortality observed in the one-year survivorship data and the differentials in orphanhood and infant mortality trends, by religion, all point to HIV-1 as an increasing influence on death rates within the study populations. The increases in mortality are most visible among the non-Apostolics in the Honde Valley, for whom HIV-1 prevalence levels are believed to be highest. Other possible explanations do not satisfactorily account for the observed changes;

iv. Generally, men (husbands) appear to be infected first and to be dying earliest; a pattern which has also been observed in rural areas of Uganda [284]. However, some increases in female adult mortality are also evident. Infant and early childhood mortality have so far been little affected, although there are signs that this is changing;

v. Apostolics, particularly the Marange Apostolics in the Honde Valley, seem to have been less affected by the epidemic so far. However, again there are some signs of excess adult mortality;

vi. To date, the impact of HIV-1 related deaths on population structure has been modest, at most. However, the epidemic may have contributed to the low proportions of men of working age and of children under the age of 10 years;

vii. Delays are known to occur between the timing of behaviour changes, designed to reduce the risks of HIV-1 infection, and moderations in the demographic impact of epidemics [84]. These results do not therefore preclude the possibility that some such behaviour changes may have occurred recently;

viii. Even if individuals have now begun to protect themselves, a further rapid escalation in mortality is to be expected, given the levels of HIV-1 prevalence observed at antenatal clinics in the study areas (Chapter 4).

CHAPTER 6

HIV-1 and Fertility Change in Rural Manicaland

Bridal Veil Falls, Chimanimani, Zimbabwe, 1994.

6

HIV-1 and Fertility Change in Rural Manicaland

6.1 Aims of the Chapter

The aims of this chapter are as follows:

i. To describe recent trends and patterns of fertility in rural areas of Manicaland, Zimbabwe; and

ii. To explore recent trends in the proximate determinants of fertility with reference to underlying socio-economic determinants including the influence of the recent HIV-1 epidemic.

6.2 Organization of Chapter

The data analyzed in this chapter was collected in the HIV-1 and Fertility Survey following the procedures set out in Chapter 2. A summary of the methods used in the analysis is given in section 6.3. Section 6.4 provides an overview of recent trends and patterns of fertility in the Honde and Rusitu valleys and includes a brief discussion of the principal socio-demographic determinants of fertility. Section 6.5 reviews the results of a series of analyses of the relationships between socio-economic factors, including HIV-1 infection, and each of the proximate determinants of fertility. The final section (section 6.6) provides a summary of the findings from these analyses.

6.3 Methods

General fertility rates (GFRs), total fertility rates (TFRs), age-specific fertility rates (ASFRs) and period parity progression ratios (PPPRs) are calculated following established demographic procedures [170, 285].

Numbers of women in each age-group, in each year, were calculated by simple back-projection from the numbers aged 15, 16, 17 ... 49 years at their last birthday prior to the survey date. As women over the age of 50 years at the survey date were not interviewed, no results are available for women aged 45-49 years for periods greater than five years into the past, for women aged 40-44 years for periods more than ten years ago, and so on. In each five-year period, the results for the oldest available age-group are partially truncated and are biased towards the experience of slightly younger women. They may therefore tend to be over-estimates. Results which include partially truncated data are shown in italics in the tables presented in this chapter. It should also be noted that the same results which are truncated are based on the fertility experiences of the oldest cohort of women interviewed and that the numbers of these women were relatively small and may be un-representative (Chapter 2 conclusions). They should therefore be interpreted with particular caution.

The data from the individual birth histories obtained in the HIV-1 and Fertility Survey were used to calculate the numbers of live births occurring among women, at each single year of age, in each year prior to the survey date. The overall totals were then divided by the numbers of all women of prime childbearing ages - taken here as 13-39 years - to compute the GFRs for each year. As the total numbers of births per annum are small when the data are sub-divided by study site, these were summed for each three-year period preceding the survey and three-year averages were calculated. The total births for each five-year age-group was divided by the number of women in the age-group to compute the ASFRs. This was done by five-year period prior to the survey date, again, to derive more robust estimates. Period TFRs were then calculated by multiplying the ASFR for each age-group, in each period, by five, dividing by one thousand and then summing the results. Partial TFRs up to ages 29 years, 34 years etc were also derived for use in examining changes by time period. Each TFR computed as described represents an approximation of the number of children a women would expect to have during her lifetime - or up to the stated age - if she were to experience the fertility rates of the given period, at each age [277, pp221-222].

As comparisons of TFR over time can give misleading results when the level and/or timing - ie: between age-groups - of fertility is changing [285], period parity progression ratios (PPPRs) have also been computed. This has been done just for the two sites combined, due to the problems of relatively small population size. A parity progression ratio (a_n) is the proportion of women with at least n live births who go on to have one or more further births [277, p171]. The PPPR is an hypothetical measure based on the numbers of births of each order in a given year. In the current application, following the procedure established by Feeney and Yu [285], the PPPRs were calculated with reference to women who have an nth birth in a given year, rather than for birth or marriage cohorts. The total numbers of births of each order, and of each order and above, were computed and tabulated, by five-year period. Each PPPR, a_n, was estimated by dividing the number of births of order $n+1$ or above by the number of order n or above. a_0 values were calculated by dividing the numbers of first births in each period by the number of women who had never had a child at the beginning of the period. Separate PPPRs were calculated for each five-year age-group of women so that changes in rates of childbearing over time could be examined by age.

Logistic and Poisson regression techniques were used in the study of socio-economic determinants of fertility and its proximate determinants and have been applied using the STATA 3 statistical package [266, 267, 286]. The intermediate or proximate determinants of fertility are examined with reference to the Bongaarts framework as adapted for sub-Saharan African populations [165, 166, 287]. Possible mechanisms for interaction between HIV-1 epidemics and the proximate determinants of fertility are investigated in the regression-based analyses, with reference to the theoretical framework outlined in Chapter 1 - see also Appendix A.

6.4 Recent Patterns and Trends in Fertility in the Honde and Rusitu Valleys

6.4.1 Trends in the Levels of General Fertility and Total Fertility

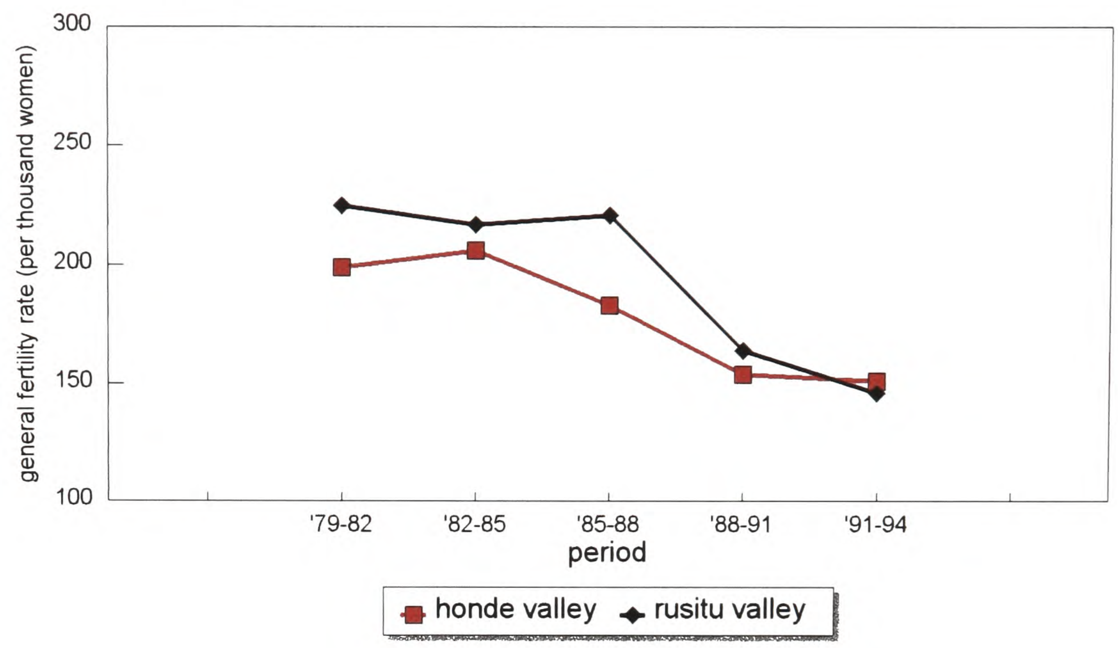
Over the period 1989-94 the crude birth rate (CBR) was very similar in both study areas. The CBR recorded in the Honde Valley was 32.09 births per 1,000 head of population, while the rate in the Rusitu Valley was 32.01 per 1,000. Given the crude death rates recorded in Chapter 5 (Section 5.4.4), these figures imply rates of natural increase in population of 1.95 per cent and 2.33 per cent per annum in the two areas, respectively. These rates are low due to fertility decline (see below), the selective out-migration of young adults and possibly because of the early impact of HIV-1 related mortality upon death rates and the age-structure of the populations. They may also reflect a degree of under-reporting of births.

The trends in GFR are shown by study site and religion in Figure 6.1. These suggest that there was little change in fertility during the early 1980s, but that rapid reductions in birth rates have taken place since the mid-1980s *($p < 0.001$)*. The decline appears to have commenced rather earlier in the Honde Valley than in the Rusitu Valley. The results indicate a possible increase in fertility among Apostolics in the Honde Valley in the early to mid 1980s and a slow but consistent decline among women of other religions throughout the decade and continuing into the early 1990s. In the Rusitu Valley, birth rates begin to decline in the late 1980s. The decline is slightly more pronounced among non-Apostolics.

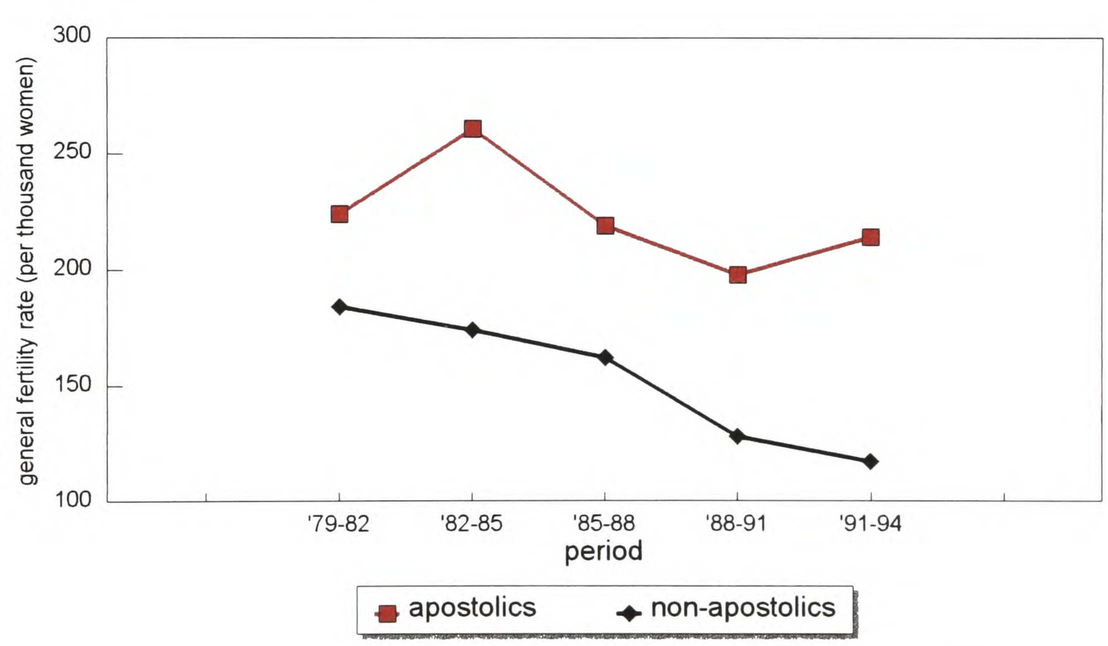
Education levels are lowest among Apostolic women in the Honde Valley and are somewhat lower in the Rusitu Valley, as a whole (Table 3.5). In Chapter 2 (Appendix C), it was noted that there may have been some shifting of births into the period 5-9 years before the survey and it is possible that mis-reporting of dates of birth and omissions of early births by less educated women [288, 289] could account for some of the apparent surplus of births in this period. If so, the actual declines in fertility may be rather more modest than indicated by the results and could have commenced slightly earlier. Nationally, it has been suggested that there may have been an increase in birth rates in the period immediately following Independence (1980) [201, p19] - a phenomenon which was also observed in European countries after the

Figure 6.1 General fertility rate (GFR) for women aged 13-39 years by study site and religion, 1972-94: 3 year averages

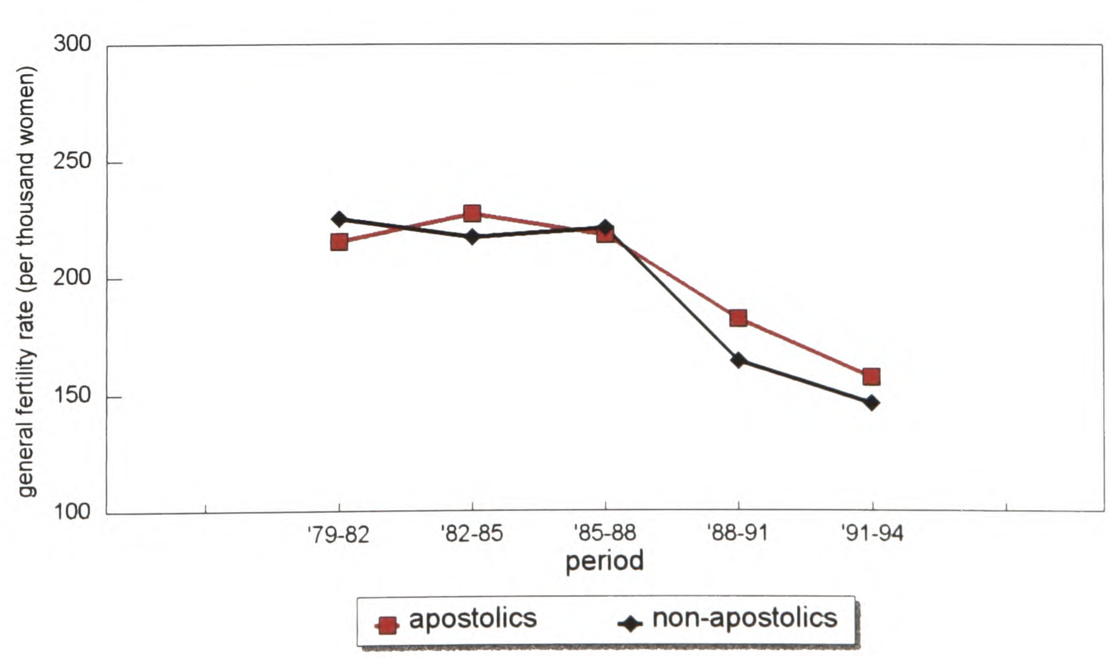
(a) *GFR: by study site*



(b) *GFR: Honde Valley by religion*



(c) *GFR: Rusitu Valley by religion*



end of the Second World War - for the example of France: see [290]. This may have contributed to the high birth rates recorded from the early to mid-1980s.

Total fertility rates of 5.08 and 5.27 births per woman were recorded in the Honde and Rusitu valleys, respectively, for the period 1990-94. Partial TFRs, up to exact age 30 years, are shown by five-year period prior to the survey date in Figure 6.2. Period rates are given in Figure 6.2(a) and cumulative family sizes up to age 30, by birth cohort, are shown in Figure 6.2(b). These results indicate that early age fertility has been declining steadily since the early 1980s in both locations, but this picture may again conceal variations in trends by religion and level of education. As was the case with the GFRs, the fertility decline appears to have been more recent in the Rusitu Valley. The second graph shows that fertility up to the age of 30 years has been declining in successive cohorts since the cohort born in the late 1950s. The results for the previous birth cohort (1950-54) include births in periods going back to the 1960s and are almost certainly understated.

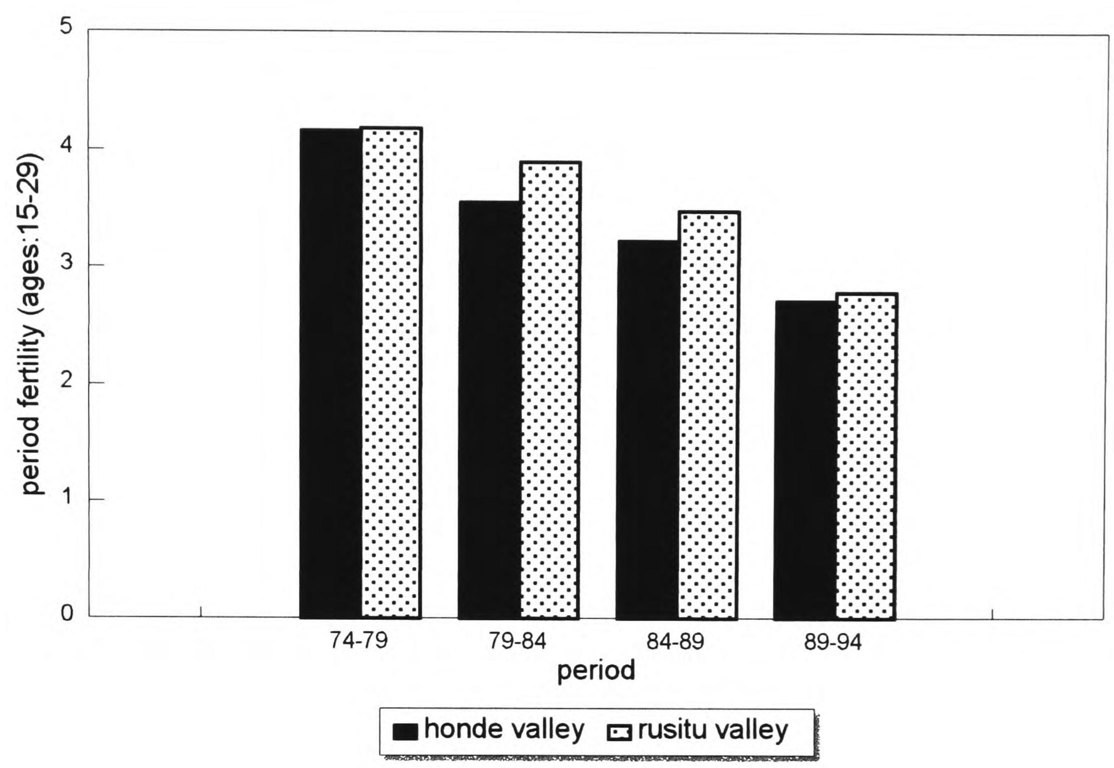
6.4.2 Age-Patterns of Fertility

Figure 6.3 and Table 6.1 show the levels of age-specific fertility recorded in the two study areas for the five-year period immediately preceding the survey. The patterns of age-specific fertility recorded nationally in the Zimbabwe Demographic and Health Surveys (ZDHS) conducted in 1988 and 1994 [195, 198] are superimposed in the figure for comparison. The levels and age-patterns of fertility recorded in the survey are very similar in both areas. They were also similar to those found in the 1988 ZDHS but rather higher than those recorded in the 1994 ZDHS, particularly for women aged 25 years and above. The rural nature of the study populations is the most obvious explanation for this. Whilst the Honde Valley is rather more developed than Rusitu, high fertility levels are sustained by the presence of the Marange Apostolics who do not use modern methods of contraception (Table 3.7).

It is generally understood that older women begin to limit their family sizes first and that this results in increasingly concave patterns of age-specific birth rates in the early stages of fertility transition [291, p230]. However, the shape of the age-distributions over the age of

Figure 6.2 Total fertility rate to age 29 (TFR): trends in period and cohort rates compared

(a) *TFR (15-29): by study site and period*



(b) *TFR (15-29): by study site and cohort*

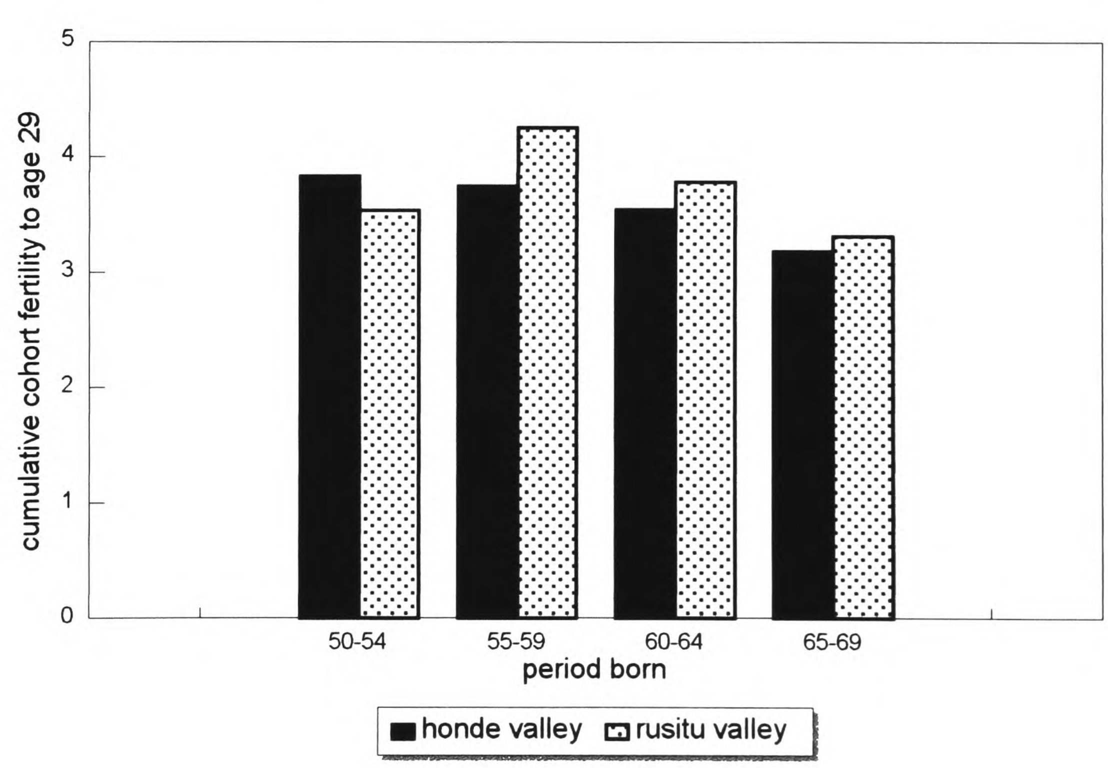


Figure 6.3 Age-specific fertility rates, 1990-94: Honde and Rusitu valley results compared to national estimates derived from the Zimbabwe Demographic and Health Surveys

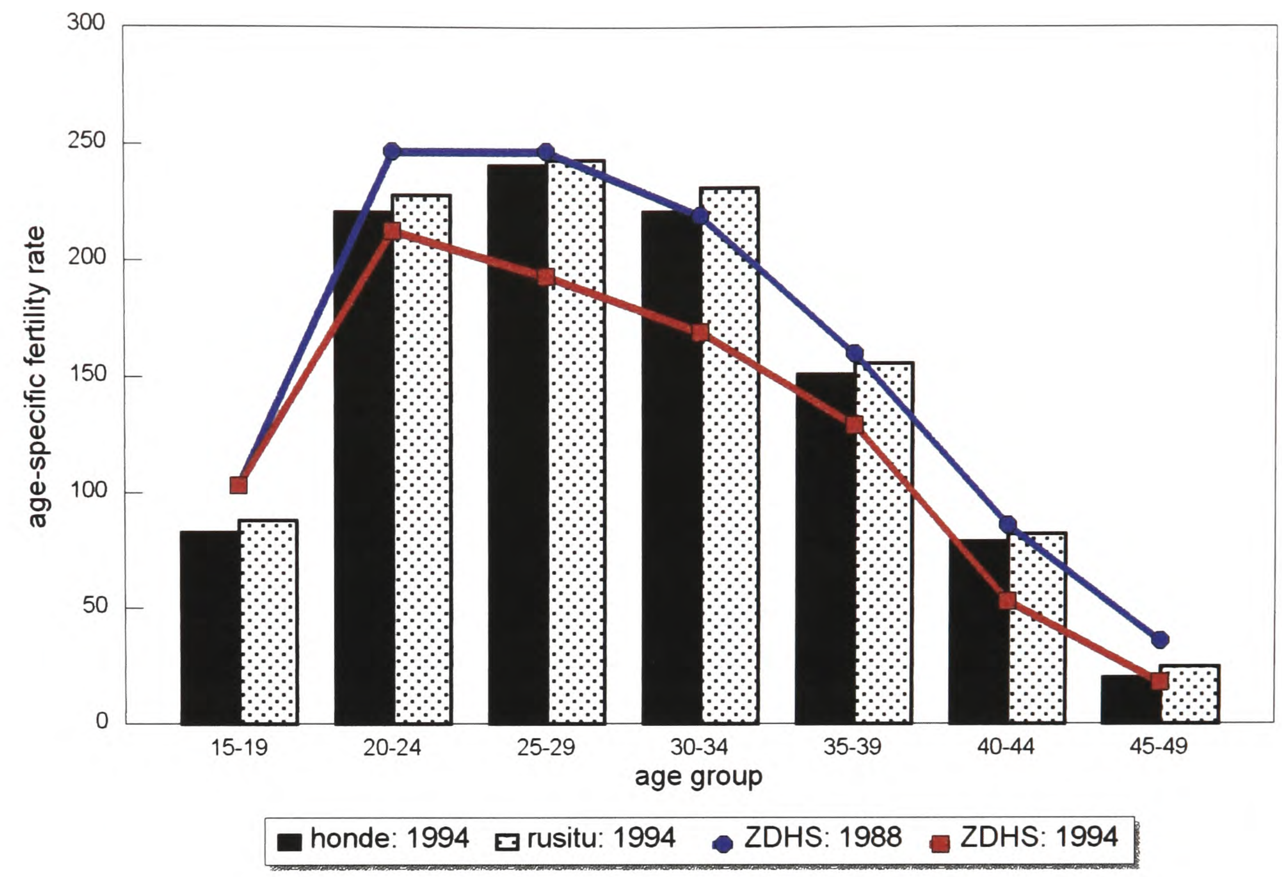


Table 6.1 Age-period fertility rates (births per thousand women per annum) and total fertility rates by period and study site

Age group	Period						No. of women
	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1994
Honde Valley							
15-19	90	115	105	105	83	83	144
20-24	*283*	307	358	330	290	221	115
25-29	-	*283*	370	277	274	241	92
30-34	-	-	*323*	302	229	221	67
35-39	-	-	-	*212*	222	151	46
40-44	-	-	-	-	*71*	79	46
45-49	-	-	-	-	-	*20*	30
TFR: 15-49	-	-	-	-	-	*5.08*	-
TFR: 15-44	-	-	-	-	*5.84*	4.98	-
TFR: 15-40	-	-	-	*6.13*	5.49	4.59	-
TFR: 15-34	-	-	*5.78*	5.07	4.38	3.83	-
TFR: 15-29	-	*3.53*	4.17	3.56	3.23	2.73	-
Rusitu Valley							
15-19	70	130	145	117	90	88	152
20-24	*325*	309	364	306	302	228	114
25-29	-	*400*	328	358	306	243	78
30-34	-	-	*313*	285	271	231	78
35-39	-	-	-	*275*	207	156	60
40-44	-	-	-	-	*125*	82	61
45-49	-	-	-	-	-	*25*	30
TFR: 15-49	-	-	-	-	-	*5.27*	-
TFR: 15-44	-	-	-	-	*6.51*	5.15	-
TFR: 15-40	-	-	-	*6.71*	5.88	4.73	-
TFR: 15-34	-	-	*5.75*	5.33	4.85	3.95	-
TFR: 15-29	-	*4.20*	4.19	3.91	3.49	2.80	-

25 years is relatively convex in the ZDHS results and in both the current survey areas. As will be shown in the next sub-section - see also [198, p28, 292] - fertility levels in Zimbabwe are closely associated with prevalence of female secondary education. Furthermore, levels of female secondary education increased dramatically after Independence (Table 3.5), so that the observed patterns of fertility almost certainly reflect a strong cohort effect. Cohorts who received high levels of secondary education - ie: those aged under 35 years at the survey date - can be seen to have lower fertility even at younger ages (Figure 6.2(b) and Table 6.1). At the same time, Zimbabwe's national family planning programme has placed relatively little emphasis on long-term methods of family planning - compared, for example, to family planning programmes in southern Asian countries. Thus few women and hardly any men have received sterilization treatment (Table 6.14). Reductions in fertility at older ages have so far been relatively modest.

The period parity progression ratio (PPPR) estimates derived from the data collected in the study are given in Figures 6.4 and 6.5. PPPRs are shown first for all women aged 13-32 years. Older women are excluded here as no data are available for the earlier periods prior to the survey date. Nonetheless, the results reveal an interesting pattern of change in fertility within this younger age-group. Progression to first birth, a_0, slows steadily from the late 1970s and there also appears to have been a recent reduction in the rate of progress from first to second births, a_1. The PPPRs from second to third birth, a_2, and from third to fourth birth, a_3, show little change over the period. However, there have been reductions in the proportions of women going on to have fifth and sixth births, a_4 and a_5. It may be worth noting that each of the PPPRs, with the one exception of a_0, increased during the period 1980-84 which is consistent with the suggestion that fertility may have risen following the ending of the Liberation Struggle in 1980. However, increased under-reporting of births occurring further into the past would be an alternative explanation.

In Figure 6.5, these results are disaggregated by five-year age-group. The age-intervals shown have been adjusted downwards by 2.5 years to reflect the fact that the most recent data refer to births occurring on average 2.5 years prior to the survey date. Relatively few women in the youngest age-groups had any births and it is impossible to detect a change in pattern

Figure 6.4 Period parity progression ratios among women aged 13-32 years for the Honde and Rusitu valley populations combined

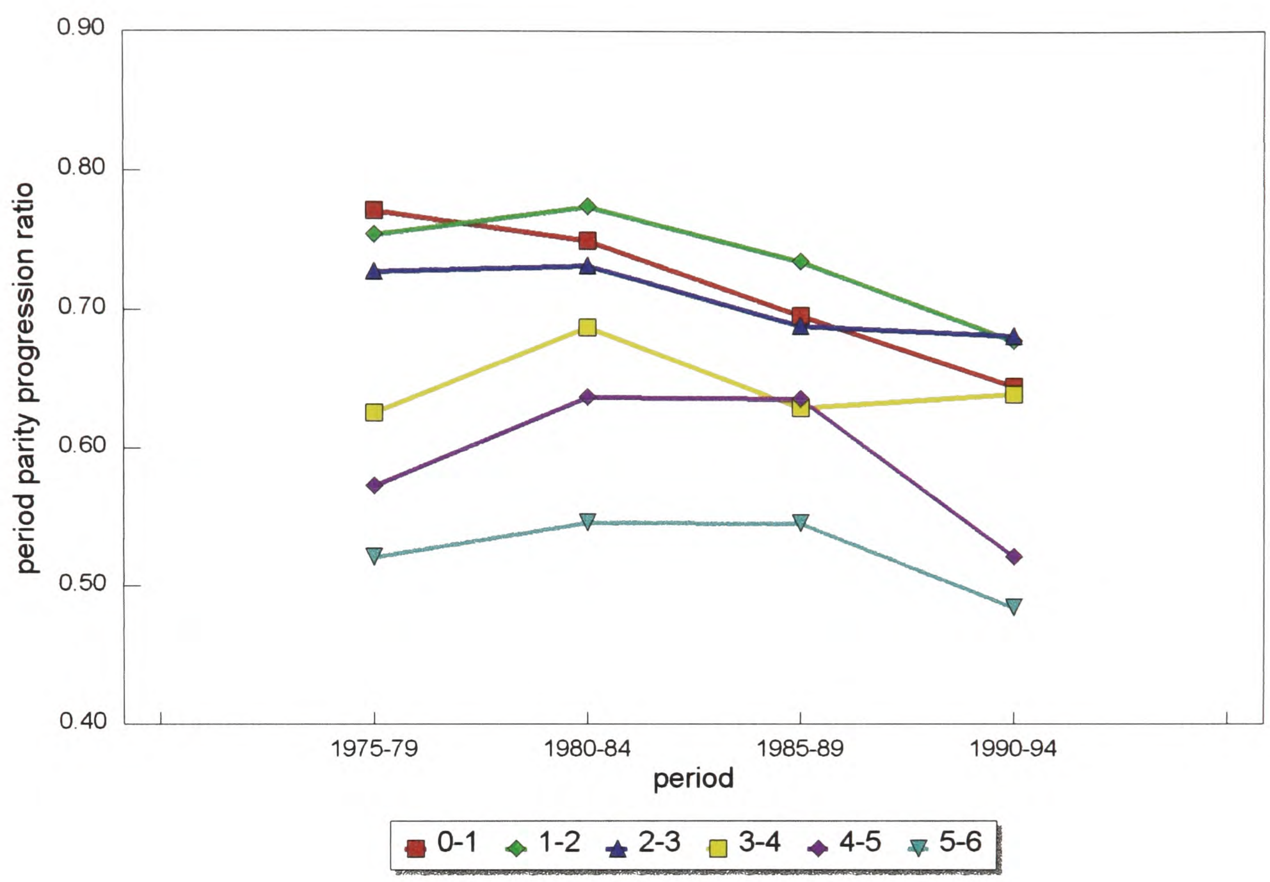
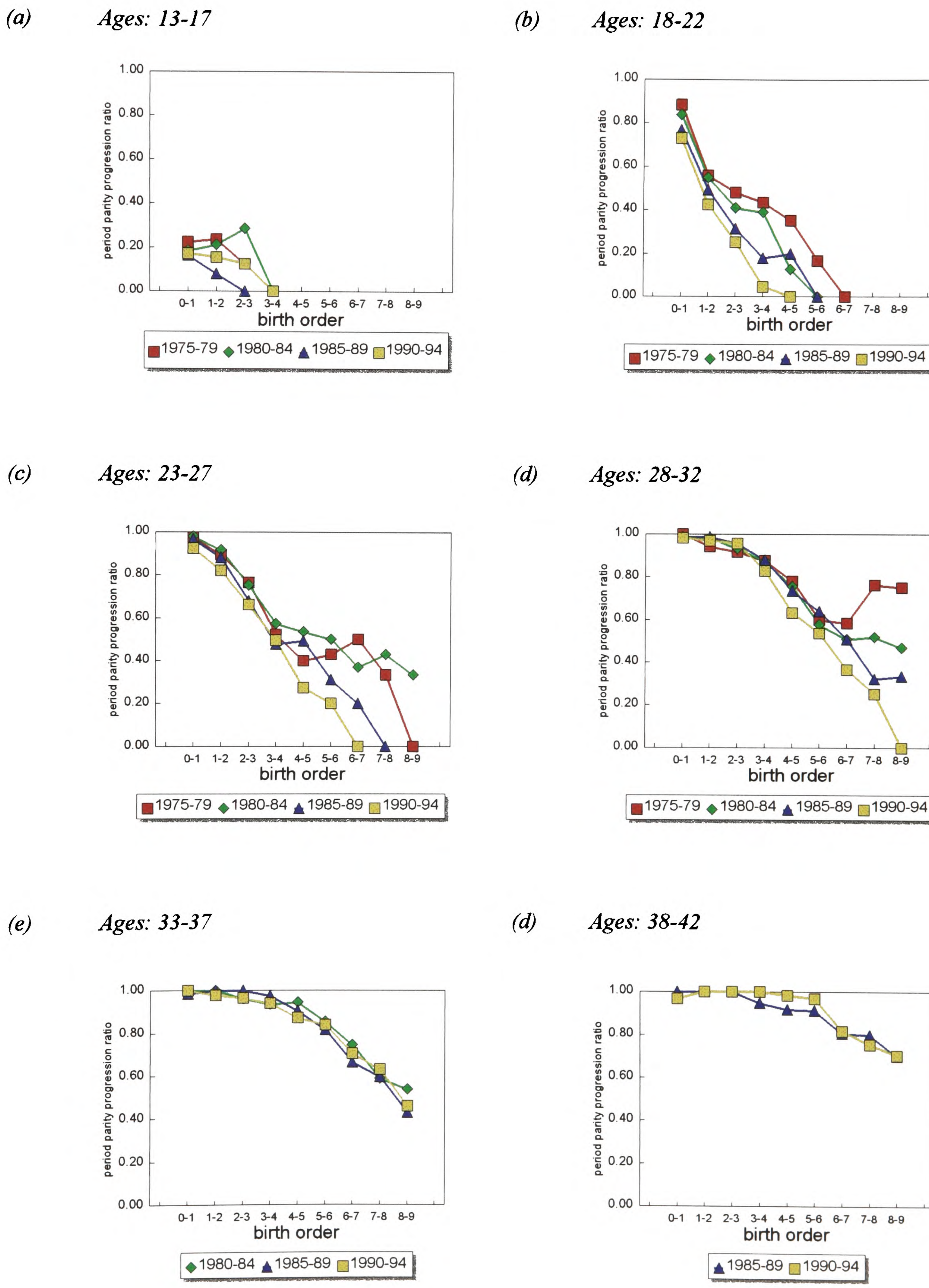


Figure 6.5 Period parity progression ratios by five year age interval for the Honde and Rusitu valley populations combined



within the PPPRs over time. However, there are some fairly clear changes in the age intervals between 18 and 33 years. Between ages 18 and 23 years there were consistent reductions in all of the PPPRs in each period - with just one exception. The proportions starting childbearing and progressing from one to two children declined but the biggest drops were seen at intermediate parities (2-4). In the age range 23 to 28 years the declines are concentrated at parities 4-7 and are most pronounced in the latter two periods. This fits the cohort effect hypothesis suggested above, in that the women aged 23-28 in the last five years are most likely to have received secondary education, while at least a few of those in this age group ten years ago will also have had some secondary education. Between ages 28 and 33 years, there is very little sign of changes in fertility, except at high parities and among women in this age range in the most recent period. Again, these are the only women likely to have received some secondary education. There is little suggestion of any change in fertility in the two older age intervals (33-38 years and 38-43 years). The PPPRs remain at high levels indicating that many of these women have seven or more children - the average completed family size for women aged 45-49 years at the time of the survey was 7.7 children.

6.4.3 Socio-Demographic Differentials in Fertility

Table 6.2 shows the TFRs up to exact age 45 years, for the two most recent five-year periods, by study site, religion, education and proximity to a growth point. In both areas, increased education, living near the growth point and not being an Apostolic are associated with lower fertility. The birth rates in the last five years by education and proximity to growth point are remarkably similar in each area. However, the effect of religion is much more pronounced in the Honde Valley, with the TFR for Apostolic women in the most recent period being almost twice that recorded for other women. The TFRs in the most recent period are lower in every case than those for 1984-89. The biggest reductions are among women with secondary education in the Honde Valley and among Apostolic women in the Rusitu Valley. Women with only primary education also tended to have reduced fertility in 1989-94.

In Table 6.3 the results of a set of Poisson regressions for numbers of children born in the last five years are presented. The Poisson distribution was used in the regressions because the

Table 6.2 Total fertility rate (ages 15-44) by period, site, religion, education and proximity to growth point

Control variable	**Honde Valley**			**Rusitu Valley**		
	1984-89	1989-94	Women in 1994	1984-89	1989-94	Women in 1994
All women	5.84	4.98	540	6.51	5.15	573
Religion						
Apostolic	8.08	7.01	165	7.41	5.24	221
Non-Apostolic	4.96	3.95	375	6.19	4.96	352
Education						
Primary or less	6.50	5.56	269	7.00	5.65	305
Secondary or Higher	5.23	3.67	241	4.56	3.92	238
Growth point						
Inside	4.79	4.09	198	5.81	4.16	64
Outside	6.27	5.28	307	6.61	5.20	472

Table 6.3 Socio-demographic determinants of number of children born in last five years: all women aged 15-49 years

Individual characteristic	**Honde Valley**		**Rusitu Valley**		**Areas combined (I)**		**Areas combined (II)**	
	Co-eff	p > |t|	**Co-eff**	p > |t|	**Co-eff**	p > |t|	**Co-eff**	p > |t|
Socio-Demographic								
Age last birthday	**-0.015**	0.039	**-0.017**	0.009	**-0.017**	0.000	**-0.018**	0.000
Religion	**0.447**	0.007	**0.079**	0.432	**0.183**	0.014	**0.204**	0.007
Education level	**-0.115**	0.280	**-0.250**	0.004	**-0.209**	0.002	**-0.220**	0.001
Marital status	**1.485**	0.000	**1.269**	0.000	**1.359**	0.000	**1.190**	0.000
Steps to Avoid AIDS								
Condom use	-		-		-		**0.338**	0.009
Sexual abstinence	-		-		-		**-0.600**	0.000
Constant	**0.471**	0.148	**0.867**	0.002	**-0.730**	0.000	**0.238**	0.636
Number of observations	542		574		1,116		1,092	
Chi2	149.29		137.01		280.87		302.00	
df	3		3		4		6	
P > Chi2		0.000		0.000		0.000		0.000
Log likelihood	-520.92		-573.76		-1097.53		-1058.21	
Goodness of fit to Poisson distribution	439.33		501.52		946.57		898.22	
df	537		569		1,111		1,085	
P > Chi2		0.000		0.019		0.000		0.000

Notes:

i The results are derived from a Poisson regression performed in STATA version 3.

ii Religion is represented by a dichotomy (Apostolic = 1, Other = 0); Education levels: None, Primary and Secondary and Higher; Marital status: Unmarried = 0, Married = 1. Stable unions were excluded from the "Married" category.

iii Model II for the areas combined includes actions reported as having been taken to avoid AIDS.

data represents counts of births occurring in a fixed time period and the variance (0.678) was found to be close to the mean (0.706) [293, p377]. For each model the goodness of fit to the Poisson distribution proved to be high *($p < 0.0001$)*. Socio-demographic correlates of the number of children born in the five years preceding the survey date were investigated for the Honde and Rusitu valleys separately and in combination. In each case, current marital status was the dominant factor *($p < 0.0001$)*. As might be expected, currently married women were significantly more likely to have had children. However, it should be noted that these women may not have been married throughout the period and some of those currently not married may of course have been divorced or widowed during the period. Furthermore, some non-married women are known to have had children. Twenty births to never married women were recorded in the five years preceding the survey. On this basis, the pre-marital ASFRs were 9, 19 and 30 per thousand per annum for women aged 15-19, 20-24 and 25-29 years, respectively. The effect on birth rates of having a polygynous husband was investigated in the model and was found to be negative but non-significant *($p > 0.05$)*.

After marital status, religion was the most important determinant of fertility in the Honde Valley *($p < 0.0001$)*. Education was not significant *($p > 0.05$)* possibly because of the close association with religion. Age was significant at the 95 per cent level. In contrast, religion was not a factor in the Rusitu Valley. Education and age at last birthday were both highly significant *($p < 0.001$)*. Taking the two sites together, increasing age at last birthday, non-Apostolic religion, increased education and current non-marriage were all significantly associated with lower fertility. Other socio-economic variables were tested in the model but did not result in significant improvements in the fit. These included partner's level of education, access to modern media and proximity of residence to the growth point. In the combined model, residence in the Rusitu Valley was associated with higher fertility, but the effect was not significant. Death of an infant or child in the period one to six years before the survey date showed a small positive effect on fertility but again this was not statistically significant. Any replacement effect would therefore appear to be weak.

In the final model, a number of variables relating to HIV-1 and AIDS were tested. Greater knowledge of HIV-1 and AIDS was associated with a slight reduction in fertility, but was non-significant. Increased knowledge about HIV-1/AIDS has been shown to be closely associated with level of education (Table 4.14), so that any genuine effect may be obscured by the separate inclusion of education in the model. Reported use of condoms and sexual abstinence as steps to avoid AIDS were found to be associated with recent fertility. In the case of condom use there was a positive effect on birth rates *($p < 0.001$)*. This may be because condoms are a less reliable form of contraception than other commonly used modern methods both in terms of usage and efficacy [166, p166]. However, there is a problem of interpretation here. Women who *already* use condoms for family planning or STD control purposes may report condom use as a means of protection against HIV-1 infection. In these cases the HIV-1 epidemic cannot be said to have resulted in a change in fertility. As will be seen later in this chapter, there were a small number of women who reported switching to condoms from a different method of contraception. There may also be some women/couples who have chosen condoms as their first method of family planning because of its protective effect against HIV-1 infection. It is therefore possible that this finding could have some genuine impact upon fertility rates.

The observed association between lower fertility and sexual abstinence - as a measure taken to avoid HIV-1 infection - is equally difficult to interpret. Of course, it is not at all unexpected that abstinence is associated with reduced fertility. However, once again, a degree of post-event rationalization may have prompted the response of abstinence as a measure taken to avoid infection. In Chapter 4, it was found that abstinence was more likely to be reported as an action taken to reduce the risk of HIV-1 infection by single and divorced women with greater knowledge about HIV/AIDS (Table 4.18). It is therefore conceivable that some of these women are delaying or avoiding marriage as a response to the HIV-1 epidemic and that they could have less children as a result.

6.5 HIV-1 and the Proximate Determinants of Fertility

6.5.1 Introduction

It was hypothesized that fertility declines might be hastened in sub-Saharan populations by the presence of the HIV-1 and AIDS epidemics (Chapter 1 and Appendix A). A number of possible mechanisms for interaction between these epidemics - and responses to them - and the principal proximate determinants of fertility in sub-Saharan Africa [287] were suggested. These were summarized in Table 1.1. In this section, data on the current levels and socio-demographic determinants of the proximate determinants in the Honde and Rusitu valleys will be presented. In each case, tests will be carried out to assess the nature and extent of the early impact of increased knowledge and awareness of the risks of HIV-1 infection. Perhaps it should be emphasized from the beginning that the patterns of change in attitudes and behaviour identified represent *early* responses to the epidemic and that these may be modified as the impact on morbidity and mortality increases - and awareness and sense of personal risk increase. Further changes may be under way which have not been identified here, due to their omission from the original hypotheses, or other aspects of the study design, including the modest population sizes covered and the limited availability of longitudinal data.

The variables used to assess the impact of the HIV-1 and AIDS epidemics included the indices of knowledge and personal experience (**INDEXK** and **INDEXE**) and the variable on whether the respondent felt in danger of HIV-1 infection (**DANGER**) developed in Chapter 4. An additional variable on perceived personal risk of HIV-1 infection due to close friends and relatives dying of AIDS (**RISK**) has been constructed from the responses to the third option in the question on reasons for feeling in danger (IQ717). This variable is intended to reflect general awareness of the risks of infection rather than a sense of danger due to the respondent's own personal circumstances - ie: whether she or her husband has had multiple partners. The socio-demographic determinants of this variable are shown in Table 6.4. Older women, more educated women, women who are not currently married and women living near a growth point appear to experience a greater sense of risk. Women who knew more about HIV-1/AIDS (not significant) and those who reported close personal experience of the

Table 6.4 Sense of personal risk of HIV-1 infection due to "large numbers of friends and relatives dying of AIDS": socio-demographic determinants of reported risk (women aged 15-49 years)

Independent variable	Excluding HIV-1 related variables		Including HIV-1 related variables	
	OR	p > |t|	OR	p > |t|
Age at Last Birthday	**1.03**	0.020	**1.03**	0.034
Religion:				
Non-Apostolic	**1.00**		**1.00**	
Apostolic	**1.15**	0.563	**1.23**	0.397
Education:				
None	**1.00**		**1.00**	
Primary	**1.11**	0.825	**0.98**	0.967
Secondary	**1.35**	0.552	**1.03**	0.954
Marital Status:				
Married	**0.40**	0.000	**0.39**	0.000
Not married	**1.00**		**1.00**	
Proximity to Growth Point:				
Inside	**1.00**		**1.00**	
Outside	**0.60**	0.020	**0.62**	0.460
Radio and TV Exposure	**1.86**	0.008	**1.71**	0.024
Knowledge about HIV-1 (index)	-	-	**4.46**	0.076
Personal Experience of HIV-1 (index)	-	-	**9.89**	0.043
Number of observations		1,101		1,101
Chi2		33.64		41.74
df		7		9
P > Chi2		0.000		0.000

Notes:

i The results are derived from Logistic regression analyses performed in STATA version 3. DFM indicates variables which have been dropped from the model.

ii Marriage here excludes other forms of stable union.

iii Level of education and religion were included in the models because they improved the overall fits. However, the incremental improvements were non-significant in each case.

epidemic were more likely to report a sense of risk.

In addition, a number of specific variables have been created from responses to questions relating to each proximate determinant of fertility under consideration. For example, the questionnaire included a question on possible risks of breastfeeding (IQ540) with an option: "HIV transmission if mother is HIV positive". The question came before the section on HIV and AIDS and enumerators were asked not to prompt. A test was carried out to see whether women who gave this response were likely to breastfeed their children for shorter periods.

In carrying out the statistical tests, controls were introduced for other key socio-economic factors which influence the proximate determinants of fertility. Principal amongst these is education. Where appropriate, separate results are presented by level of education, because past changes often occurred first among more educated people and then spread within other groups. To the extent that this is *not* the case with responses to AIDS, future levels of education will be important determinants of the long-term course of the epidemic.

6.5.2 Marriage: Exposure to Sexual Relations

Pre-Marital Sexual relations

The survey results on age at first sexual intercourse and sexual activity prior to first stable union were described in Chapter 3 - Figures 3.10 and 3.11; Tables 3.8, 3.9 and 3.12. These suggest that there may have been a shift towards later commencement of sexual relations in recent years. In all, 12 per cent of the women interviewed said they thought it was acceptable for a woman to have sex before entering into a stable union. More women in Rusitu (17 per cent) said they thought this was acceptable than was the case in the Honde Valley (6 per cent). There was no evidence of variations in attitudes to pre-marital sex between women of different current union status. These figures contrast with the attitudes expressed regarding extra-marital sex when in a union: only 6/1,201 women (0.5 per cent) said they thought this could be acceptable. Most currently single women reported that they were not sexually active, but there were some who said they were in a stable union (8 per cent) or were having casual relationships (4 per cent). The GFR among single women aged 15-29 years in the five-year period preceding the interview date was estimated at 13 births per thousand women - compared to 147 births for all women regardless of current marital status.

Table 6.5 summarizes the key results of a regression analysis of determinants of experience of sexual relations among women currently aged 15-22 years. After controlling for age, education and religion, both increasing knowledge about HIV-1 and greater sense of personal risk of infection (**RISK**) were associated with delayed commencement of sexual relations. The latter effect is stronger statistically and is interesting, as a degree of reverse causality might have been expected, given that most women know that HIV-1 infection can be transmitted through heterosexual intercourse (Chapter 4).

Current Marital Status

The distributions of women by current marital status in the Honde and Rusitu valleys are given, by age, in Table 6.6 and are illustrated graphically in Figure 6.6. Overall, the distributions appear to be similar, although there seems to be a greater tendency towards cohabiting and long-term (six months or more) non-marital unions in the Rusitu Valley population. Divorce, separation and widowhood are slightly more common current marital states among women aged 20-49 years in the Rusitu Valley than is the case in the Honde Valley ($p < 0.025$).

Entry Into First Stable Union

Results from the study on age at first entry into a stable union are shown for women in both areas combined, by current age-group in Figure 6.7. Graph (a) shows the cumulative proportions of each age cohort who have experienced a union by age **X**, from age **X=10** to age **X=25**. Graph (b) shows the proportions of women who had not experienced a union by age **X** who entered a union before reaching age **X+1**. The results suggest that the recent trend has been towards later entry into a union - 53 per cent of women currently in their 20s had entered a union by age 20 years compared to 61 per cent of women now aged over 30 years

Table 6.5 Impact of increased knowledge and awareness of the risk HIV-1 and AIDS on commencement of sexual relations among women currently aged 15-22 years

Independent variables	**Women aged 15-22 years**	
	OR	p > |t|
Knowledge about HIV-1 (index)	**0.19**	0.067
Perceived risk of HIV-1 transmission	**0.25**	0.005
Number of observations		**444**

Notes:

i The results are derived from a Logistic regression analysis performed in STATA version 3. Age at last birthday, level of education and religion were controlled for in the model.

ii Women are treated as having an enhanced awareness of the risk of HIV-1 infection if they stated that they felt in danger of infection because friends and relatives were dying of AIDS (IQ 717).

Table 6.6 Current marital status by age and study location

Age-group	Single	Stable union	Married	Divorced or separated	Widowed	Total
	%	%	%	%	%	
Honde Valley						
13-14	100.0	0.0	0.0	0.0	0.0	51
15-19	75.0	2.8	20.8	1.4	0.0	144
20-24	33.9	3.5	57.4	4.3	0.9	115
25-29	7.6	6.5	77.2	6.5	2.2	92
30-34	6.0	4.5	82.1	1.5	6.0	67
35-39	0.0	4.3	80.4	8.7	6.5	46
40-44	0.0	4.3	78.3	10.9	6.5	46
45-49	0.0	6.3	81.3	3.1	9.4	32
13-49	35.2	3.9	54.1	4.0	2.7	593
Rusitu Valley						
13-14	98.5	0.0	1.5	0.0	0.0	66
15-19	84.9	2.0	13.2	0.0	0.0	152
20-24	19.3	12.3	56.1	10.5	1.8	114
25-29	7.6	13.9	67.1	10.1	1.3	79
30-34	3.8	7.7	71.8	10.3	6.4	78
35-39	0.0	15.0	70.0	8.3	6.7	60
40-44	0.0	6.6	78.7	4.9	9.8	61
45-49	3.2	0.0	58.1	12.9	25.8	31
13-49	35.3	7.3	47.1	6.2	4.1	641

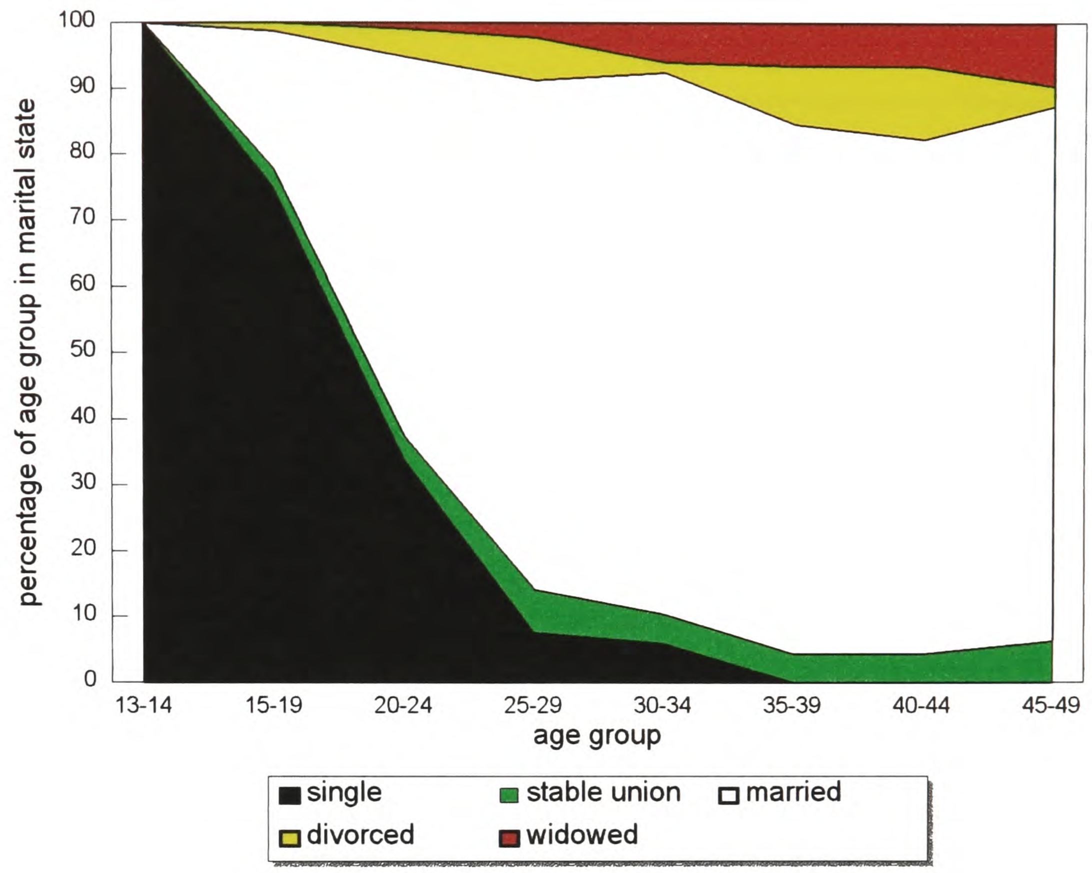
Notes:

i Cohabiting unions and long-term unions - 6 months or more - are treated here as "stable unions".

ii Divorced and widowed women entering new unions are included in the stable union and married categories, as appropriate.

Figure 6.6 Current marital status by age and study location

Honde Valley



Rusitu Valley

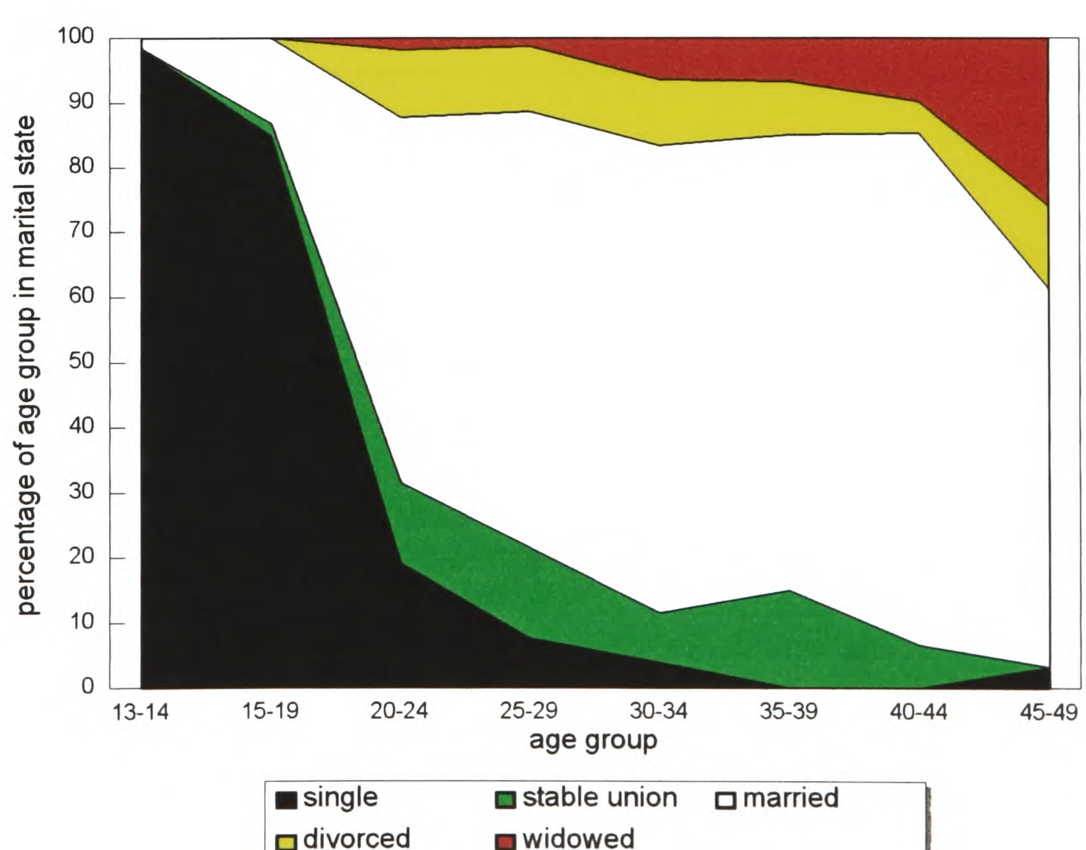
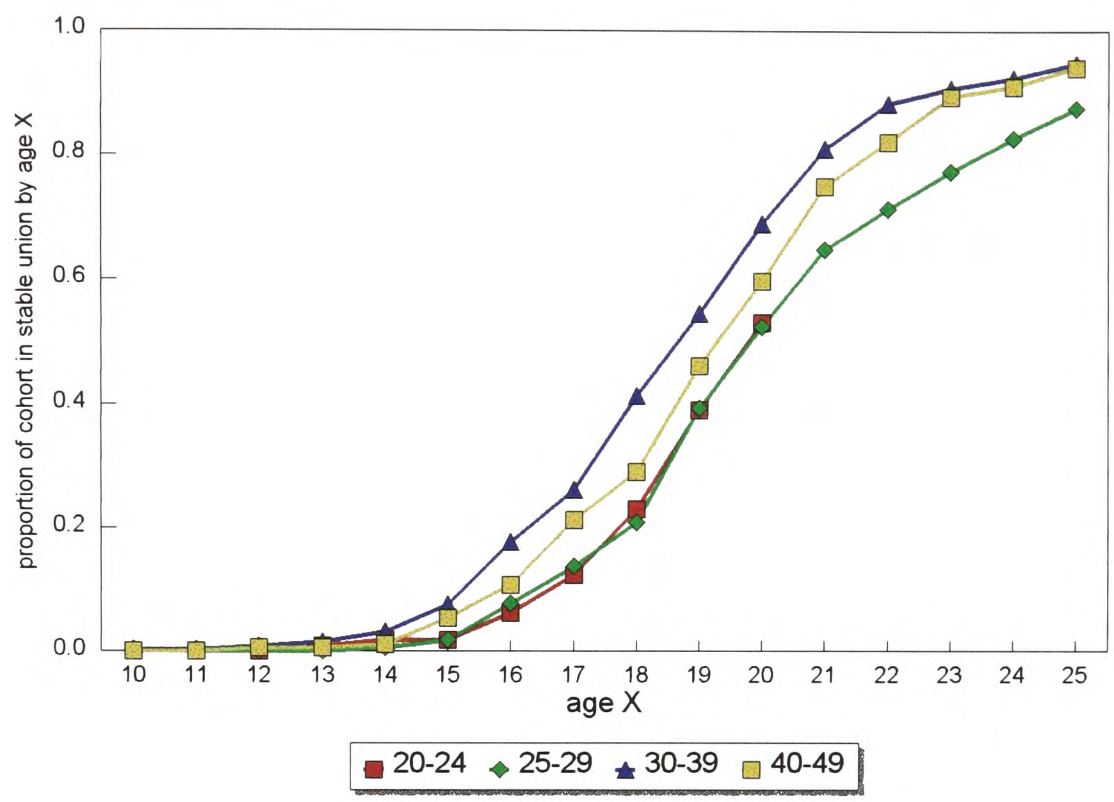
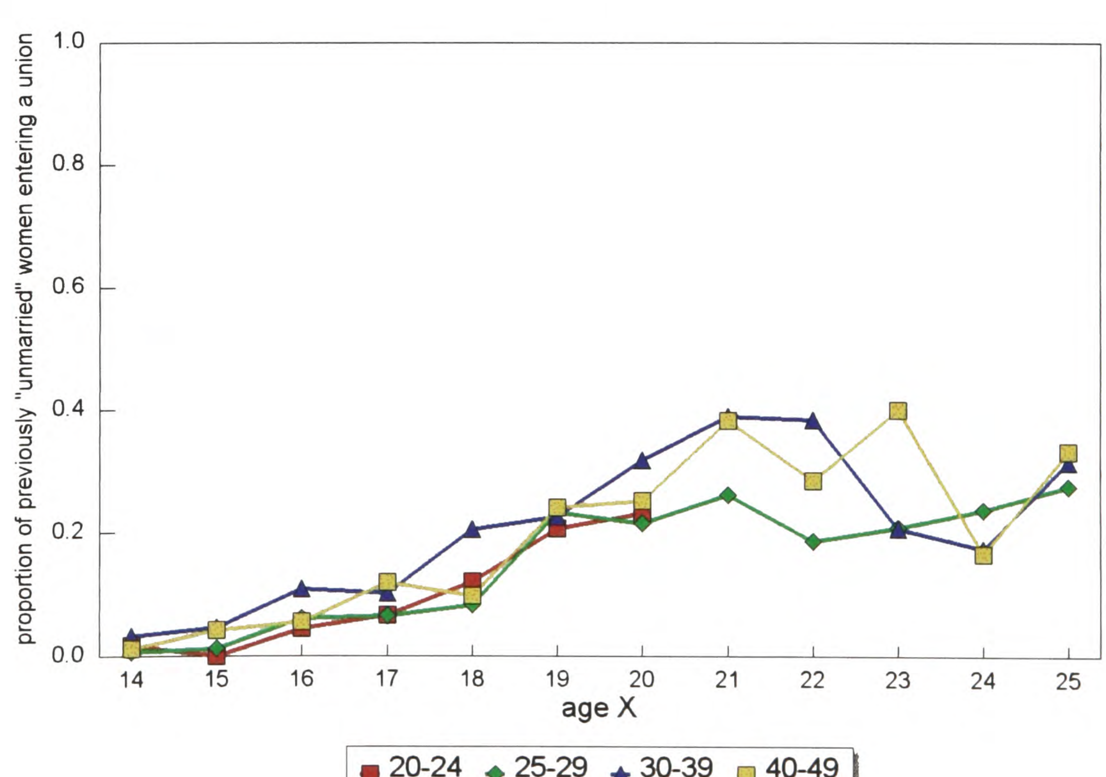


Figure 6.7 Age at entry into first stable union: marriage, cohabiting or long-term

(a) Proportions of women entering a first stable union before age X, by birth cohort



(b) Proportions of women not previously in a stable union entering one by age X



($p < 0.025$). However, women *currently* in their thirties appear to have married earlier. These women would have been in their teens and early twenties during the immediate post-Independence period when demand for brides might have been expected to be high.

Table 6.7 summarizes the key findings from a regression analysis of determinants of first entry in stable unions among women aged between 16 and 23 years at their last birthday. As was the case with onset of sexual relations, increasing knowledge about HIV-1 and greater sense of personal risk were associated with delayed entry into a stable union. The effect of greater awareness of the risk of HIV-1 infection was weaker among more educated women, perhaps because these women tend to marry later in any event. This may be a sign that the epidemic is more likely to result in delayed marriage rather than a significant reduction in the proportion of women who ever marry. However, it is really much to early to tell.

Features of Marriage: Bridewealth and Polygyny

Bridewealth (*lobola*) continues to be widely practised. Eighty-seven per cent of ever married women - excluding other stable unions - said that bridewealth had been agreed upon in connection with their marriages. Bridewealth was less common in Rusitu (83 per cent) than in the Honde Valley (92 per cent); $p < 0.001$. No evidence was found for a link between bridewealth and religion but there was a suggestion that such arrangements may be becoming slightly less common - lower proportions of younger married women said that bridewealth had been agreed in respect to their marriages (non-significant). However, the latter may reflect less formal arrangements or delays in the agreement of terms. The increasing monetarization of *lobola* and the sharper focus of responsibility for payment upon the husband were noted in Chapter 3 (Appendix D). This trend may serve to support higher male ages at marriage [157], increased male pre-marital sexual experience and consequently greater risk of husbands' being infected before marriage. Furthermore, payments of bridewealth may enhance a husband's sense of his "rights" over the sexuality of his wife. They may therefore reduce the latter's power to negotiate safe sex and monogamy.

Twenty-eight per cent of women currently in a stable union reported that their partners had

Table 6.7 Impact of increased knowledge and awareness of the risk HIV-1 and AIDS on first entry into stable unions among women currently aged 16-23 years

Independent variables	**Women aged 16-23 years**	
	OR	p > |t|
Knowledge about HIV-1 (index)	**0.22**	0.099
Perceived risk of HIV-1 transmission	**0.28**	0.004
Number of observations		432

Notes:

i The results are derived from a Logistic regression analysis performed in STATA version 3. Age at last birthday, level of education and religion were controlled for in the model.

ii Women are treated as having an enhanced awareness of the risk of HIV-1 infection if they stated that they felt in danger of infection because friends and relatives were dying of AIDS (IQ 717).

other "wives". The proportions were very similar in both study areas, but were higher among Apostolics in the Honde Valley (Table 3.7). In the study, polygyny was found to be associated with reduced coital frequency (Table 3.12). A small negative effect on number of births in the last five years was also found, but this was not statistically significant *($p > 0.05$)*. In focus group discussions, women expressed disapproval of polygyny. It was said to be a sign of lust and greed and a cause of family friction. In recent times it was most commonly practised under a religious pretext or by men engaged in labour migration. However, as was noted in Chapter 5 - with reference to mortality trends among Apostolics - polygyny may afford *some* measure of protection against the spread of HIV-1 infection, in circumstances where it is associated with an effective taboo against extra-marital partnerships.

Marital Breakdown: Divorce and Widowhood

Data on the incidence of divorce (including separations) and widowhood was collected in the survey calenders for the five-year period preceding the interview date. The mean age at divorce was 26.1 years in Honde and 27.6 years in Rusitu. The mean ages at widowhood were 33.0 years and 36.5 years, respectively. Overall, 65 (8.4 per cent) and 32 (4.1 per cent) of women who had been in a stable union at some time during the period experienced a divorce or widowhood, respectively. In both cases, women in Rusitu reported higher levels of marital breakdown than their counterparts in the Honde Valley: 11.0 per cent and 5.7 per cent as against 5.7 per cent and 2.4 per cent. Much of the difference in divorce rates was accounted for by the greater concentration of Marange Apostolics in the Honde Valley. There were no instances at all of divorces amongst these women. The early impact of HIV-1 and AIDS on the incidence of divorce among women aged 20-49 years is examined in Table 6.8. The analysis confirms that Apostolic women are less likely to experience divorce whilst women in Rusitu are more likely to be divorced - note: remarriage rates and differentials will be discussed below. There was no evidence that increased knowledge about HIV-1 was associated with divorce. However, women who experienced a divorce were more likely to report a sense of personal risk of infection *($p < 0.001$)*. This result is difficult to interpret as it may flow from the experiences of women after divorce, particularly given that high proportions of divorced women appear to become involved in commercial sex work, where

Table 6.8 Impact of increased knowledge and awareness of the risk of HIV-1 and AIDS on the incidence of divorce and divorcee remarriage among women currently aged 20-49 years

Independent variables	**Divorce**		**Remarriage**	
	OR	p > |t|	**OR**	p > |t|
Knowledge about HIV-1 (index)	**0.77**	0.788	**96.76**	0.109
Perceived risk of HIV-1 transmission	**3.24**	0.000	**5.78**	0.032
Number of observations		821		63

Notes:

i The results are derived from a Logistic regression analysis performed in STATA version 3. Age at last birthday, level of education and religion were controlled for in the model.

ii Women are treated as having a enhanced awareness of the risk of HIV-1 infection if they stated that they felt in danger of infection because friends and relatives were dying of AIDS (IQ 717).

iii Enhanced awareness of risk of HIV-1 infection is positively associated with divorce *($p < 0.001$)*. However, this is felt to have resulted principally from experiences *after* becoming divorced.

iv Increased knowledge about HIV-1 and AIDS reduces the chances of divorce among more educated women (secondary and above; OR: 0.64) but is positively associated with divorce for less educated women (OR: 1.55). The latter may also result from experiences after divorce.

v Residence in the Rusitu Valley was also associated with increased chances of divorce but was not included in the model on grounds of consistency with the other tests.

they may be more likely to meet people who have become sick. However, observations from the sociological studies indicate that marital breakdowns often result from disputes about unfaithfulness and HIV-1/AIDS is certainly an increasingly important factor in these disputes.

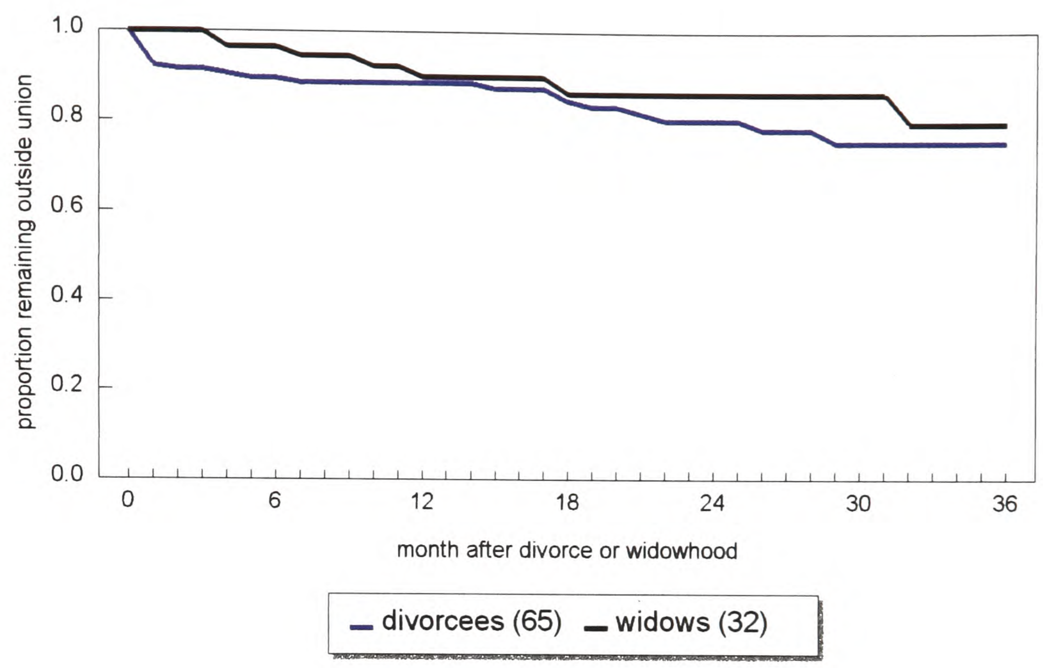
Forty-one per cent of the women interviewed stated that they thought extra-marital sexual relations were acceptable for divorced, separated or widowed women. Again attitudes on this question appeared to be more relaxed in the Rusitu Valley. Forty-six per cent of the women there said this was acceptable compared to 36 per cent of women in the Honde Valley. Overall, currently divorced and separated women were more likely to approve (61 per cent) than single women and women in unions. 17/45 divorcees not currently in a union at the time of the interview (38 per cent) reported recent sexual activity. The equivalent statistic for widows was 3/25 (12 per cent). Of course, divorcees and widows who have not (yet) entered new unions may not be representative of all women who experience these situations. One can only speculate, but it seems plausible that women who remarry quickly may be less tolerant of the idea of extra-marital sex. The GFR among women while divorced, based on conceptions during periods outside unions within the five years preceding the interview date, was estimated at 46 births per thousand women years. There were no extra-marital births among widows during this period.

Remarriage after Divorce or Widowhood

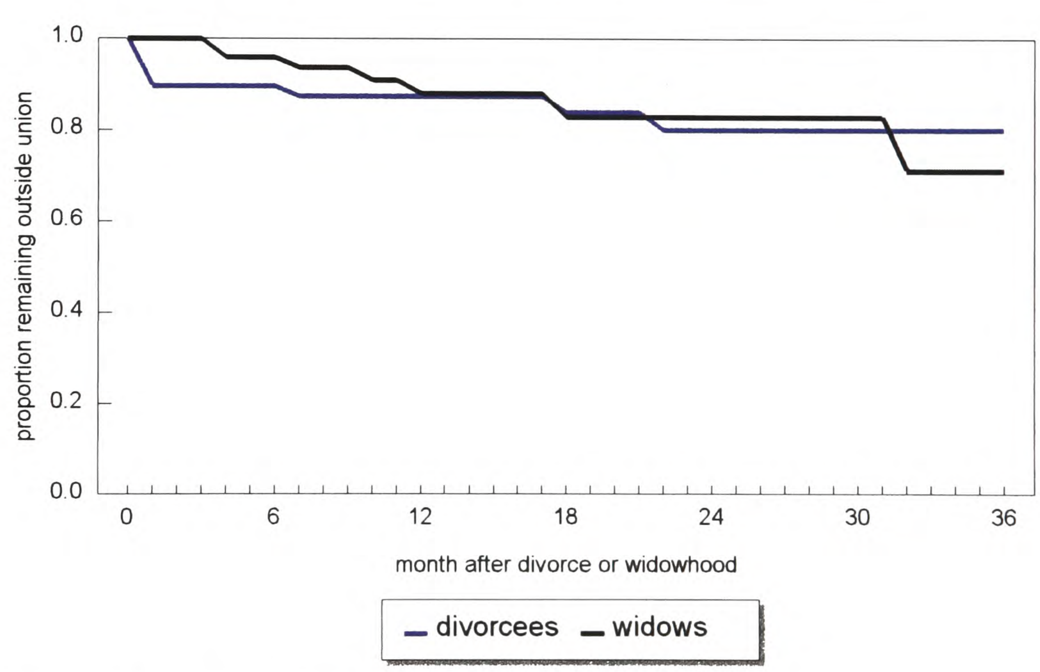
Figure 6.8 shows the proportions of women divorced and widowed during the five years preceding the survey date who remained outside stable unions, by month following marital breakdown. The first graph shows the proportions by form of marital breakdown. In both cases, remarriage rates are low - less than 25 per cent within the first three years. A small proportion of divorced women enter a new union within one month and it is possible that the new relationship may have been the cause of the marital breakdown in some of these cases. If allowance is made for this and for the younger ages of women experiencing divorce - this is done in graph (b) by selecting 27 matched pairs of women of similar age - there is a suggestion that remarriage rates may actually be higher among widowed women. However, the numbers of women involved are too small to yield statistically significant results. Similar

Figure 6.8 **Proportions of divorcees (including separations) and widows remaining outside unions by time since divorce (widowhood): women divorced or widowed in the five years preceding the survey**

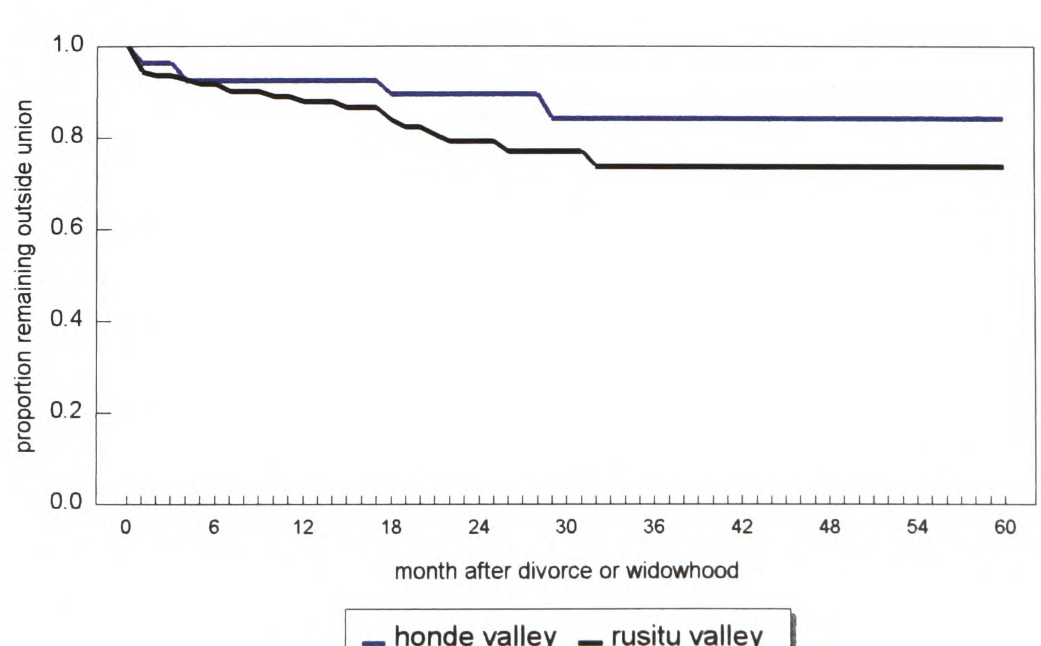
(a) *Remarriage by form of marital breakdown: without control for age*



(b) *Remarriage by form of marital breakdown: pairs of women matched by age (27)*



(c) *Remarriage by study site - divorcees and widows*



problems hamper attempts at comparisons between the two study locations. The results shown in graph (c) suggest that remarriage rates may be greater in the Rusitu Valley. Of the 28 "remarriages" recorded by the study only four were new marriages in the strict sense, the majority being new cohabiting or long-term unions.

Respondents were asked whether they thought remarriage after divorce might be problematic and, if so, to state their reasons. The results from these questions are summarized in Table 6.9. Thirty-nine per cent of women reported at least one potential problem. Generally, women in the Honde Valley were more likely to report difficulties, a finding which supports the picture of lower *actual* remarriage rates shown in Figure 6.8. Possible risk of HIV-1 infection was mentioned by 9 per cent of the women.

The women were also asked about the advisability of remarriage following widowhood - Table 6.10. No distinction was made in the question between remarriage within the former husband's family - as was the traditional custom - and other forms of remarriage. Almost three-quarters of the respondents in each area said they thought it would be inadvisable to remarry. The principal reason given was that this would be detrimental to the children. It is now common for a widow to be permitted to keep her children, even in cases where she does not remarry within the family. Nonetheless, the women were concerned that the existing children of potential new husbands would be given preferential treatment over their own. In polygynous settings, widows who remarried were liable to become second or higher rank wives and therefore experience a fall in status. Eleven per cent of respondents gave risk of HIV-1 transmission as the main reason for not remarrying - slightly higher than the proportion who reported this as being a problem after a divorce. Very few currently widowed women gave this response, possibly because they are older than average, less educated and perhaps less conscious of the risks. Over time the risk of HIV-1 transmission may become of greater concern. If this were the case, it would tend to reinforce the already dominant female view that remarriage after widowhood should be avoided. The most common reason given by women who felt it *would* be advisable to remarry was economic and physical security. It is noticeable that rather higher proportions of current widows - and divorcees - favoured remarriage in the Rusitu Valley compared to the Honde Valley. This is in keeping with the

Table 6.9 Reasons remarriage following divorce might be difficult, by study site and current marital status

Age-group	Single	Stable union	Divorced or separated	Widowed	Total
	%	%	%	%	%
Honde Valley					
HIV-1 risk	10	11	4	5	10
No longer a virgin	11	9	7	5	10
Infertility	5	4	7	0	4
Other reasons	27	30	41	30	29
No reasons	52	51	48	60	52
Total no. of women	224	321	27	20	592
Rusitu Valley					
HIV-1 risk	11	6	5	6	8
No longer a virgin	3	3	0	0	2
Infertility	2	3	5	3	3
Other reasons	22	20	15	9	20
No reasons	63	72	75	83	70
Total no. of women	245	303	61	35	644

Note: More than one reason was given by some of the women.

Table 6.10 Attitudes towards remarriage following widowhood, by study site and current marital status

Age-group	**Single**	**Stable union**	**Divorced or separated**	**Widowed**	**Total**
Honde Valley	%	%	%	%	%
Advisable to Remarry:					
Economic/security	14	10	18	5	12
Tradition	4	2	0	0	2
Other reasons	8	7	15	15	8
Don't know	0	1	0	0	0
Total	25	19	33	20	22
Inadvisable to Remarry:					
HIV-1 risk	21	9	7	0	13
Bad for children	29	54	44	70	44
Other reasons	13	12	7	5	12
Don't know	8	2	0	5	4
Total	71	77	59	80	74
No Opinion	3	4	7	0	4
Total no. of women	224	321	27	20	592
Rusitu Valley					
Advisable to Remarry:					
Economic/security	12	12	30	17	14
Tradition	4	4	10	6	5
Other reasons	6	7	10	11	7
Don't know	0	0	0	0	0
Total	22	23	49	34	26
Inadvisable to Remarry:					
HIV-1 risk	16	8	0	6	10
Bad for children	40	55	33	54	47
Other reasons	17	12	15	6	14
Don't know	3	0	0	0	1
Total	76	76	48	66	73
No Opinion	2	2	2	0	2
Total no. of women	245	303	61	35	644

behaviour pattern observed - Figure 6.8(c).

The nature of the risks following divorce and widowhood are of course rather different. In the latter case, there is no element of choice and the balance of the risk may fall on potential future partners, particularly as the epidemic progresses. The contemporary predominant patterns of sexual activity by gender in Zimbabwe (Chapter 3) and the data on adult mortality obtained in the current study (Chapter 5) point towards rapid increases in widowhood over the next 5-10 years.

For women contemplating divorce, personal risk of infection is likely to be the paramount concern. They may feel that they will reduce their risk if they fear that their husband is unfaithful. On the other hand, if they consider the relatively low prospects of remarriage and the shortage of viable economic alternatives to involvement in commercial sex work, they could decide that remaining married is the safer option. The second of these scenarios may become increasingly dominant, although this could depend upon the extent to which condoms gain acceptance within casual relationships. Remarriage may also become increasingly difficult for women who do wish to find another partner. Widows are becoming seen as potentially risky partners, particularly where their husbands are suspected as having died of AIDS. The perceived associations between risk of HIV-1 infection and multiple sex partners and between divorcees and commercial sex work increase the chances that women who have been divorced for significant periods of time will become seen as risky marital partners.

These issues have not been addressed fully in the study fieldwork to date but clearly have important implications for future patterns of marriage. The impact of one partner discovering that he or she is HIV-1 positive on a marital relationship was raised in one focus group discussion with women in Chingwekwe village, Rusitu Valley. The group had mixed views, as can be seen from the following extract from the field notes:

> "This was a hotly debated issue and one where it was very difficult to establish a consensus. One group was of the opinion that it was better to separate than to infect each other and die. The other group said that it was difficult to separate since you were married and had children together. When it was suggested that they could have protected sex, the women actually laughed at the suggestion because they felt the men would refuse to use condoms with their wives. .... It would be difficult, particularly for a wife, to tell her partner if she had HIV because of the risks of violence and divorce. Often the information is only passed on when the person becomes sick and receives visits from hospital staff; in many cases it is the hospital staff who inform the partner".
>
> T.Zhuwau & C.Matowanyika, May 1994

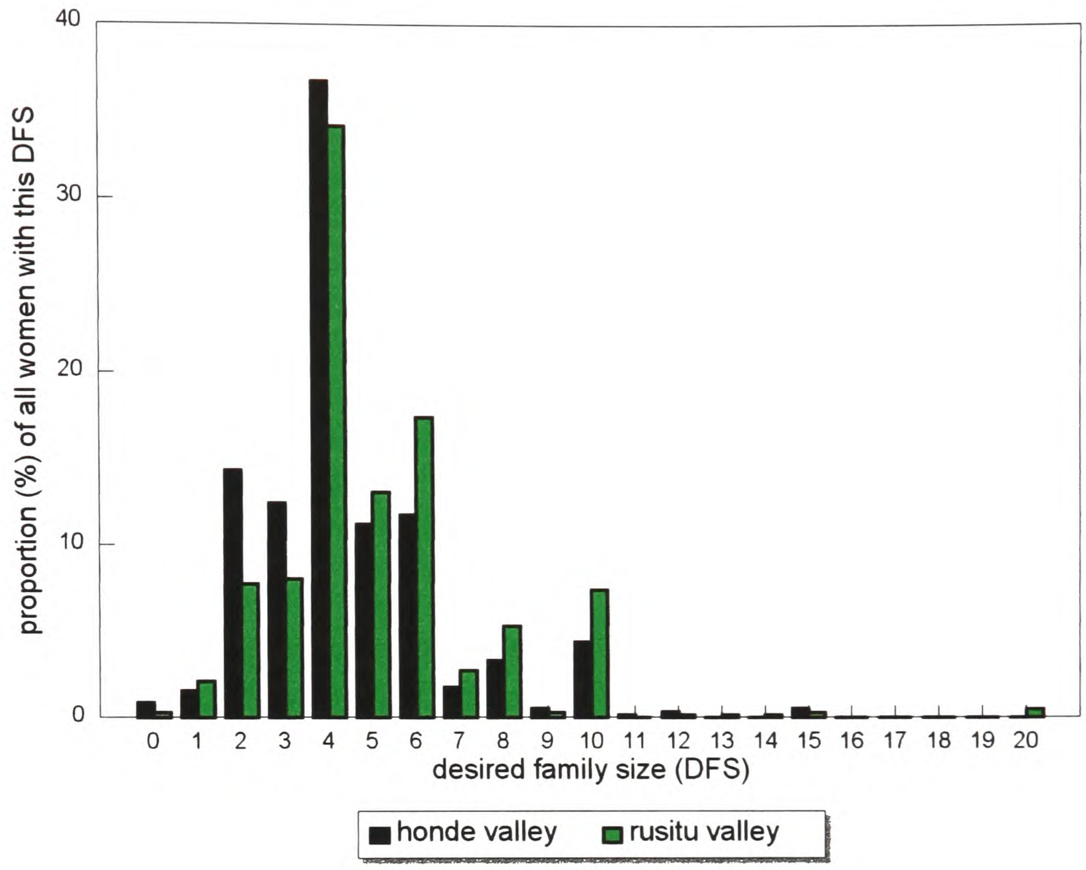
Some indirect clues on attitudes towards remarriage are available from the statistical data. Although the total number of women experiencing divorce or separation during the five years preceding the survey was small (62), the correlates of remarriage amongst these women are interesting (Table 6.8). The results of the regression analysis suggest that older women and more educated women are less likely to remarry. Increased knowledge about HIV-1 increases the chances of remarriage but the association is not strong enough to be significant. However, divorced women who reported a sense of risk of infection because friends and relatives were dying, were five times as likely to have remarried *($p < 0.05$)*.

6.5.3 Contraception and Abortion

Desired Family Size

The distributions for desired family size (DFS) reported by women in the two study locations are shown in Figure 6.9. The mean number of children wanted in a lifetime, reported by women in the Honde Valley was 4.43 (standard deviation: 2.18, n = 571). In the Rusitu Valley, the mean number was slightly higher - 5.15 (standard deviation: 3.02, n = 621). In both areas the modal value was 4. The second most popular number of children wanted was two in the Honde Valley and six in Rusitu. A total of 45 women - similar numbers in each location - gave a non-numeric response. In most cases the response given was "as many as

Figure 6.9 Desired family size (DFS) by study location, women aged 13-49 years



God grants" - a reaction which has often been noted in studies in Africa [294, p447]. This response reflects the traditional belief that a woman should have as many children as possible, which has been assimilated into the belief systems of a number of contemporary religions - Apostolics in particular. Exclusion of these women from the mean DFS calculations almost certainly results in a degree of understatement of the true levels in each population. Nevertheless it is interesting that the mean DFS is similar to the total fertility rate in each of the study locations - 4.43 vs 5.08 in Honde and 5.15 vs 5.27 in Rusitu.

The socio-demographic determinants of DFS in rural areas of Manicaland are examined in Table 6.11, by level of education. In each education category, older women are likely to report higher DFS. Apostolic women with no secondary education tend to report higher DFS than non-Apostolics. A similar but weaker association is present among more educated women. Women in Rusitu reported higher levels of DFS than their counterparts in the Honde Valley, irrespective of education level. Among women of all levels of education taken together, currently being in a stable union was associated with higher desired family size. Women with higher levels of education were likely to report wanting smaller numbers of children. Interestingly, increased knowledge about HIV-1 and AIDS was associated with reduced DFS among more educated women. In an earlier analysis of data from the 1988 Zimbabwe Demographic and Health Survey [Gregson, 1992, unpublished], similar associations were found. Women with secondary education who knew that HIV-1 was spread by sex and that there was no cure for AIDS, and who reported having taken some form of action to avoid AIDS were found to report lower DFS *($p < 0.01$)*. However, these effects may be due to the presence of a group of relatively more "progressive" women who make a point of finding out the facts about HIV-1 and AIDS and who also wish to have smaller numbers of children. Thus the results do not in themselves establish a causal relationship between increased knowledge about HIV-1 and lower DFS.

<u>Impact of HIV-1/AIDS on DFS and Family Building Strategies</u>

Similar difficulties in interpretation surround the survey results on reported attitudes towards fertility and the effects of HIV-1 and AIDS - Table 6.12. The results on general attitudes

Table 6.11 Socio-demographic correlates of desired family size among women aged 13-49 years

Independent variables	Women with primary education		Women with secondary education		All women	
	Co-eff	p > |t|	Co-eff	p > |t|	Co-eff	p > |t|
Study Variables						
Knowledge about HIV-1 (index)	**0.011**	0.929	**-0.486**	0.010	**-0.083**	0.411
Perceived risk of HIV-1 transmission	**-0.029**	0.619	**-0.029**	0.697	**-0.037**	0.427
Control Variables						
Age at last birthday	**0.020**	0.000	**0.022**	0.000	**0.019**	0.000
Education	**-**		**-**		**-0.152**	0.000
Religion	**0.123**	0.000	**0.085**	0.107	**0.107**	0.000
Study site	**0.104**	0.010	**0.114**	0.013	**0.105**	0.000
Marital status	**0.069**	0.078	**-0.021**	0.674	**0.036**	0.241
Number of observations		659		525		1,184
Chi2	186.73		66.87		422.84	
df	6		6		7	
P > Chi2		0.000		0.000		0.000
Constant	**0.983**	0.000	**1.028**	0.000	**1.141**	0.000
Log likelihood	-1398.87		-973.52		-2368.91	
Goodness of fit to Poisson distribution	514.38		301.53		808.94	
df	652		518		1,176	
P > Chi2		0.000		0.000		0.000

Notes:

i The results are derived from a Poisson regression analysis performed in STATA version 3.

ii Religion is represented by a dichotomy (Apostolic = 1, Other = 0); Education levels: None, Primary and Secondary and Higher; Study site: Honde = 0, Rusitu = 1; Marriage: Not in union = 0, In union = 1.

towards fertility reveal a strong preference for smaller numbers of children, particularly among the more educated. Furthermore, over 70 per cent of women placed stress on the importance of spacing births and 40 per cent complained that their last birth had come earlier than they would have liked. Perhaps not unexpectedly, relatively few women said they would have preferred not to have had their last birth at all. Partners were reported to be more likely to support the use of family planning methods for birth spacing than for fertility control.

Half of the women interviewed said they now wanted to have less children because of AIDS and almost as many said they would now prefer to have their next child later. Very few reported an increase in DFS, despite the pervading belief that infant survival chances had been reduced by AIDS. However, this pattern of response may simply reflect the underlying trend towards wanting less children and the feeling that "times are hard", which has been fuelled by the recent drought and the Economic Structural Adjustment programme (ESAP). The finding that most respondents felt that women should stop childbearing if they found they had HIV-1 infection is perhaps more significant. Similar sentiments were expressed in a focus group discussion on the subject in Chingwekwe Village in the Rusitu Valley. Women stated that: "It was pointless to bear children who you are aware would die because of infection. The agony was unbearable". This view is partly based on the belief that all children of infected mothers will inevitably develop AIDS and die. If this mis-apprehension was corrected, it could be argued that a woman with no children, who was faced with the decision in real life, would be likely to take the risk. A belief in the requirement to leave successors in order to gain admission into the spirit world after death remains deeply entrenched in the consciousness of rural *shona* women. Their natural instinct towards childbearing is therefore powerfully re-enforced.

If it is accepted that women will cease having children once they discover they are infected with HIV-1, the question then arises as to how they will find this out. Voluntary testing services are currently unavailable in rural areas of Zimbabwe and testing of suspected AIDS patients has only recently begun to be introduced at rural health clinics. Women are therefore only likely to have hard medical evidence of infection where they have begun to experience symptoms - ie: towards the end of the infection period, when they may not have long to live

Table 6.12 Reported attitudes towards fertility and the effects of HIV-1 and AIDS, by level of education (women aged 15-49 years)

Attitude	Primary or less			Secondary of higher			All women		
	Yes	No	No diff'ce	Yes	No	No diff'ce	Yes	No	No diff'ce
	%	%	%	%	%	%	%	%	%
Attitudes Towards Fertility									
DFS under 5 children?	**37**	57	6	**79**	21	0	**55**	41	4
Ideal birth interval over 24 months?	**67**	31	3	**77**	22	1	**71**	27	2
Last pregnancy came too soon?	**40**	60	-	**40**	60	-	**40**	60	-
Last pregnancy not wanted?	**9**	91	-	**5**	95	-	**8**	92	-
Delay next pregnancy if infant or child dies?	**66**	16	19	**73**	11	16	**69**	13	18
Partner approves of family planning:									
To stop births?	**35**	65	-	**30**	70	-	**33**	67	-
To space births?	**63**	37	-	**76**	24	-	**68**	32	-
Impact of HIV-1 and AIDS									
Reduced DFS?	**43**	4	53	**56**	1	43	**50**	3	48
Now wants next child later?	**43**	3	54	**51**	3	46	**46**	3	51
Reduced infant survival chances?	**42**	7	51	**55**	9	35	**48**	8	44
Chances of survival from birth to 16 years reduced in last 10 years?	**47**	17	36	**58**	22	19	**52**	19	29
Women with HIV-1 should stop childbearing?	**78**	2	20	**89**	1	11	**83**	1	16
Total number of respondents			630			484			1,114
Number of respondents having discussed family planning with their current regular partner			283			186			469

Note: "No difference" includes "Don't know" responses where applicable.

and the consequences for fertility are small. Equally, it is at this stage of infection that women are most likely to suspect for themselves that they have become infected. Even in these circumstances, some women may prefer to believe that their illness is not HIV-1 related. On the other hand, a woman who has had a number of partners or who fears that her husband may have contracted the infection, could suspect that she had been infected. She might decide that it is safest not to have any more births - particularly if she has some children already. Again the issues are complex and must be set within the context of predominant underlying cultural belief systems and social pressures.

A related point is the question of how a woman should respond when she experiences the death of an infant or child. There is of course a natural "replacement effect", in the sense that, in the absence of contraception, a woman may conceive more quickly if she experiences a shorter period of amenorrhoea because breastfeeding is curtailed by an infant death. Where effective family planning methods are used, the question arises as to whether a woman or couple might consciously seek to speed up the arrival of the subsequent birth. While this seems a plausible hypothesis in many cultures, it has often proved difficult to establish and rationales for an opposite effect have been posited for some societies [295-297]. Preston has pointed out that in no population have as many as 50 per cent of child deaths been found to be replaced by additional births. Two of the reasons he suggests for this may be of particular relevance here: (1) the absence of a target number of surviving children, and (2) that the child death can result in a downward modification of ideal family size [296].

In the current survey, over two-thirds of respondents stated that they would wish to *delay* their next pregnancy if an infant or child died - Table 6.12. This point was raised in the focus group discussions. The women confirmed that they believed this would be the best course of action. They said that they believed that an infant or child death could have resulted from the activities of an angered spirit. If they conceived a new child shortly after the death there was a risk that the spirit might interfere again. They felt it was advisable to wait for a longer period until the spirit had been appeased.

The results of a regression analysis of factors influencing reported preference for a delay in childbearing following an infant or child death are summarized in Table 6.13. Older women were less likely to report a preference for a delay. While older women might be thought to be more traditional, it may be that they are more conscious of the need to have further children before they reach menopause. Apostolic women were also less likely to report preference for a delay *($p < 0.081$)*. This could be because their religion emphasises the powers of its prophets and healers in identifying and exorcising spirits, so that they are rendered harmless [257, p92]. Women in Rusitu were more likely to say that they thought a delay was best, which is consistent with their more traditional beliefs. There was no evidence for an education effect, which is perhaps surprising, if it is felt that more educated women might be less concerned about spirits. However, increased knowledge about HIV-1 infection and perceived personal risk of infection were both associated with preference for a delay, although the latter effect was not statistically significant *($p = 0.121$)*.

Contraceptive Methods Currently and Ever Used

Table 6.14 sets out the proportions of women who reported that they were currently using or had ever used the principal modern and traditional methods of family planning. In each case, these are given by study location and are contrasted with the levels of use recorded nationally in the 1988 and 1994 Zimbabwe Demographic and Health Surveys [195, 198]. The figures are shown for all women aged 15-49 years, regardless of current marital status.

The overall patterns of use by method and age are similar. Older women in Rusitu were more likely to report use of a traditional method. Use of modern methods in the Honde Valley was less common among Apostolic women. The levels of use reported by non-Apostolics were very similar to the 1994 national figures. Younger cohorts of women - those currently under 35 years of age - were more likely to report use of modern methods, which is consistent with the earlier results on trends in fertility. The levels of use of modern methods of contraception recorded in each location and in the national surveys are high for sub-Saharan populations [298]. If the Apostolics are excluded and the high levels of abstinence are taken into account, it seems likely that more than half of currently sexually-active women are using some form of modern method. For younger women the fraction may be as high as three-quarters. Given

Table 6.13 Impact of increased knowledge and awareness of the risk of HIV-1 and AIDS on reported preference for a delay in the timing of the next birth following the death of an infant or child

Independent variables	OR	p > |t|
Knowledge and Perceived Risk		
Knowledge about HIV-1 (index)	**3.03**	0.022
Perceived risk of HIV-1 transmission	**1.31**	0.239
Knowledge and Sense of Being in Danger		
Knowledge about HIV-1 (index)	**2.81**	0.034
Feels in danger of HIV-1 infection	**1.28**	0.086
Number of observations		1,153

Notes:

i These results are derived from a Logistic regression analysis performed in STATA version 3. Age at last birthday, level of education, religion, study site and marital status were controlled for in the model.

ii Religion and study site are represented by dichotomies (Apostolic = 1, Other = 0; Honde = 0, Rusitu = 1).

iii Women are treated as having an enhanced awareness of the risk of HIV-1 infection if they felt in danger of infection because friends and relatives were dying of AIDS (IQ 717).

iv The sense of personal danger of HIV-1 infection variable is as described in Chapter 4 - ie: women who stated that they felt in danger of being infected themselves - for any reason (IQ 716).

Table 6.14 Current and ever use of modern and traditional methods of contraception among *all* women aged 15-49 years

Method	Current use				Ever use			
	Honde Valley	Rusitu Valley	ZDHS 1994	ZDHS 1988	Honde Valley	Rusitu Valley	ZDHS 1994	ZDHS 1988
	%	%	%	%	%	%	%	%
Modern Methods								
Pill	16.1	18.8	23.6	23.5	35.0	39.5	50.4	43.4
IUD	0.8	0.5	0.6	0.7	3.0	1.2	1.9	2.5
Injections	2.9	1.5	2.4	0.2	8.0	3.7	9.5	11.2
Vaginals/Implants	0.4	0.2	0.1	0.0	1.9	0.4	0.6	1.5
Condoms	3.7	4.2	2.4	0.9	17.9	23.3	20.7	12.8
Female sterilization	1.6	1.1	1.7	1.7	1.1	1.2	1.7	1.7
Male sterilization	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1
Any modern method	25.5	26.3	31.1	27.2	38.4	50.3	56.1	48.4
Non-Apostolics	33.6	29.0	-	-	52.3	50.7	-	-
Apostolics	11.8	22.1	-	-	18.9	49.5	-	-
15-19	4.3	3.4	-	7.1	9.1	12.7	-	11.5
20-24	28.8	42.7	-	32.7	42.6	68.5	-	53.3
25-29	42.0	53.9	-	41.5	57.1	84.6	-	68.9
30-34	44.3	34.7	-	41.6	72.3	65.4	-	71.5
35-39	34.9	29.1	-	31.2	60.0	62.1	-	63.6
40-44	28.3	13.6	-	25.5	50.0	44.3	-	52.8
45+	12.5	12.9	-	14.5	46.9	32.3	-	40.3
Traditional Methods								
Safe period	0.6	0.4	0.2	0.5	3.7	3.9	4.2	6.2
Withdrawal	3.7	6.2	2.6	3.2	30.0	40.9	20.2	29.4
Other	0.8	0.7	1.2	1.3	2.8	2.5	5.7	7.3
Any traditional method	5.1	7.3	4.0	5.0	33.0	42.5	25.3	35.6
Non-Apostolics	2.3	7.6	-	-	29.2	40.7	-	-
Apostolics	17.1	7.2	-	-	41.5	45.4	-	-
15-19	1.4	0.7	-	1.3	4.9	6.0	-	6.9
20-24	6.3	2.9	-	3.3	27.8	39.6	-	29.3
25-29	7.4	3.9	-	5.6	41.8	39.7	-	44.5
30-34	4.9	17.3	-	6.8	58.5	71.8	-	49.6
35-39	7.0	12.7	-	9.9	53.3	67.2	-	56.7
40-44	10.9	15.3	-	9.1	43.5	67.2	-	53.5
45+	0.0	12.9	-	5.2	56.3	67.7	-	53.1
Total number of women	514	548	6,128	4,201	537	567	6,128	4,201

Note: Women recorded as currently being pregnant are excluded from the survey results for current usage of family planning. The ZDHS figures for current and ever use are national figures for all women aged 15-49 years. The ZDHS results for women in Manicaland showed lower current use of modern methods than the national average among currently *married* women: 1994: 27.6% vs 42.2%; 1988: 25.6% vs 36.1%. Current use was also lower in rural areas (1994: 37.3%; 1988: 30.8%).

that this is the picture in rural areas, Zimbabwe can no longer be regarded as a country with low levels of contraceptive use.

Looking at the results for individual methods of contraception, it is interesting to note that the greatest increases nationally have been in condom use. One-in-five women interviewed said they had used this method at some point in their lives. Ever use of the contraceptive pill also increased between 1988 and 1994, but there was little change in current use. In terms of current use, injections and condoms appear to have increased most in popularity. In the present study, injections were seen as being a more convenient method, although some women expressed concerns about side effects - principally, they feared the injections might result in permanent infertility. In absolute terms, the increase in current use of condoms for family planning was small. Indeed the proportions of women reporting *current* condom use are consistently low in relation to the proportions reporting *ever* use - eg: less than one-fifth of women who reported ever use in the Rusitu Valley said they were currently using the method. This contrasts with the situation with the pill, where more than half of the women who reported ever use were also current users.

<u>Condom Use to Reduce Risks of HIV-1 Infection</u>

In the present survey, 34 women reported using a method of contraception for a reason other than family planning (IQ422). All but two of these women said they were using the condom. With one exception, these women stated that they were using condoms as protection against HIV-1 (19) or other STDs (12). The remaining woman reported condom use to avoid contamination of breastmilk. The two women who did not mention condoms said they were using herbs to protect themselves against HIV-1/STD infections. As is noted in Appendix C, higher rates of condom use were reported when respondents were asked about actions taken to avoid HIV-1 infection. The most plausible explanation for this would seem to be an interview effect in the HIV-1/AIDS section of the questionnaire, whereby respondents were anxious to impress the enumerators by stating that they were using condoms.

The determinants of choice of condom use among current users of family planning are examined in Table 6.15. Older women and married women were less likely to report condom use. Women with partners who were often absent from the home area were more likely to use condoms. The effect of education appears to vary by level. Women with primary education were least likely to report current condom use. The number of women with no education currently using any method is small (15). There is a suggestion that condom use is more likely to be reported by women with greater knowledge about HIV-1 infection. Women who reported using condoms to control STDs tended to be younger, non-Apostolic and non-married. Enhanced knowledge and sense of risk of HIV-1 were both (weakly) associated with condom use for this purpose. The statistical evidence for most of these associations is weak, possibly because of the relatively small numbers of women involved.

Of the women currently using condoms for family planning purposes, only one mentioned protection against HIV-1 infection as the principal reason for this choice of method. For others this may of course have been a secondary consideration. In the questionnaire section on HIV-1 and AIDS, 43/732 currently married women reported changing their method of contraception since hearing about AIDS - Table 6.16. All but two of these said they were now using condoms. The two exceptions had previously been using condoms but had switched to the pill. A third of the women now using condoms said they were also taking the pill. The others were just using condoms. The numbers here are small, but suggest that changes in contraceptive strategies may result from the HIV-1 epidemic. There is some evidence both for switching between the pill and condoms, and for the use of combinations of methods.

<u>Induced Abortion</u>

Induced abortions are understood to occur in Zimbabwe [213], but numbers are impossible to quantify as the practise is illegal in most circumstances. No attempt was made to estimate the numbers of induced abortions occurring within the study populations. Instead the question on miscarriages and stillbirths (IQ331) was framed so that it referred to all kinds of abortion. The results of this question will be examined in section 6.5.5.

Table 6.15 Impact of increased knowledge and awareness of the risk of HIV-1 and AIDS on choice of condom use (i) among current users of family planning and (ii) as a current measure for health reasons (primarily HIV and STD control)

Independent variables	Family planning		STD control	
	OR	p > |t|	OR	p > |t|
Study Variables				
Knowledge about HIV-1 (index)	**4.31**	0.425	**3.20**	0.399
Perceived risk of HIV-1 transmission	**1.02**	0.976	**1.59**	0.398
Control Variables				
Age at last birthday	**0.95**	0.241	**0.96**	0.150
Education - primary	**0.15**	0.021	**0.68**	0.594
Education - secondary	**0.30**	0.163	**0.66**	0.605
Religion	**0.95**	0.935	**0.24**	0.013
Marital status	**0.07**	0.000	**0.12**	0.000
Partner's education	**0.58**	0.177	**1.02**	0.142
Partner's migration	**3.96**	0.025	**1.68**	0.296
Number of observations		224		419
Chi2	44.77		45.45	
df	9		9	
P > Chi2		0.000		0.000

Notes:

i The results are derived from Logistic regression analyses performed in STATA version 3.

ii Women are treated as having an enhanced awareness of the risk of HIV-1 infection if they stated that they felt in danger of infection because friends and relatives were dying of AIDS (IQ 717).

iii Only women who are currently sexually active have been included. In the former model, only current users of family planning methods - modern or traditional - were included.

Table 6.16 Women reporting change of contraceptive method since hearing about AIDS: methods reported as being used before and after hearing about AIDS

Previous method(s)	TOTAL WOMEN	New method(s): PILL	CONDOM	OTHER	NONE
PILL	24	11	24	0	0
CONDOM	2	2	0	0	0
OTHER	11	2	11	0	0
NONE	6	0	3	0	0
TOTAL WOMEN	43	15	38	0	0

Note:

i A total of 752 women who currently had a sexual partner and had heard of AIDS were asked wheth they had started using a new method of contraception since hearing about HIV/AIDS (IQ 724).

ii One of the two women who reported switching from condom use to use of the contraceptive pill did so following marriage. The second reported using the pill for the last five years throughout which she was unmarried; her marital circumstances at the time of changing method are not known.

6.5.4 Breastfeeding and Post-Partum Abstinence

Breastfeeding and Amenorrhoea

Median periods of breastfeeding, amenorrhoea and post-partum abstinence reported by women in the study are shown in Table 6.17. Median periods are given because the means are distorted by small numbers of women who reported extremely long periods and to facilitate comparisons with results from other studies - DHS reports normally quote median periods. However, comparisons based on medians can obscure important differences in the distributions of periods of breastfeeding etc. A case in point is the comparison between breastfeeding periods in the Honde and Rusitu valleys. There is very little difference in the medians but closer inspection of the distributions (Figure 6.10) reveals that breastfeeding periods may be eroding more quickly in the Honde Valley than is the case in Rusitu. Caution must therefore be taken in interpretation.

Subject to this caveat, it appears that younger women and particularly women with higher levels of education are tending to breastfeed for shorter periods than their elders. A similar pattern by education was recorded in the 1994 ZDHS [157]. The median numbers of months breastfeeding recorded in each of the survey areas were marginally lower than that found for women in *rural* populations (19.2 months) in the national survey. The reported periods of amenorrhoea are broadly consistent with those for breastfeeding, although the median period for 15-29 year-olds appears rather short. The smaller differential among older women presumably reflects their lower underlying fecundability [299]. Interestingly, given the contrasting patterns of breastfeeding, the distributions of numbers of months amenorrhoea by study area are very similar - Figure 6.10. One factor in this could be the early point at which supplementary foods are introduced in both locations - after 2.5 months in Honde and 3 months in Rusitu.

Details of knowledge and attitudes towards breastfeeding obtained in the survey are summarized in Table 6.18. The predominant reason given for breastfeeding was that it was good for the infant's health. Less than 2 per cent of women said breastfeeding was important

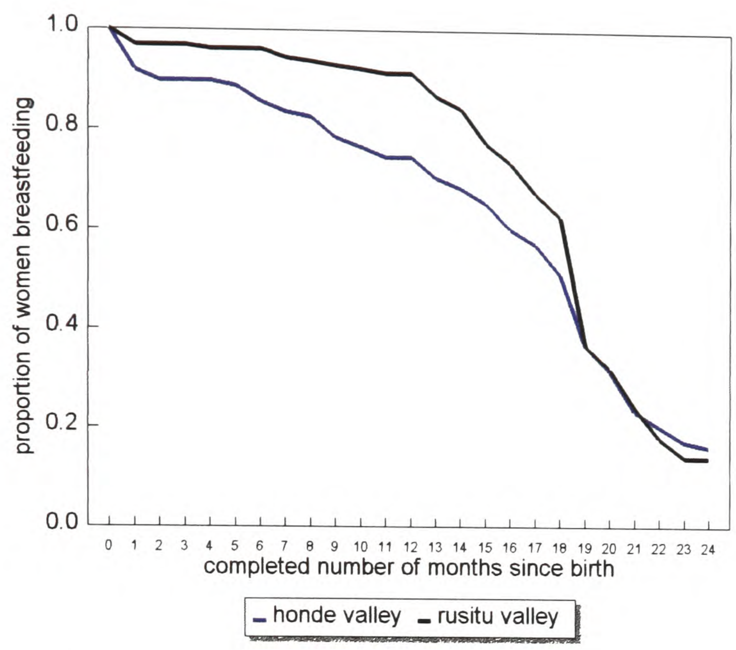
Table 6.17 Median periods (in months) of breastfeeding, amenorrhoea and abstinence by study site, age, religion and education, for penultimate births occurring less than five years before the survey

Independent variable	Breastfeeding		Amenorrhoea		Abstinence	
	Manicaland	Zimbabwe	Manicaland	Zimbabwe	Manicaland	Zimbabwe
Study Site:						
Honde Valley	18.6	-	10.3	-	5.2	-
Rusitu Valley	19.0	-	9.9	-	6.4	-
Zimbabwe	-	18.5	-	12.9	-	3.5
Age:						
15-29	17.9	-	7.7	12.3	4.9	3.2
30-49	19.4	-	12.9	13.5	6.7	4.2
Religion:						
Non-Apostolic	18.8	-	9.8	-	5.5	-
Apostolic	18.9	-	10.5	-	5.8	-
Education:						
None	19.3	20.1	12.9	16.2	6.8	7.4
Primary	18.9	19.0	10.4	12.7	6.0	3.6
Secondary	17.3	17.8	7.7	11.7	5.1	3.0

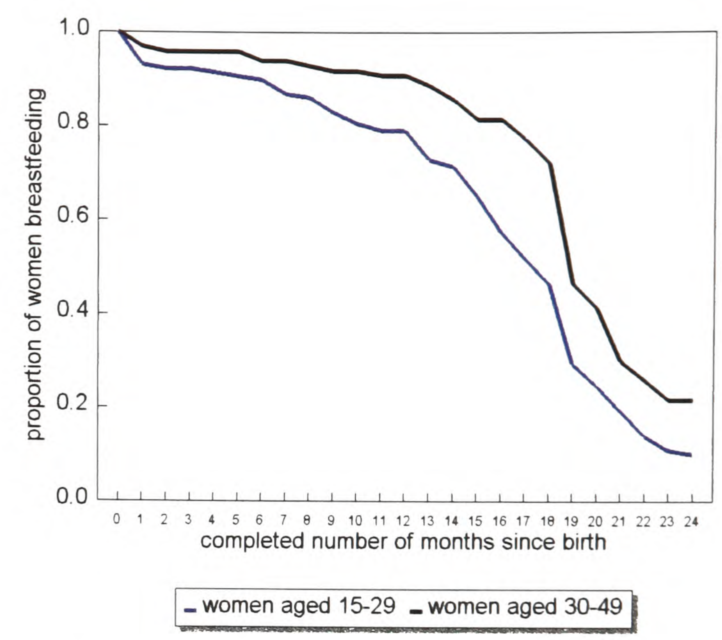
Note: A total of 226 women experienced two or more births within the five year period preceding the study. The results for Zimbabwe are taken from the 1994 Zimbabwe Demographic and Health Survey [157].

Figure 6.10 Numbers of months of breastfeeding, amenorrhoea and sexual abstinence among women in the Honde and Rusitu valleys, following the birth of the penultimate child

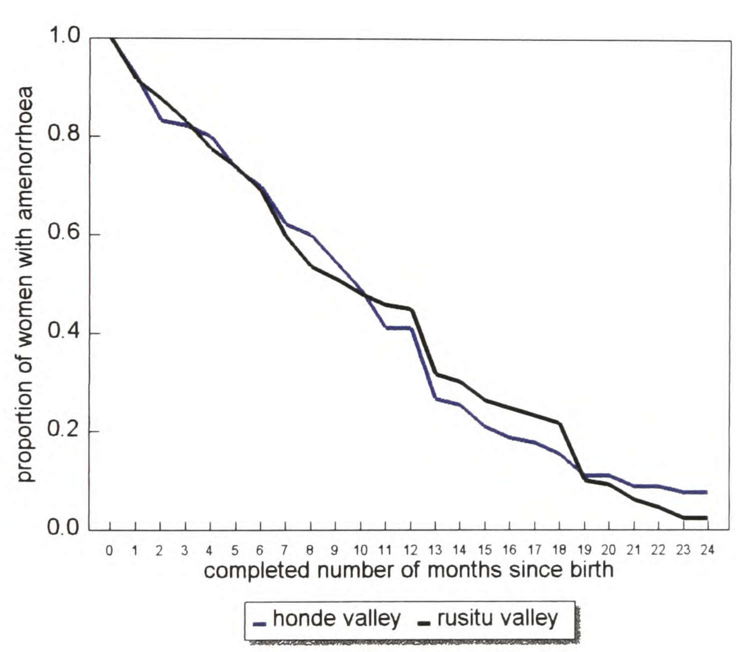
*Months of **breastfeeding** after birth: location*



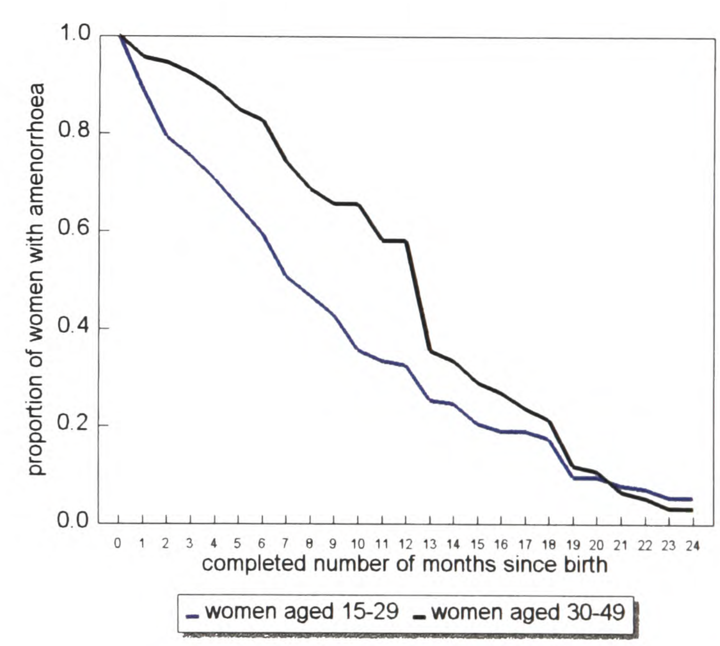
*Months of **breastfeeding** after birth: age*



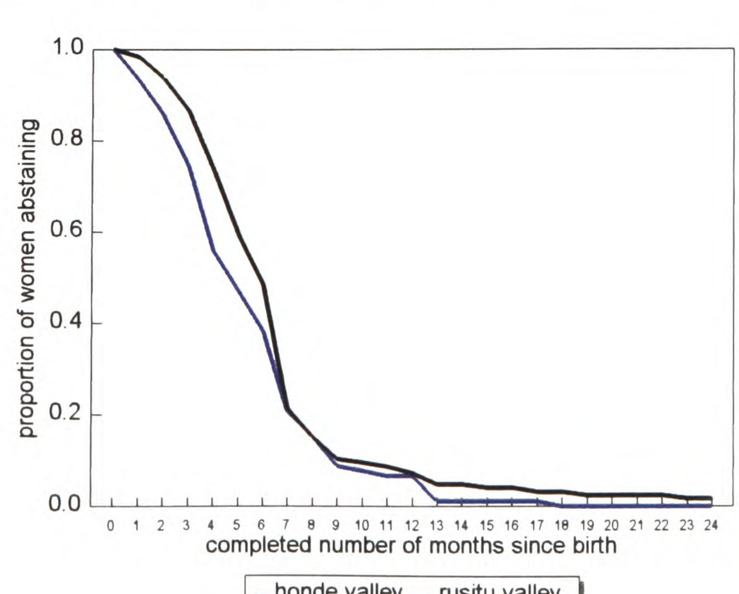
*Months of **amenorrhoea** after birth: location*



*Months of **amenorrhoea** after birth: age*



*Months of **sexual abstinence** after birth: location*



*Months of **sexual abstinence** after birth: age*

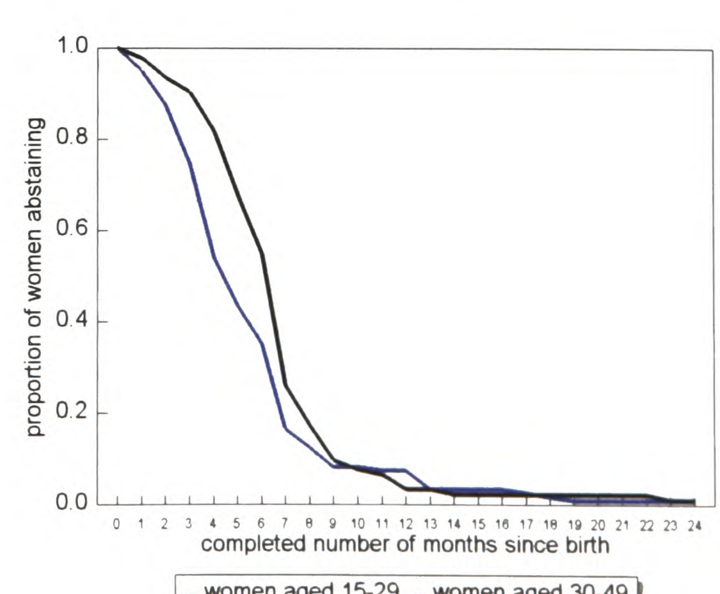


Table 6.18 Knowledge and attitudes about breastfeeding: reasons for the practise and perceived risks (women aged 15-49 years)

Question/response	**Women giving response** %	number
Reasons for Breastfeeding		
Birth spacing	1.5	18
Infant's health	79.6	950
Other	11.1	132
None	7.9	94
Contraceptive Effect Compared to Modern Methods		
More or equally effective	55.6	10
Less effective	27.8	5
Not known	16.7	3
Possible Problems with Breastfeeding		
Vertical transmission of HIV infection	5.7	64
Milk may be contaminated (sex/pregnancy)	6.2	69
Other	19.3	215
None or "don't know"	68.8	766

for birth spacing purposes. The majority of these thought breastfeeding was more effective than modern methods of contraception. Other studies in sub-Saharan Africa have established that few women recognize the contraceptive effect of breastfeeding [294, p454]. Respondents were asked about any possible risks associated with breastfeeding. Sixty-four (5.7 per cent) mentioned vertical transmission of HIV-1 infection to the infant. A more common concern - some of these responses were misclassified by enumerators as "other" - was the danger that the milk might have become contaminated due to sex and/or the possible onset of a new pregnancy. Similar beliefs have been reported in both European and other sub-Saharan populations [294, 300].

Although the numbers of women reporting concern about possible transmission of HIV-1 infection were quite small, it was thought that it would be interesting to see whether this concern had any effect on the average length of breastfeeding. Separate tests were conducted for most recent births and penultimate births occurring within five years of the interview date. In the former case, births were only included if the woman had ceased to breastfeed the child before the survey visit. This may mean that women who breastfeed their children for longer periods will be under-represented in the data. In the case of preceding births, women with low levels of recent fertility will tend to be under-represented and shorter birth intervals will be over-represented. Subject to these caveats, it was found that women who reported a risk of HIV-1 transmission were more likely to breastfeed for shorter periods (Table 6.19). When a control was introduced into the models for years of education, an effect of HIV-1 risk remained. In each case the effects were stronger statistically for previous births than for most recent births.

Post-Partum Abstinence

Median periods of post-partum abstinence by study site, age-group, religion and level of education were given in Table 6.17 - see also Table 3.10. The proportions of women still abstaining by number of months after giving birth (preceding birth) are shown in Figure 6.10. Abstinence periods are typically much shorter than periods of breastfeeding and were found to be shorter among women in the Honde Valley, younger women, non-Apostolics and more

Table 6.19 Impact of awareness of the risk of transmission of HIV-1 infection on length of breastfeeding period: most recent and preceding birth in the five years before the survey

Independent variables	**Last birth**		**Previous birth**	
	Co-eff	P > F	**Co-eff**	P > F
Knowledge of Breastfeeding Risk (alone)				
Risk of HIV-1 transmission	**-3.032**	0.053	**-5.136**	0.019
Constant	**17.137**	0.000	**16.691**	0.000
Knowledge of Risk and Years of Education				
Risk of HIV-1 transmission	**-2.872**	0.072	**-4.730**	0.030
Years of education	**-0.062**	0.578	**-0.334**	0.016
Constant	**17.534**	0.000	**18.737**	0.000
Number of observations	332		226	

Notes:

i The results are derived from a Logistic regression analysis performed in STATA version 3.

ii A total of 71 women mentioned HIV-1 infection as a possible risk of breastfeeding without prompting - 64 over the age of 15 (IQ 540). 29 of the 71 women had had a birth in the past five years. Awareness of the potential risk of HIV-1 infection was closely associated with increasing level of education (*$p < 0.0001$*).

iii Most recent births are only included in the table where the woman had ceased breastfeeding prior to the survey date.

iv No evidence was found for heterogeneity in the effect of risk by level of education (none, primary, secondary and higher) ($F(2,221,2) = 0.4010$; $p > 0.05$).

educated women. As elsewhere in Africa, abstinence is often effected by the return of the woman to her paternal home for the birth and a period thereafter. This is particularly the case for first births.

Reasons given for abstinence are summarized in Table 6.20. The principal reasons given were maternal and child health. However, one woman in five said it was because she was currently separated from her partner. Women who had experienced a birth in the previous five years were asked how long they had abstained for after the most recent birth and then what they considered to be the ideal abstinence period. Just over one-quarter of these women reported recommencing sexual activity before the ideal time interval had passed. Forty-nine of these women (9.2 per cent) said, without prompting, that they had done this to avoid their husbands having other partners. Given the high level of tolerance of male extra-marital partners in the pre-AIDS era, it might be considered reasonable to suppose that fear of HIV-1 infection was a common concern here. On the other hand, in an environment where polygyny is practised, some women may have feared that their husbands could take on additional wives. A series of tests was therefore carried out to see whether women who reported a sense of risk of HIV-1 infection because friends and relatives were dying were more likely to resume sexual relations earlier than ideally they would have liked. Separate tests were conducted for all most recent births and for births where sex had been resumed. The possible effect of perceived risk of infection was tested for all instances where sex had been resumed early and for those where this was said to have been done because of the risk of the husband having other partners. The results of these tests are given in Table 6.21. In each case, women who felt at risk of HIV-1 infection were more likely to resume sex early. The effect was consistently strongest among women with primary education. However, heterogeneity in the effect of perceived risk was only significant in the case of births where sex had been resumed before the interview date, where the reason given for resuming early was "to avoid partner having other relationships".

Further tests were carried out to see whether women who knew more about HIV-1 infection or felt at risk tended to abstain for shorter periods after their most recent and penultimate births. After controlling for other socio-demographic variables, including education, and

Table 6.20 Reasons given for post-partum sexual abstinence by women reporting having had a child in the five years before the survey (women aged 15-49 years)

Question/response	**Women giving response** %	number
Reasons for Abstaining		
Mother's health	26.4	146
Infant's health	32.6	180
Tradition	8.5	47
Partner absent	19.7	109
Other	12.3	68
	99.6	550
Did not abstain	0.4	2
	100.0	552
Reasons for Resuming Sex Before End of Optimal Period		
To avoid husband having other partners	9.2	49
Other	12.6	67
Not recorded	3.4	18
	25.1	134
Did not resume early	74.9	399
	100.0	533

Note: Data on ideal number of months abstinence was not obtained for 19 women.

Table 6.21 Impact of perceived risk of HIV-1 infection on likelihood of resuming sexual activity early following a birth: most recent births in the five years before the survey

Independent variables	n	**OR**	p > |t|
Resuming Sex Early for Any Reason			
All births	552	**2.01**	0.043
Births where sex has been resumed	428	**2.93**	0.007
Resuming Sex Early to Avoid Partner Having Other Relationships			
All births	485	**2.51**	0.038
Births where sex has been resumed:			
Sense of risk of HIV-1 infection	393	**2.90**	0.021
Sense of risk of HIV-1 infection - no education	393	**1.00**	-
Sense of risk of HIV-1 infection - primary education	393	**13.82**	0.031
Sense of risk of HIV-1 infection - secondary education	393	**1.85**	0.260

Notes:

i The results are from a series of Logistic regressions carried out on STATA version 3. Age at last birthday, study site and number of years of education were controlled for in each case. Marital status was controlled for in the models for early resumption of sex for any reason. Women not currently in a stable union were excluded from the models for early resumption to avoid partners having other relationships.

ii The variables for early resumption of sexual activity were constructed from responses to questions on (1) the ideal period of post-partum abstinence - IQ 519 - and (2) the period of abstinence following the most recent birth - IQ 514 and IQ 516. The sense of risk variable was based on responses to IQ 717 - feels in danger of personal infection because friends and relatives are dying.

iii Tests were conducted for heterogeneity in the effect of "risk" by level of education. Women with primary education were more likely to resume sex early in each case, but the effect was non-significant except in the instance shown in the table. In this case the effect was significant at the 95% level (Chi2(2)=6.80).

reported reason for abstaining, increased knowledge about HIV-1 was found to be associated with a shorter period of abstinence following the most recent birth - Table 6.22. A similar effect was also seen for previous births but this was not statistically significant. Perceived risk of HIV-1 infection did not result in a significant effect.

Finally, it may be worth highlighting the reality of the women's concerns regarding their husband's infidelity. In the pocket-chart voting exercise with men at Ngorima, abstinence on the part of their wives following childbearing was one of the two reasons given for their need to have casual affairs. In many cases, these affairs were with commercial sex workers contacted while drinking at beer halls.

Increased Infant and Early Childhood Mortality

The survey results on infant mortality presented in Chapter 5 pointed towards increases in infant and early childhood deaths as a consequence of the HIV-1 epidemic. Where periods of breastfeeding and abstinence are interrupted by the death of the child, a new conception is liable to result more quickly, unless contraception is substituted for these practises. However, in rural areas of Zimbabwe the contraceptive effect of breastfeeding is not widely recognized and other methods of family planning are frequently applied during periods of breastfeeding. Post-partum abstinence periods are generally rather short and early resumption of sexual relations is likely to be accompanied by renewed use of contraceptives. The potential for a *natural* "replacement effect" would therefore seem to be limited (6.4.3).

6.5.5 Pathological Sterility and Natural Fecundity

Sexually Transmitted Diseases and Infertility

Sexually transmitted diseases (STDs) such as *Neisseria Gonorrhoeae* and *Chlamydia Trachomatis*, which are currently common in sub-Saharan countries, including Zimbabwe, can result in pelvic inflammatory disease (PID) and lead to primary or secondary infertility [301-303]. In 1990 more than one million STD infections are reported as having been treated

Table 6.22 Impact of increased knowledge about HIV-1 and AIDS on length of post-partum abstinence: most recent and preceding birth in the five years before the survey

Independent variables	**Last birth**		**Previous birth**	
	Co-eff	P > F	**Co-eff**	P > F
Reason for abstaining - mother's health	**-1.940**	0.000	**-1.432**	0.037
Knowledge about HIV-1 (index)	**-5.052**	0.000	**-2.885**	*0.181*
Constant	**5.296**	0.002	**5.676**	0.027
Number of observations	433		216	

Notes:

i These results are derived from Logistic regression analyses performed in STATA version 3. Age at last birthday, study site, marital status and number of years education were included in each of the models.

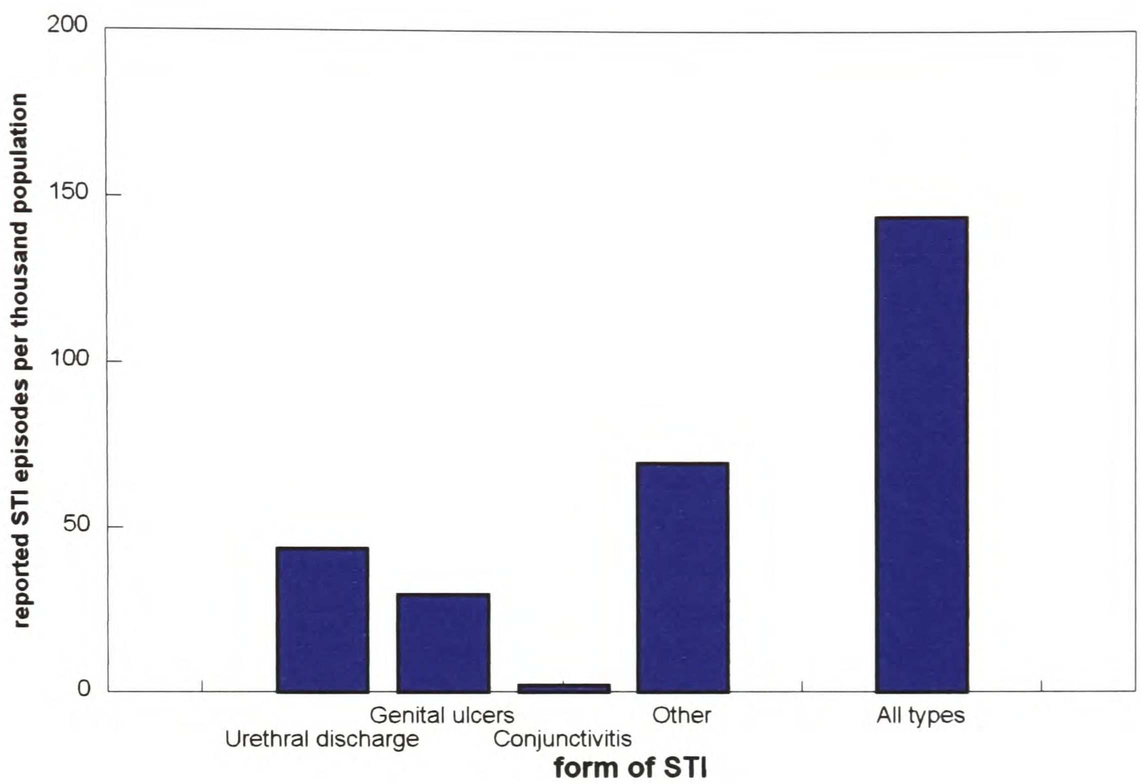
ii Most recent births are only included in the analysis where the woman had ceased abstaining prior to the survey date.

iii Sense of personal risk of HIV-1 infection was tested in the models but was not found to have a significant effect.

at public health facilities. High incidence rates have been reported in rural as well as urban areas - eg: 14 cases per hundred people annually in Karoi District [304]. Many additional cases go unrecognized and untreated due to the absence of visible symptoms, although it should also be noted that many of the reported cases are repeat cases. In Manicaland, the reported case rate among men and women aged 15-59 years is almost 15 per hundred per annum - Figure 6.11. Urethral discharge and genital ulcers were both common. In the study areas, 11.2 per cent of women reported that they or their partners had ever attended an STD clinic - Figure 6.12. In the Honde Valley, the figure was 9.6 per cent, whilst the proportion in Rusitu was 12.5 per cent (women aged 15-49 years). One reason for the difference is likely to be the greater presence of Marange Apostolics in the Honde Valley, who may be less likely to attend an STD clinic if they found they were infected. There is also the possibility that they may experience lower infection rates due their more closed sexual networks. A degree of under-reporting of STD clinic attendance may be present.

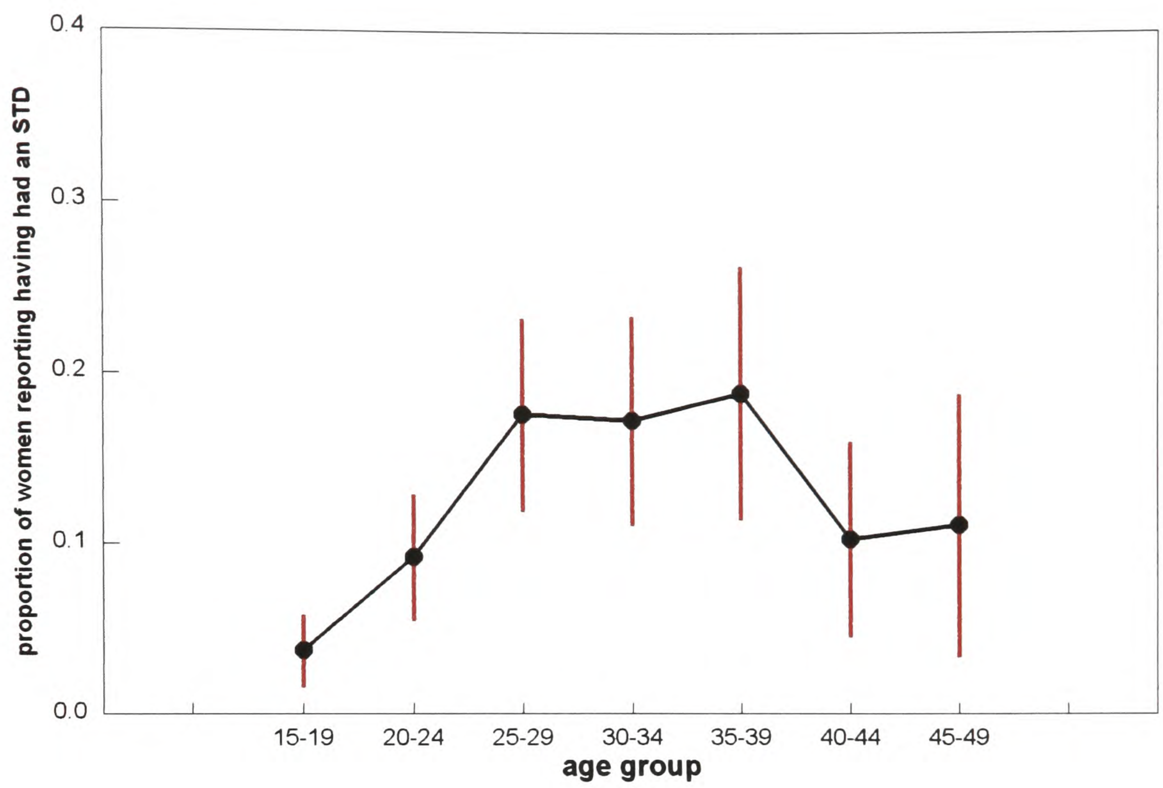
Of the 421 women in the survey who were aged 30 years or over, only five reported not having had any children (1.2 per cent). This finding is consistent with results from other studies in sub-Saharan Africa, including Zimbabwe, which have shown low levels of primary sterility, even in the presence of STDs [198, p33, 302, pp466-467]. A full analysis of the prevalence of secondary sterility has not been attempted in the current study. Nationally, it has been estimated that age-specific sterility rates may be substantial [302]. Not all of this sterility is due to STDs of course; at older ages natural infecundability becomes an increasingly important factor - Figure 6.13 [305]. Nonetheless, earlier and more effective treatment of STDs, on a widespread basis, introduced as part of the drive to counter the spread of HIV-1 clearly has the potential to increase fecundity levels significantly (Figure 6.13) and thereby to accelerate population growth [250]. However, given the extensive practise of contraception in the study populations and Zimbabwe in general, which has already been noted, the effects of such a measure are unlikely to be great. To date there have been no concerted attempts to identify and treat sexually transmitted infections (STIs) as a preventative HIV-1 intervention within the study areas. However, the national HIV-1 control programme may have had some limited impact on the incidence of new STIs through its emphasis on reductions in numbers of sexual partners and the use of condoms in casual

Figure 6.11 Sexually transmitted infection cases reported by health facilities in Manicaland, January to September 1994: annualized rates per thousand of population (male and female) aged 15-59 years



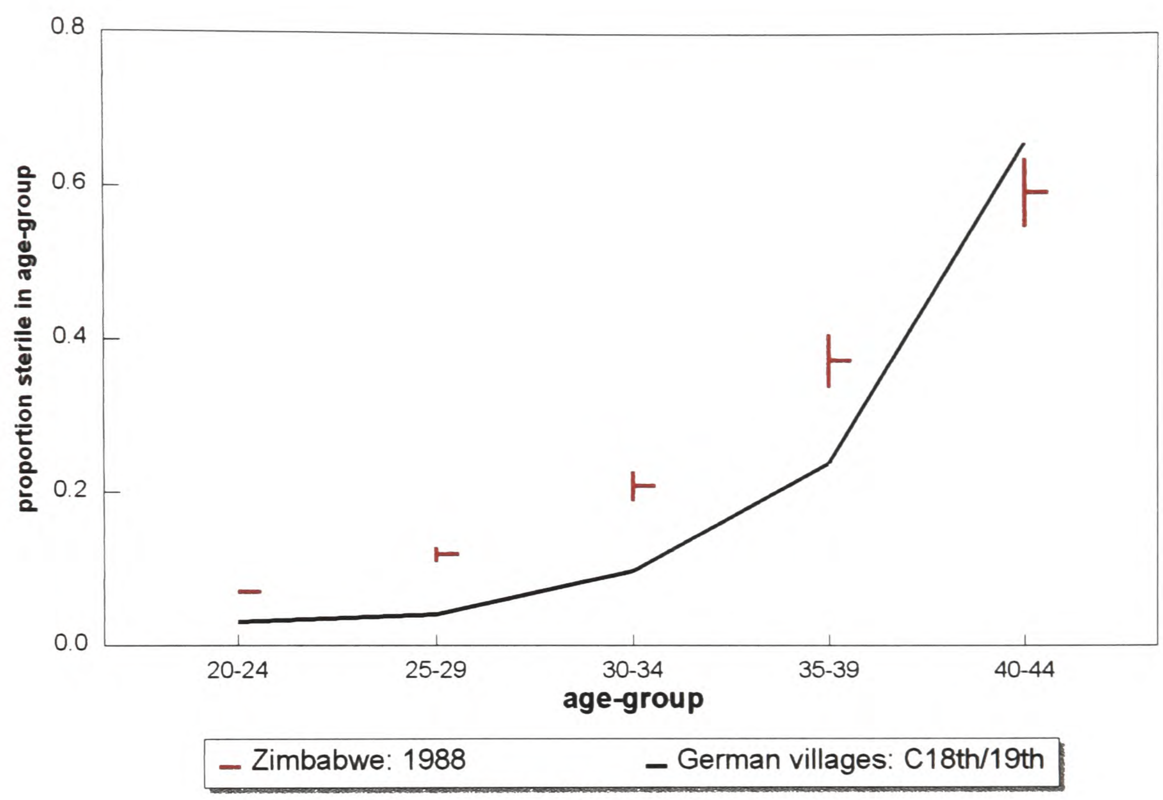
Source: T5 forms (Department of Epidemiology and Disease Control, Zimbabwe Ministry of Health and Child Welfare - as cited in National AIDS Co-ordination Programme quarterly HIV/AIDS surveillance reports, 1994 [227]).

Figures 6.12 Proportions of women (or partners) having made at least one lifetime visit to sexually transmitted disease (STD) clinics by five year age-group



Note: 95 per cent confidence intervals are shown for each age-group.

Figures 6.13 Estimated age-specific sterility rates for women in Zimbabwe, based on data from the 1988 Zimbabwe Demographic and Health Survey



Note: The upper points on the lines drawn for each age-group represent levels of sterility estimated on the assumption that current users of contraception are equally likely to be sterile as non-users. The lower points show the sterility estimates if all current contraceptive users are treated as being fertile. The lines joining these points therefore represent a plausible range for the level of age-specific sterility. The continuous line drawn from left to right across the graph represents age-specific sterility rates in populations with low levels of STD induced infertility - German village populations in the 18th and 19th centuries.

Sources: Adapted from Larsen, 1995 [302] and Knodel and Wilson, 1981 [305].

relationships.

Natural Fecundity: Foetal Wastage and Coital Frequency

HIV-1 infection has been found to be associated with adverse pregnancy outcome in a number of studies [306-308]. In the current survey, 12 per cent of women aged 15-49 years reported ever having had an abortion or stillbirth. Women who reported ever having attended for treatment at an STD clinic were more likely to say they had experienced a pregnancy loss of this kind, after controlling for age, but the strength of the association was weak (OR: 1.97; 95 per cent confidence interval: 0.91-4.26; $p = 0.083$; n = 743). However, when a composite risk of STD infection variable was computed, based on reported visits to STD clinics (score 0.5) and perceived danger of HIV-1 infection due to multiple partners (score 0.5), a significant association was found (OR: 2.68; 95 per cent confidence interval: 1.14-6.29; $p = 0.024$; n = 743).

Rates of female coital frequency estimated from the survey data were shown in Table 3.8. The socio-demographic determinants of coital frequency were investigated in Table 3.12, for women who were sexually-active at the time of the survey. HIV-1 related variables (**INDEXK**, **INDEXE**, **DANGER** and **RISK**) were tested in the model but there was no evidence that these were associated with coital frequency. The principal hypothesis here was based on the assumption that HIV-1 related morbidity was high, which in absolute terms is not currently the case in the study areas. Any early effect may be obscured by an inverse relationship, whereby women with higher rates of coital frequency are more likely to report experience or perceived risk of HIV/AIDS. As the epidemic progresses, the former effect might be expected to become the stronger of the two.

Other factors which may reduce natural fecundity include reduced levels of nutrition and health. Decreased spermatozoa among infected partners may also reduce fecundity [309]. Finally, it is understood that some employers are now considering providing more family accommodation for labour migrants [222, p301]. If this done on a large scale, coital frequency levels among women in stable unions could increase.

6.6 Summary and Conclusions

6.6.1 Summary of Results

Recent Trends in Fertility

Fertility has been declining in both study areas since the late 1970s with a possible brief hiatus in the immediate post-Independence period. The early decline appears to have been more rapid in the Honde Valley, but has been slowed in recent years, due to the presence of a significant Marange Apostolic minority. As was the case nationally, until very recently, the declines in fertility have been distributed evenly across the childbearing age range - 15-49 years. In consequence the shape of the age-specific fertility distribution remains essentially convex. This suggests that the declines in birth rates have been concentrated within younger cohorts.

Increasing levels of female secondary education appear to have been the principal driving force for the decline in fertility, together with greater availability of modern contraceptive methods. The National Family Planning Programme has been successful in reaching rural populations through its use of modern media, community based distributors and dispensaries at rural health clinics. Relatively low priority has been given in the Programme to long-term methods of family planning including sterilization, although these have been given greater emphasis in more recent campaigns. Economic development and the spread of western ideas, both religious and secular, may also have been important underlying influences. The Marange Apostolic religion appears to have acted as a barrier to fertility decline among a section of the population in the Honde Valley.

The great majority of women in both areas marry in their late teens or early 20s. In recent times, age at first marriage - or first stable union - has been on the increase. Formal marriage arrangements appear to be less strictly observed among the *Ndau* dominated Rusitu Valley population. Coital frequency levels among women in stable unions are modest - in part because of the extensive circulatory labour migration involving women and especially their male partners.

The modal value for desired family size was four in each area. However, there was a tendency towards wanting larger family sizes among Rusitu Valley respondents. Many couples still place great emphasis on birth spacing to maximize the number of surviving children and sustain maternal health. The concept of an ideal target number of births or surviving children remained alien to a number of the women. Contraceptive prevalence is high - even in the remote rural area surrounding Rusitu. This is particularly the case if the Marange Apostolics are excluded and note is taken of the high proportions of women abstaining from sex at any given time. Abstinence may be due to non-marriage, advanced stages of pregnancy, a recent birth or temporary spousal separation, usually for reasons associated with labour migration.

Post-partum abstinence periods appear to be becoming shorter. This is also the case with breastfeeding, although the practise continues to be almost universal and the median period still exceeds 18 months. Younger more educated cohorts of women are tending to breastfeed and abstain for shorter periods than their elders. Sexually transmitted diseases are common in both areas, as elsewhere in Zimbabwe. As a consequence, levels of age-specific sterility are likely to be high.

Impact of HIV-1 and AIDS on Fertility

Evidence was found in the statistical and sociological data for a number of changes in fertility-related attitudes and behaviour, resulting from increased knowledge about HIV-1 and enhanced sense of personal risk of infection.

In particular, there were indications of greater reticence towards engaging in sexual relations and of reductions in aspirations regarding numbers of children wanted. Women who knew more about HIV-1 or felt at risk of infection were less likely to have commenced sexual activity or to have entered a stable union, and were more likely to have remarried following a divorce, to have chosen condoms as their current method of family planning or to have resumed sexual relations early following a birth. Women who reported a risk of HIV-1 transmission through breastfeeding tended to breastfeed their children for shorter periods. There was evidence that a small number of couples had changed their method of family planning from the pill to condoms since hearing about AIDS. Some couples were now using both methods.

The study did not address the question of trends in other STDs directly. However, the increase in condom use in response to the HIV-1 epidemic appears to have been modest so far and, as yet, there have been no significant changes in STD diagnosis and treatment procedures in these rural communities. Nevertheless, there is clearly some potential for an upward pressure on fertility should the incidence of new sexually transmitted infections be reduced.

6.6.2 Discussion and Conclusions

Shifts in the relative contributions of the proximate determinants to observed births rates appear to be occurring in response to the HIV-1 and AIDS epidemics. However, these results and the interpretations suggested should be treated with caution. The surveys conducted were small-scale, results may be affected by reporting bias or recent changes in knowledge about HIV-1 and personal risk-awareness. The underlying social processes are complex. While HIV-1 prevalence is now high among women at antenatal clinics, the impact of the epidemic on morbidity and mortality has been modest so far. Awareness of the risks of infection is likely to be heightened and more widespread as the AIDS epidemic develops. Gaps in knowledge are likely to be filled. The changes in attitudes and behaviour observed here could therefore become more common but there may also be modifications as the epidemic intensifies. At the same time, other factors, notably education and religion, will probably remain influential. Over the next 10-15 years, increasing education among women at older ages may result in lower fertility. Any expansion in the membership of the Marange Apostolic faith and other similar religious sects would *ceteris paribus* tend to slow future reductions in birth rates.

The ultimate consequences of some of the early changes in the proximate determinants can only really be guessed at. Compensating adjustments might be expected, particularly in view of the existing high levels of contraceptive use. Given the natural desire to have children -

which is re-enforced in *shona* culture by the ancestral spirit belief system - it may be that any deferral of initial sexual activity will result in delayed marriage and later commencement of childbearing, but have little effect on total fertility. This seems particularly plausible in a population where desired family size is often four children or less.

Given that husbands seem to be infected earlier than wives, in most cases, significant increases in widowhood would appear to be inevitable. However, many of these women may not live for very long after the deaths of their husbands. The impact on divorce is not yet clear. In both cases remarriage is currently relatively unusual. Widows appear to be even less likely to remarry in the AIDS era. Divorcees may be more likely to remarry. If this turns out to be the case, the net effect on time spent outside stable unions - where birth rates are lower - would be relatively small. The total fertility rate would be little affected, although increased proportions of women would not survive the full potential childbearing lifespan.

Contraceptive use is already on the increase. This trend may be accelerated by more open discussion of contraception in public and in private, due to AIDS education programmes. To the extent that couples come to suspect or be told that they are infected with HIV-1, contraceptive use to prevent further births may become more common. This effect may be seen more widely if it is true that the HIV-1 epidemic is causing couples to want less children - ie: that the reported results are valid and do not simply reflect a general tendency to want less children. Significant reductions in contraceptive use due to couples seeking to "insure" against increased infant and child mortality or "replace" children who died appear to be unlikely. Nonetheless it is hard to believe that women or couples with no children would not seek to ensure that they had some successors - particularly when they realise that there is perhaps a two-in-three chance that the child of an infected mother will not itself be infected. The impact of any natural replacement effect, due to increased early childhood mortality will be small in populations where contraceptives are used widely.

Similarly, women who breastfeed or abstain for shorter periods after giving birth may be expected to use contraception to delay the next birth. Few women in the current study recognized the contraceptive effect of breastfeeding and there were a number of instances of women who were breastfeeding and using modern family planning methods simultaneously. If the wider health benefits of breastfeeding are stressed in future HIV-1 control and family planning programmes - in line with current World Health Organization guidance [310] - it may be possible to forestall further reductions. However, this is an issue that will require sensitive handling. Further reductions in post-partum abstinence are likely to be relatively unimportant in relation to fertility in Zimbabwe, as periods are already relatively short and contraception is usually adopted on resumption of sexual activity.

Any increase in fecundity at the population level, achieved through reductions in sexually transmitted diseases, seems likely to be associated with further increases in contraceptive use. Some reductions in fecundity may be expected, due to reduced coital frequency among sick individuals. HIV-1 infection itself may result in reduced fecundity, particularly in its latter stages [107, 164].

The above is essentially informed speculation. If the interpretation suggested is true, the most plausible outcome would seem to be a modest acceleration in the pace of fertility decline in rural areas of Zimbabwe. This could result from delayed marriage and childbearing and further increases in contraceptive use. There may also be an increased concentration of births into the age-range 25-34 years - ie: a slight upward shift in the peak age at childbearing. In an extended epidemic this would result in more women dying before completing their intended childbearing and a further downward pressure upon the crude birth rate and population growth.

This prognosis and the data on which it is based is society specific. Similar changes may be seen elsewhere. However, the net effect may differ substantially. In particular, populations where contraceptive availability and acceptance are low could experience *increases* in fertility, if breastfeeding and abstinence were to decline and sterility was to be reduced. This would be especially likely in populations where there is a strong conscious replacement effect.

CHAPTER 7

The Impact of Fertility Change on the Projected Demographic Effects of HIV-1 Epidemics in sub-Saharan Africa

Great Zimbabwe, Zimbabwe, 1994

7

The Impact of Fertility Change on the Projected Demographic Effects of HIV-1 Epidemics in sub-Saharan Africa

7.1 Aims of the Chapter

The aims of this chapter are as follows:

i. To use mathematical modelling techniques to investigate the demographic impact of an HIV-1 epidemic in the context of fertility decline; and

ii. To examine the sensitivity of the demographic results to variations in key biological and behavioural determinants of HIV-1 epidemics; determinants whose value may alter in circumstances where preventative measures are taken.

Wherever possible, the simulations are based on demographic and epidemiological parameter settings derived from data obtained in the current study of HIV-1 and Fertility in Manicaland, Zimbabwe, or from other studies carried out in sub-Saharan Africa.

7.2 Organization of Chapter

Section 7.3 provides a brief background introduction to the modelling exercise. The following section (section 7.4) gives a brief description of the mathematical model used in the simulations. Section 7.5 describes and justifies the parameter settings used in the different scenarios. The results from these scenarios and from the sensitivity analyses are presented in sections 7.6 and 7.7, respectively. These results are discussed in the final section, section 7.8.

7.3 Background and Approach

An overview of previous mathematical model-based work carried out to assess the potential nature and extent of the demographic impact of HIV-1 epidemics in sub-Saharan African contexts was given in Chapter 1. Little attention has so far been given to changes in fertility, in progress during the course of an epidemic, whether these be consequences of the epidemic or flow from other socio-economic influences. The nature of the combined impact of fertility decline and the spread of HIV-1 infections has not previously been investigated. Results from this study and from recent demographic surveys in a number of other African countries indicate that fertility declines may now be under way in some areas. It is therefore relevant to consider what the combined effects of increased mortality, due to the HIV-1 pandemic, and changes in fertility, due to family planning programmes and other socio-economic factors, might be on the demography of affected populations. Recent modifications to a previously published mathematical model, which combines descriptions of the major epidemiological and demographic processes, now permit examination of these effects under alternative assumptions regarding the intermediate biological and behavioural determinants.

Zimbabwe is clearly one country which has experienced recent declines in birth rates, which is also subject to a major HIV-1 epidemic. The early indications are, that in the rural context at least, HIV-1 is most likely to accelerate the pace of fertility decline in the short to medium term (Chapter 6). It therefore seems most plausible that further falls in birth rates will be seen. The scenarios explored in this chapter are based on current understanding of the progress of the HIV-1 epidemic and of fertility declines in Zimbabwe and of the underlying socio-economic forces. Much of this understanding is based on results obtained directly or indirectly in this study. However, for some of the biological determinants, there are currently no specific estimates for Zimbabwe, and results from other African, and in some cases, Western studies, have been applied. It should be noted that little is known about likely future behavioural responses to the HIV-1 epidemic and other socio-economic changes. The results of the simulations cannot therefore be taken as *predictions* of demographic impact. Nonetheless they should provide some qualitative clues which may be of value for planning purposes.

The extent and combined effects of HIV-1 epidemics and fertility change - and indeed the nature of any interactions between the two - will vary between populations. Underlying local culture, patterns of socio-economic development and the nature and impact of HIV-1 control and family planning programmes, will all be important factors. However, study of the Zimbabwean case represents a first step, in the process of developing an understanding, of what the combined demographic effects of HIV-1 epidemics and fertility change might be, in different conditions.

To this end, a series of five demographic and epidemiological scenarios have been developed. These are summarized in Table 7.1. Scenarios (a)-(d) explore the projected impact of the HIV-1 epidemic within the context of a fertility decline, which may or may not be sustained (in part) by responses to the epidemic. Scenario (e) investigates the nature of any further effects which might follow from a concentration of fertility at older ages, due to behaviour changes resulting from the HIV-1 epidemic. Sensitivity analyses were carried out to test the robustness of the projected demographic impact of the HIV-1 epidemic to variations in some of the key parameters. Details of these tests and of the results will be given and discussed in section 7.7.

7.4 Mathematical Model

The analysis of the impact of the HIV-1 epidemic on the demography of Zimbabwe, in the context of fertility decline, presented here, is based on a mathematical model of the demographic characteristics of populations subject to HIV-1 epidemics. This model is itself derived from current understanding of the biological and behavioural processes involved in the transmission of HIV-1, the incubation period between HIV-1 infection and development of AIDS, and the rate of progression to death among people who have contracted AIDS. The model is able to take account of different patterns of sexual partner acquisition and different rates of partner change, factors which have been shown to be highly influential in determining the rate of spread of HIV-1 within a population and the demographic consequences [52, 224]. A full description of the model is outside the scope of this study but can be found in the

Table 7.1 HIV-1 epidemic and fertility change scenarios modelled in the simulations

Simulation scenario	HIV-1 epidemic	Fertility change
a	No	No
b	No	Yes - ZDHS decline continues to 1997
c	Yes	No
d	Yes	Yes - ZDHS decline continues to 1997
e	Yes	Yes - reduced concentration at younger ages

Note: In each of the scenarios (b), (d) and (e), total fertility declines from 5.49 live births per woman in 1986 to 3.47 live births per woman in 1997. In scenarios (b) and (d), the pattern of reduction by age observed between the 1988 and 1994 Zimbabwe Demographic and Health Surveys (ZDHS) is assumed to continue until 1997. In scenario (e), the pattern is assumed to remain more concentrated at older ages as a consequence of the HIV-1 epidemic - see Chapter 6. The resulting age patterns of fertility in 1997 - and thereafter - are illustrated in Figure 7.1. The HIV-1 epidemic is taken as having reached the same stage at commencement of the simulations (1986) in each of the scenarios (c) to (e).

literature [30, 43, 311].

The published model has been modified to permit changes in age-specific fertility rates during the course of an epidemic. Linear changes can occur for each 5-year age-group within a simulation, between any two specified time points. The proportionate change can vary according to age. Thus it is possible to reflect changes in the *shape* of the age-specific fertility distribution as well as changes in the overall *level* of total fertility.

A summary of the principal epidemiological and demographic parameter assignments used in the current simulations is given in the following section.

7.5 Input Parameter Settings

7.5.1 Baseline Demographic Parameters

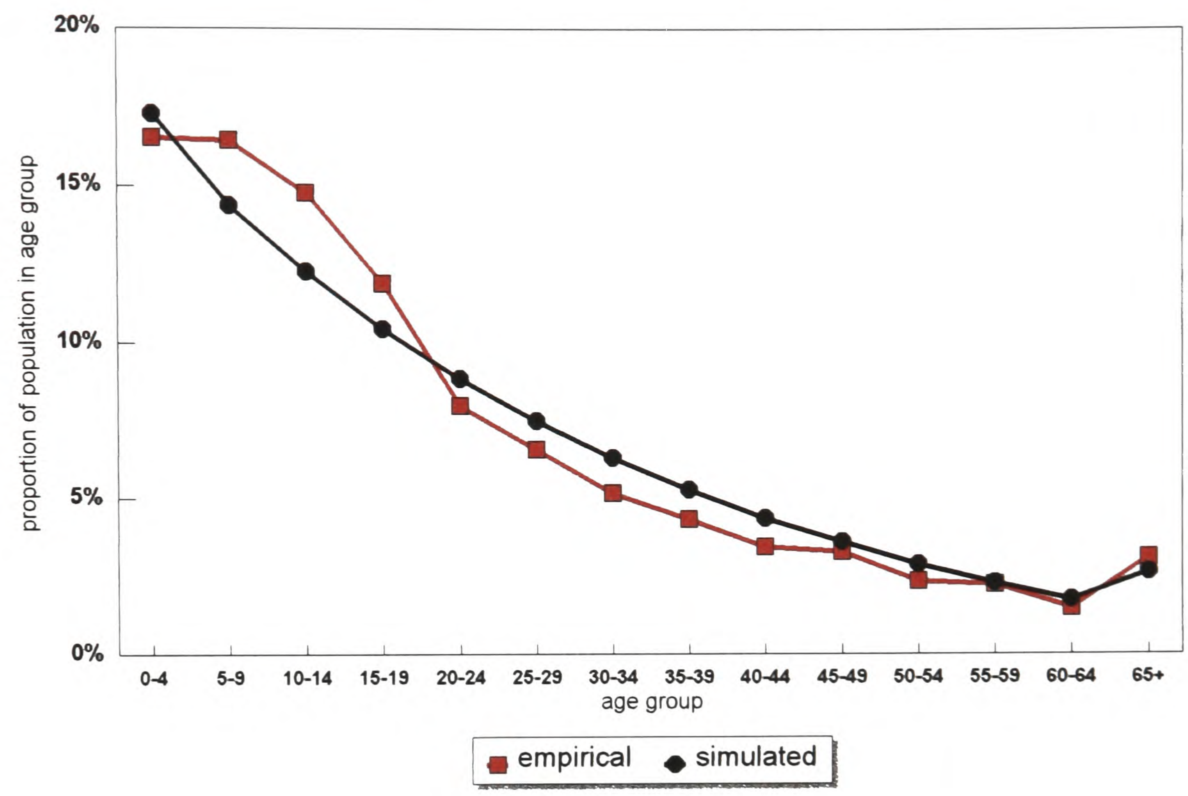
The simulations were set to run from 1986 so that results from the 1987 Zimbabwe Inter-Censal Demographic Survey (ZICDS) and the 1988 Zimbabwe Demographic and Health Survey (ZDHS) could be used to describe the initial demographic profile of the population (Table 7.2). For the scenarios which include an epidemic ((c)-(e)), the model was seeded with a small number of HIV-1 infections in 1986 to reflect the prior existence of some cases and to trigger the epidemic. The model structure requires the assumption that the population was stable during the period prior to 1986. Recent variations in mortality and fertility and recent patterns of international migration would suggest that this has not been the case - see Chapter 3. Indeed comparison of the age-structure of the national population recorded in the 1987 ZICDS with the age structure simulated for 1986 reveals some significant differences - Figure 7.1. Age-selective under-enumeration and age mis-reporting may be present in the empirical data, but there are signs that the initial population was younger than that portrayed by the simulation. This may be due, for example, to the surge in fertility which is believed to have occurred in the period immediately following Independence [265]. Nevertheless, it is thought that the differences between the simulated and actual population structures in 1986 are not

Table 7.2 Initial (1986) demographic parameter settings for model simulations

Age-group	**Age-specific fertility rates per 1,000**	**Age-specific mortality rates per 1,000**	
		Males	**Females**
0-1		100	77
1-4		8	7
5-9		2	2
10-14		2	2
15-19	103	3	2
20-24	247	3	3
25-29	247	4	4
30-34	219	5	5
35-39	160	7	6
40-44	86	9	8
45-49	36	12	10
50-54		15	13
55-59		20	18
60-64		32	27
65-69		48	41
70-74		76	66
75+		154	145
Life expectancy at birth		55.3 yrs	58.6 yrs
Total fertility	5.5 live births per woman		
Sex ratio at birth	1.05 males for each female		
Rate of natural population increase	3% pa		

Note: The mortality estimates are based on data from the Zimbabwe Inter-Censal Demographic Survey, 1987 [184]. Fertility estimates from the Zimbabwe Demographic and Health Survey, 1988 [177].

Figure 7.1 **Age-distribution of the national Zimbabwe population in 1986: empirical and simulated estimates**



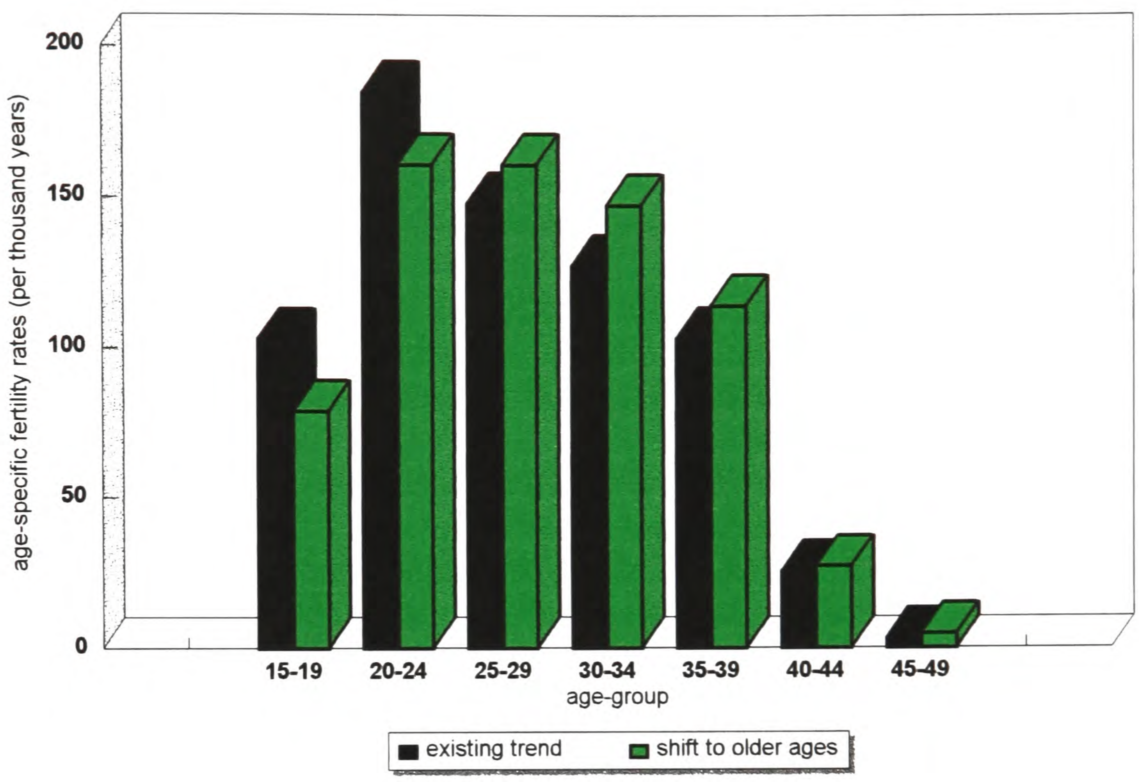
Note: The empirical estimates are national estimates taken from the Zimbabwe Intercensal Demographic Survey, 1987 [184].

sufficiently great as to result in major distortions in the medium to long-term simulation results. As will be seen, the HIV-1 epidemic is projected to cause increases in the proportion of the population accounted for by older children and young adults. The presence of this pre-existing pattern might be expected to accelerate and accentuate the projected concentration of the population within these age-groups.

Age-specific mortality rates for causes other than those related to HIV-1 infection are taken to remain constant throughout the period of the simulations. In practise, there may be changes, due to variations in access to health systems. For example, increased charges introduced during the Economic Structural Adjustment Programme or competition for resources in the face of the HIV-1 epidemic, could result in reductions in overall standards of health care and increases in other forms of mortality. Secondary cases of tuberculosis, resulting from the HIV-1 epidemic, are liable to result in increased mortality, which is not reflected in the simulations. The degree to which the recent increase in the incidence of tuberculosis cases has included non HIV-1 infected individuals in Zimbabwe is not known. However, to the extent that mortality among uninfected individuals does rise due to tuberculosis, the projected trend in overall mortality will understate the true levels over time.

Scenarios (b) and (d) reflect the pattern of decline in fertility, by age, recorded in the 1988 and 1994 Zimbabwe Demographic and Health Surveys [195, 198]. This results in a decline in total fertility from 5.49 live births per woman in 1986 to 4.39 in 1992. The scenarios assume that this trend will continue until 1997, when total fertility stabilizes at 3.47 live births per woman. In scenario (e), the same overall decline in total fertility is assumed to take place between 1986 and 1997. However, the reduction is taken as being relatively more concentrated at younger ages, as a result of changes in the proximate determinants of fertility flowing from the HIV-1 epidemic (Chapter 6). The final impact of the current and hypothesized modified trends on the pattern of age-specific fertility rates at 1997 is illustrated in Figure 7.2. The resulting mean age at childbirth in 1997 is 27.7 years in scenarios (b)&(d) and 28.6 years in scenario (e), compared to 29.7 years in 1986.

Figure 7.2 Age-specific fertility rates (1997-2016): with and in the absence of a delay in childbearing due to the HIV-1 epidemic



Note: The pattern of age-specific fertility rates based on the "existing trend" in birth rates is derived from results of the 1988 and 1994 Zimbabwe Demographic and Health Surveys [157] and [177].

7.5.2 Criteria Applied in Selection of Parameter Settings for the HIV-1 Epidemic

The principal aim in this modelling exercise was to investigate the potential *future* development of the HIV-1 epidemic in Zimbabwe and the nature of its likely demographic consequences. The initial objective was therefore to develop a simulation which was consistent with what is currently known about both the biological and behavioural processes involved in the HIV-1 epidemic and the development of the epidemic itself to date. In each case, this was to be done with specific reference to Zimbabwe and was conducted at the national level. The exercise could only be conducted at the national level because of the high levels of interaction between men and women living in urban and rural areas. Quantitative estimates specific to the Zimbabwe context are not available for some of the principal biological and behavioural parameters. Settings were therefore selected which are in keeping with the sociological and epidemiological data obtained in the study (Chapter 3) and quantitative estimates obtained elsewhere, and which, in combination, generate an initial HIV-1 epidemic consistent with the somewhat sketchy picture which emerges from the sentinel survey data collected in Zimbabwe, to date - Chapter 4.

7.5.3 Biological Parameters

Heterosexual intercourse and perinatal transmission from mother-to-infant are currently understood to be the predominant causes of HIV-1 infection in sub-Saharan Africa [312, 313]. The model therefore ignores the relatively small numbers of infections which result from blood transfusions and the use of contaminated needles in health care settings. The risks of transmission within heterosexual partnerships applied in the simulations are given in Table 7.3 and are based on estimates derived by Peterman and colleagues [280]. At the individual level, the risk per partnership is believed to vary according to condom use, frequency of intercourse, duration of relationship, presence of other sexually transmitted infections, stage of infection and a number of other factors [48, 50]. The majority of partnerships involving infected females and uninfected males in Zimbabwe, are short-term casual relationships and condoms are believed to be used on some occasions. The risk of transmission in these partnerships has therefore been taken as being 20 per cent lower than that estimated in the

Table 7.3 Biological parameter settings for model simulations: length incubation period and transmission probabilities

Form of transmission	**Stage of infection:** 1	2	3	4 (AIDS)	Total/ Mean
Heterosexual: Female to Male					
Rate of transition to next stage of infection (pa)	4	0.182	4	2	6.50
Transmission risk per partnership	0.184	0.061	0.184	0.184	0.080
Heterosexual: Male to Female					
Rate of transition to next stage of infection (pa)	4	0.182	4	2	6.50
Transmission risk per partnership	0.459	0.153	0.459	0.459	0.200
Vertical: Infected Mother to Infant					
Rate of transition to next stage of infection (pa)	0.5	-	-	2	2.50
Transmission risk per infant	0.35	-	-	NA	0.35

Note: Overall heterosexual transmission rates based on estimates derived by Peterman *et al.* [280]. See text for further explanation. Vertical transmission rates are based on estimates reviewed in Ryder and Temmerman [313]. Other forms of transmission - including transmission via blood transfusions and contaminated medical instruments - are assumed to be of negligible significance.

Peterman study, which investigated transmission in primarily stable unions - 0.08 rather than 0.1 per partnership - see also [314]. Partnerships involving infected males and uninfected females in Zimbabwe, are understood to be stable unions in most cases, with levels of condom use being low. The pattern of concurrent partnerships seen in Zimbabwe places women at great risk of sexual contacts with spouses who are at peak infectiousness, due to recent infections [63]. The Peterman estimate has not therefore been adjusted in this case.

The mean incubation period between infection with HIV-1 and development of AIDS was set at six years. The only known published cohort-based estimate for an African population comes from Nairobi, Kenya. This indicates that the median length of the incubation period may be as short as 4.4 years [10]. However, the results of the current study suggest that progression from HIV-1 infection to AIDS may be slower in Zimbabwe. Results from studies in Western countries indicate that the median period can be eight years or more [43, 52], in circumstances where high living standards are maintained and opportunistic diseases are controlled. It is also possible that the commercial sex workers studied in Nairobi are unrepresentative of adults in the general population in respect to disease progression. For example, they may be subject to infection with multiple strains of HIV-1 infection which could lead to accelerated disease development [10]. The incubation period was subdivided into three phases, with the first and last phases averaging three months each and being symptomatic, while the intermediate asymptomatic stage extends for a mean period of five and a half years. Individuals in the initial and late stages of infection have been taken as being three times as likely to transmit HIV-1 to their sexual partners as those in the asymptomatic period [48]. The mean survival period after contracting AIDS is taken as being 6 months.

A number of studies have been carried out to assess the overall level of risk of perinatal transmission of HIV-1 infection [43, 313]. These indicate that transmission rates may be higher in sub-Saharan settings than in Western countries and are of the order of 35 per cent. One reason for this may be the more extensive practise of breastfeeding in African societies. The additional risk of HIV-1 infection via breastfeeding has been estimated at 14 per cent (CI: 7-22 per cent) [54]. Uninfected infants of women with HIV-1 are taken as being subject to the same rates of infant and child mortality as children of uninfected mothers; a conservative assumption, since infected mothers may be less able to care for their children [80, 315, 316].

7.5.4 Behavioural Parameters

The behavioural assumptions upon which the model is based and the settings applied in the current simulations are given in Table 7.4. The model permits up to four sexual-activity classes for each sex and differential sexual-activity by five-year age-group. Indices of mixing, e_i, are incorporated, to allow for different levels of interaction between age and activity classes. In each case, $e_i=0$ denotes fully assortative mixing - ie: like-with-like - and $e_i=1$ represents random mixing - ie: partners acquired in proportion to the supply of partnerships available from each sexual-activity group. It is also possible to adjust the mean age difference between partners.

In the current applications, information obtained during the fieldwork in Manicaland has been used as the basis for the parameter settings. Difficulties in obtaining reliable reports on rates of partner acquisition meant that direct quantitative estimates were not available from the statistical survey. However, descriptive and qualitative information collected during pocket-chart voting sessions, focus group discussions and key informant interviews provided a clear impression of the nature of contemporary behaviour patterns (Chapter 3). The parameter settings summarized in Table 7.4 fit this observed behaviour pattern. In combination with the settings for rates of heterosexual transmission described above, they serve to generate an HIV-1 epidemic (Figure 7.3) consistent in speed, scale and composition - ie: prevalence by age and gender - with that which is understood to have occurred to date.

This behaviour pattern can be summarized as follows. Sexual activity among males is relatively homogeneous. There is some increase in activity between the teens and mid-20s, reflecting enhanced economic status. Age at marriage tends to be higher for males than for women [157] and it is common for men to have a number of serial and/or casual relationships before marriage. Most married men engage in extra-marital relationships. Numerically, the

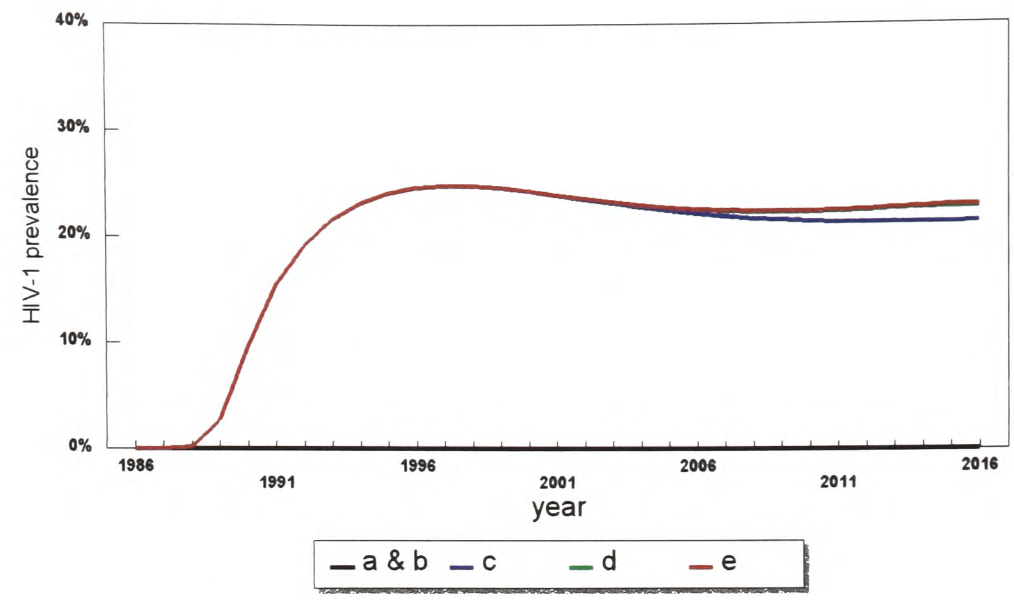
Table 7.4 Behavioural parameter settings for model simulations

Parameter	**Sexual activity clas**	**1**	**2**	**3**	**4**	**Total/ Mean**
Males						
Ratios of partnership change rates by age						
15-19		1	1	1	1	-
20-24		2	2	2	2	-
25-29		3	3	3	3	-
30-34		3	3	3	3	-
35-39		3	3	3	3	-
40-44		3	3	3	3	-
45-49		2	2	2	2	-
Ratios of partnership change by activity group						
Proportion in activity group		0.05	0.35	0.30	0.30	1.00
Ratio of partner change rates		8	4	3	1	3.00
Females						
Ratios of partnership change rates by age						
15-19		2	2	1	1	-
20-24		3	3	2	2	-
25-29		4	2	1	1	-
30-34		2	1	1	1	-
35-39		1	1	1	1	-
40-44		1	1	1	1	-
45-49		1	1	1	1	-
Ratios of partnership change by activity group						
Proportion in activity group		0.04	0.06	0.88	0.02	1.00
Ratio of partner change rates		49.995	2	1	0.01	3.00
Mixing Pattern: Indices of Dis-assortative Mixing						
Age groups (e_1)						0.6
Activity classes (e_2)						0.6
Age difference between partners						0.5

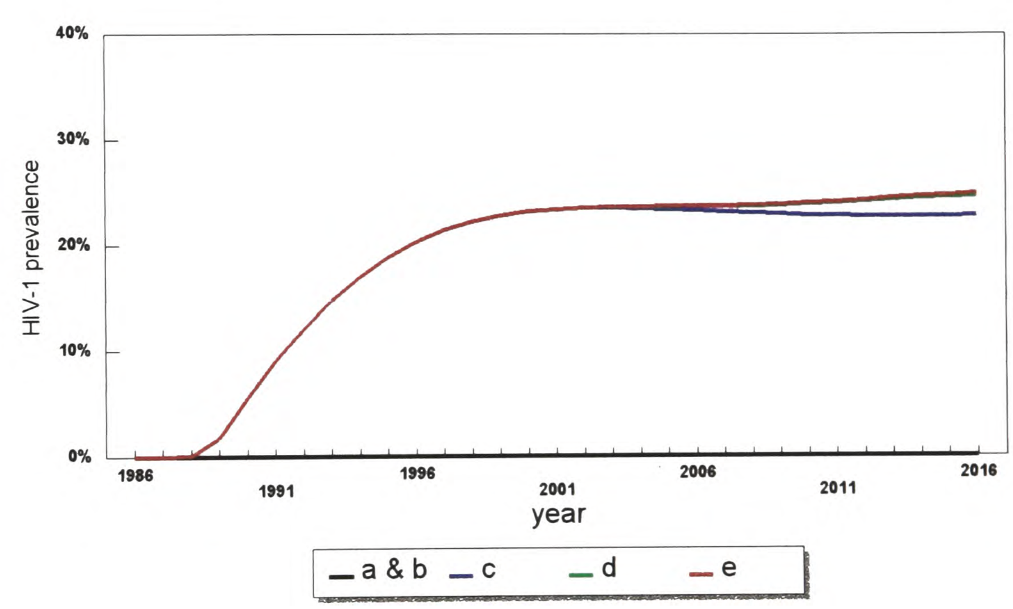
Note: These estimates are based on demographic and sociological data obtained in the current study in Manicaland, Zimbabwe (Chapter 3). The indices of mixing by age and sexual activity class are described in the text and in more detail in Garnett and Anderson [30.43].

Figure 7.3 HIV-1 prevalence by year of epidemic: model scenarios (a)-(e)

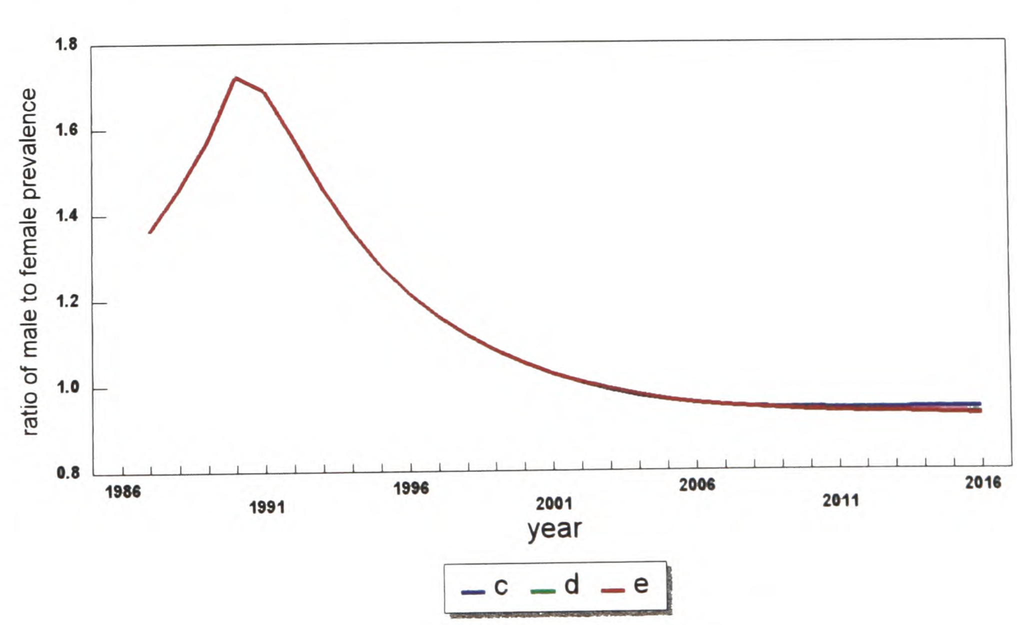
(a) Males aged 15-49 years



(b) Females aged 15-49 years



(c) Ratio of prevalence among males and females



majority of these relationships are casual affairs. However, some men maintain longer-term concurrent relationships with regular girlfriends in the towns where they work and with wives in their family homes in rural areas. In some instances - and this is particularly the case within certain religious groupings (eg: the Marange Apostolics in the Honde Valley) - formal polygyny is practised. The position with women is essentially the opposite. The great majority of women are married or are in other forms of long-term relationship. When married, women are monogamous. Prior to marriage, some women may have serial relationships and a minority - probably a greater minority in towns - engage in commercial sex work for a short period of years before entering a stable union. A small proportion of women remain single and some of these are involved in commercial sex work. In the event of divorce, and in some cases widowhood, women may also enter into prostitution as an economic survival strategy. Sexual activity among commercial sex workers based in rural areas, is relatively low - probably below one partner per night on average - and often involves previous male customers. In the larger towns, rates of partner acquisition are almost certainly higher. In both settings there appears to be a strong seasonal element, with peak activity at weekends and regular pay days. Sexual activity among women is therefore highly heterogeneous. The mixing pattern with men is dis-assortative, in the sense that men with several partners mix with women with both high and low numbers of partners. Men are typically older than their female partners. This is the case in both regular and casual relationships.

A mean rate of partner acquisition of 3.0 per annum has been used in the simulations. However, due to the different patterns of sexual activity, the median number for males (2.33) is greater than that for females (0.56). The indices of mixing are set at 0.6, indicating relatively dis-assortative mixing. Finally, it is assumed that 50 per cent of men who would otherwise have been taken to form partnerships with women in the same five-year age-group, actually form these partnerships with women up to ten years younger than themselves, and conversely for women.

7.6 Results: Scenarios (a) to (e)

7.6.1 Introduction

Table 7.1 sets out the basis for each of the principal scenarios investigated. Scenarios (a), (b) and (c) are purely hypothetical scenarios, in that it is known that there is an HIV-1 epidemic and that fertility is currently declining. They are presented as baseline simulations, to illustrate the relative effects of each of these phenomena, taken in isolation. Scenarios (d) and (e) are based on the same HIV-1 epidemic as that simulated in scenario (c), but under alternative patterns of fertility decline, by age. The latter reflects the older age-distribution of fertility which it is suggested might follow as a consequence of the HIV-1 epidemic. In the sensitivity analysis given in the next section, the impact of variations in some of the key biological and behavioural determinant settings, on the size and nature of the HIV-1 epidemic and its demographic consequences will be investigated, using this final scenario as a starting point - ie: assuming a set pattern of fertility change but varying the HIV-1 epidemic.

7.6.2 Projected HIV-1 Epidemic

The simulated progress of the HIV-1 epidemic among adult males and females between the ages of 15 and 49 years is illustrated in Figure 7.3. Given the biological and behavioural parameter settings described above, the epidemic is projected to develop most quickly among males. This result is consistent with the sex ratio of reported AIDS and tuberculosis cases reported by the National AIDS Co-ordination Programme (Chapter 4) and also with the more pronounced increase in adult mortality recorded amongst men in the current study (Chapter 5). The projections indicate that the epidemic may currently be close to peaking, particularly among males. This appears to fit the available sentinel surveillance results. However, there are relatively few locations where repeat surveys have been carried out and it is quite likely that the epidemic is still growing rapidly in some rural areas.

Results from screening of blood donors for HIV-1 infection suggest that the epidemic may have been slightly more advanced in 1986 than is indicated by the simulations. Two thousand

and forty-three (2.34 per cent) of the 87,376 blood donors screened in 1986 were found to be HIV-1 positive [317]. It is unclear how representative individuals who presented themselves as prospective blood donors at this time would have been of adults in the general population. For example, people living in large towns and cities - where the epidemic almost certainly developed more quickly - may be over-represented in these data. Nonetheless, it is possible that the epidemic may have begun to develop earlier than is shown. If this is the case, the simulation results would of course imply that the epidemic is slightly closer to peaking. Either reading would be consistent with the data on HIV-1 prevalence which are currently available.

Looking ahead, the simulation results suggest that HIV-1 prevalence levels among adults will stabilize at approximately 23 per cent, in the absence of significant behaviour change or widespread treatment of STDs. The level of prevalence may be slightly higher for females, although this result would be expected to be sensitive to variations in the relative levels of male-to-female and female-to-male heterosexual transmission and sexual mixing patterns. With this caveat, it is nevertheless interesting that the projected excess of infection among females is as small as it is. The much higher risk of transmission per partnership from males to females and younger ages of female partners might have been expected to result in a greater excess. Indeed, this has been indicated in earlier simulations [91]. However, these results show that given a pattern of sexual behaviour similar to that found in Zimbabwe, an excess of infection in males can result during the early years of an epidemic and that the ultimate sex ratio - assuming no behaviour change - may remain modest.

The presence of a decline in fertility appears to have very little effect on HIV-1 prevalence levels. A small increase in prevalence is evident twenty years from the beginning of the simulations, possibly reflecting adjustments in sexual mixing patterns, necessitated by changes in the composition of the population by age and sexual activity class, which result from the combined effects of the HIV-1 epidemic and fertility decline [30].

7.6.3 *Mortality Trends*

The impact of the simulated HIV-1 epidemic on age-specific death probabilities is shown separately for males and females in Figure 7.4. The increase in mortality is faster among males than among females (see also Figure 7.5) and is rather more concentrated at older ages. If the sexual activity of the older men and women - ie: over 50 years - was taken into account, this effect would be expected to be stronger. In total, the numbers of such individuals are relatively small, but their exclusion does have some effect on the projected pattern of mortality at older ages.

By year 2006, mortality is projected to have increased to the extent that life expectancy at birth - based on period age-specific mortality rates - will have declined from 55.3 years and 58.6 years, in 1986, to 30.4 years and 31.7 years, for males and females, respectively.

7.6.4 *Population Growth, Size and Composition*

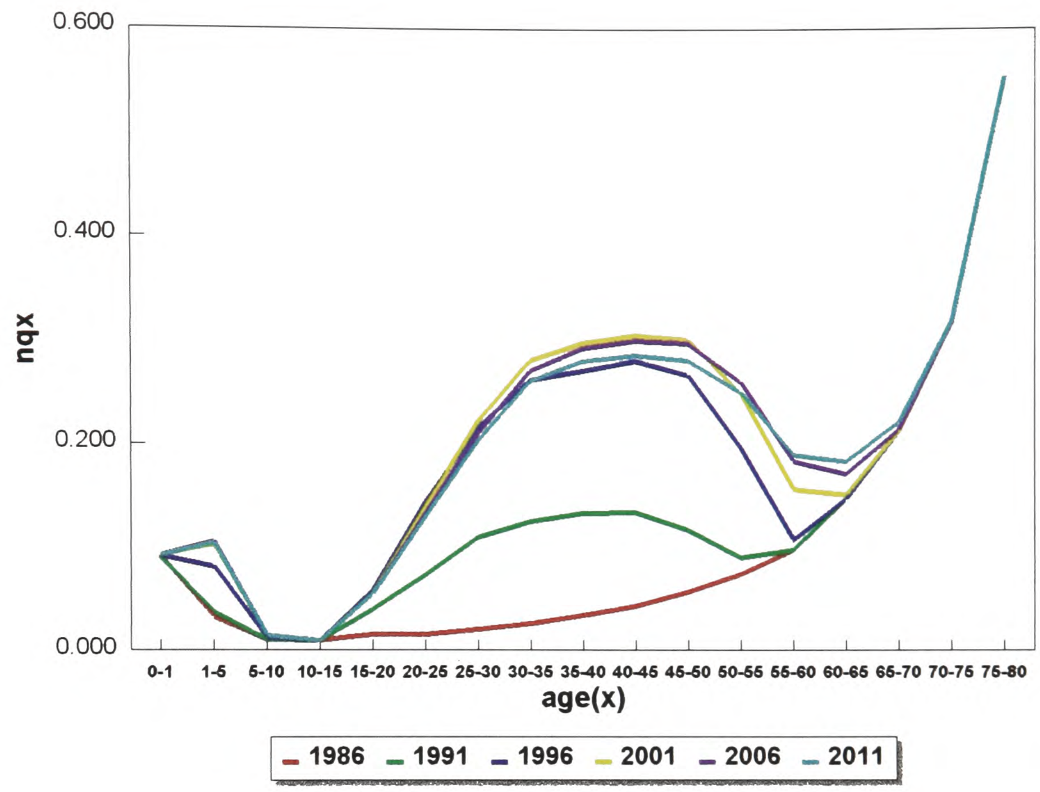
The impact of the various HIV-1 epidemic and fertility change scenarios on population growth and size is illustrated in Figure 7.6. The baseline simulation, scenario (a), indicates that should recent rates of population growth continue, Zimbabwe's population would be expected to exceed 22 million by the year 2016. This would represent a doubling of the country's current population size (1994).

In the absence of an HIV-1 epidemic, population growth remains high throughout the period of the simulations, even in the face of continuing fertility decline (b). This is due to population momentum: high rates of fertility in the past mean that increasing numbers of women enter the childbearing ages each year. In scenario (c), where the impact of the HIV-1 epidemic is shown in the absence of any fertility decline, population growth falls more steeply, before making something of a recovery around the year 2000. The projected population size in 2016 is significantly smaller than in case (b).

In scenarios (d) and (e), which combine fertility decline with the HIV-1 epidemic, population

Figure 7.4 Age-specific death probabilities by gender in the presence of an HIV-1 epidemic: model scenario (c)

(a) Males



(b) Females

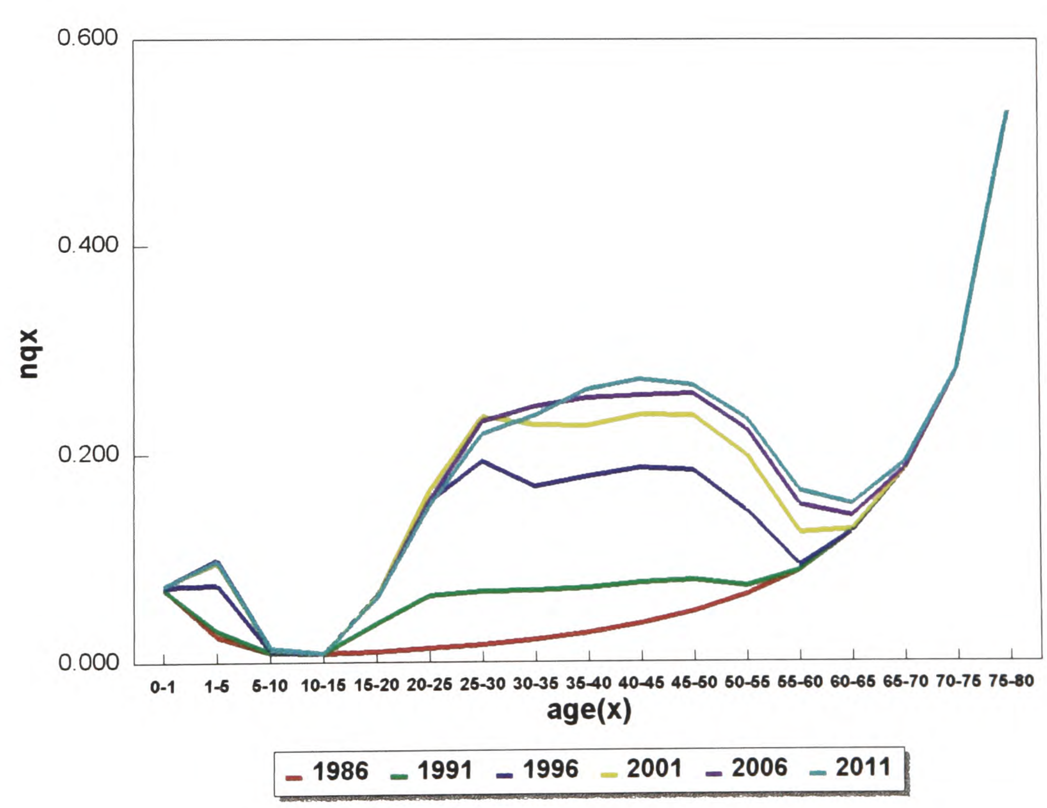


Figure 7.5 Probability of surviving from age 20 to age 50 (***30p20***) by gender and year of epidemic: model scenarios (a) and (c)

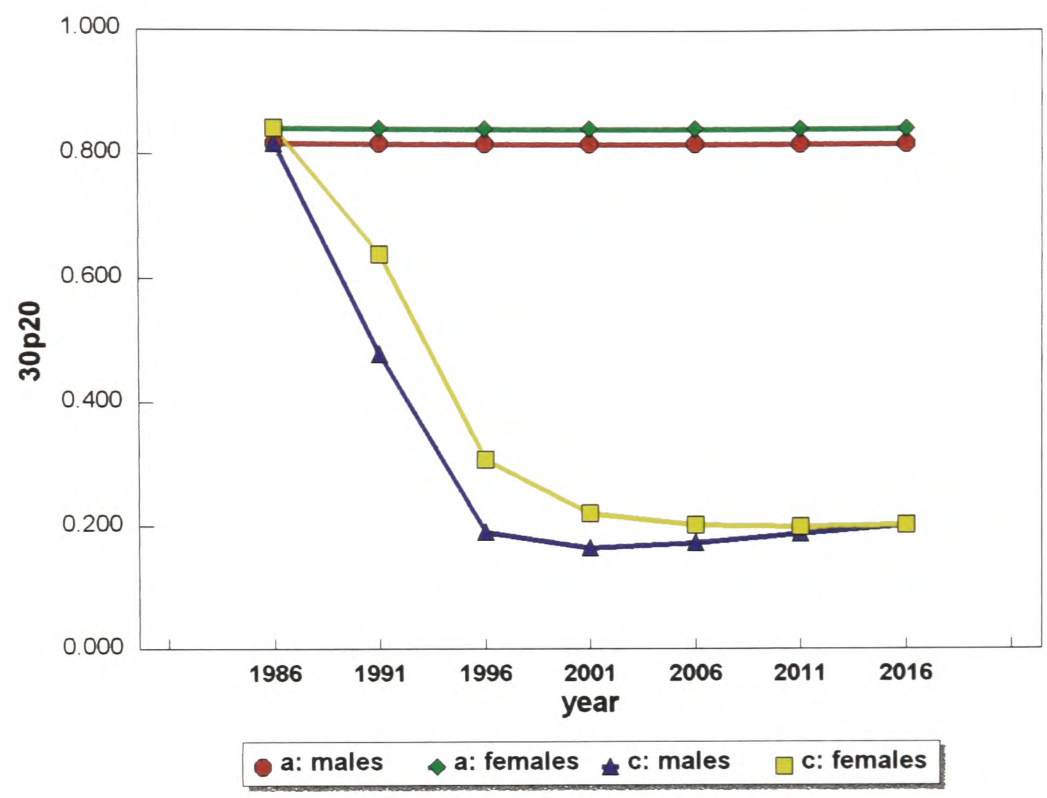
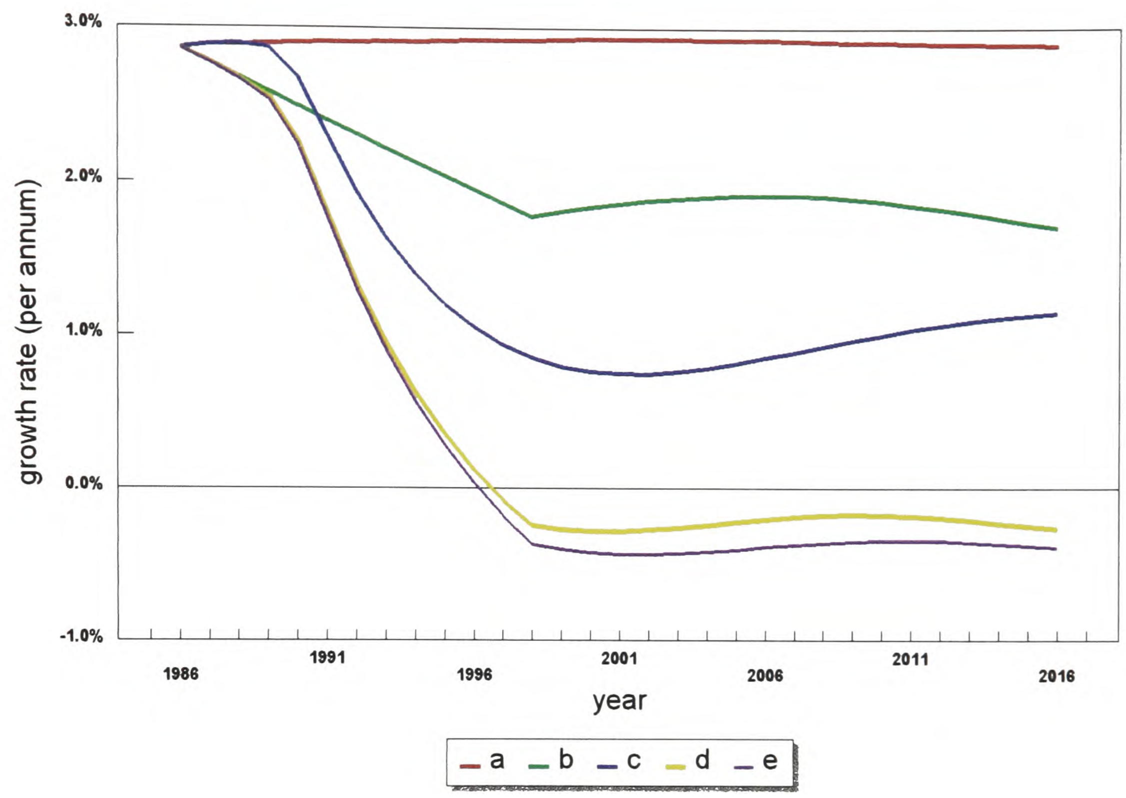
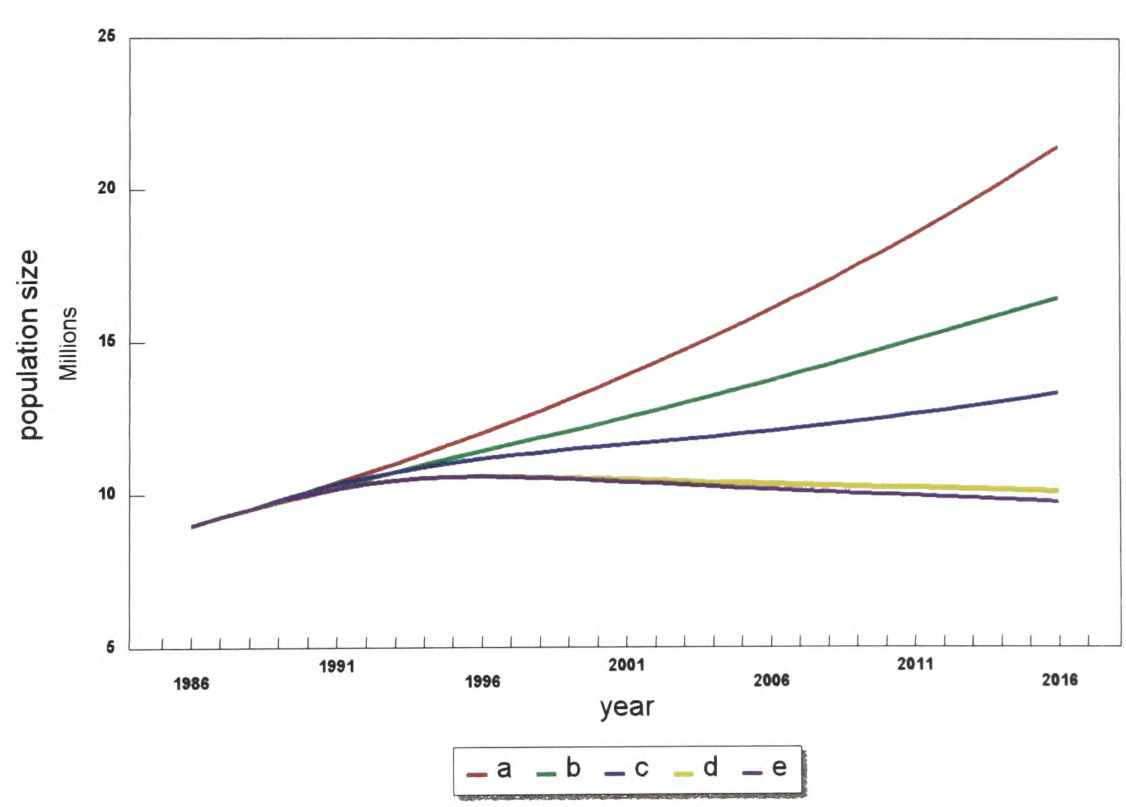


Figure 7.6 Population growth and population size by year: model scenarios (a)-(e)

(a) Population Growth



(b) Population Size



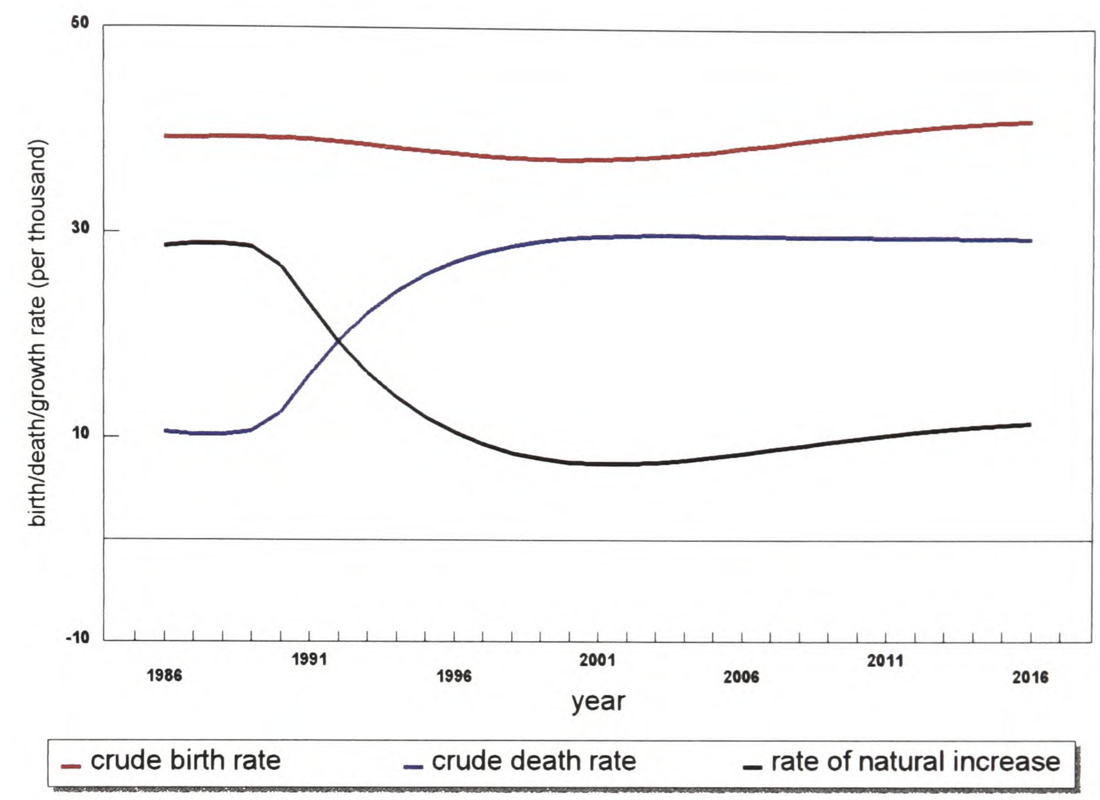
growth decreases rapidly. Negative growth rates are seen by the late 1990s and are projected to continue until 2016 and probably beyond. Despite this, given the hypothesized trends in fertility, the country's population size would remain higher in 2016 than it was in 1986. The older age-pattern of childbearing reflected in scenario (e), results in a slightly greater reduction in population growth and population size than is the case in scenario (d). However, the effect is modest.

Figure 7.7 depicts the relative contributions of changes in the crude birth rate and the crude death rate to overall trends in population growth, in circumstances where there is a major HIV-1 epidemic. Graph (a) shows these where fertility remains constant, while graph (b) gives the simulation results for the case where fertility declines are concentrated at younger ages. In the former situation, there is little change in the crude birth rate. Less women survive to the end of their potential childbearing lifespan, but the proportion of the total population accounted for by women in their peak childbearing years (20-29 years) is little affected - Figure 7.8. The decline in population growth is therefore almost entirely due to increased mortality. In scenario (e) - graph 7.7(b) - the crude birth rate does decline in the early years of the simulation, in response to the fall in total fertility. However, in this case, the concentration of the population within peak childbearing ages, as a consequence of HIV-1 related mortality and the fertility decline, becomes even more intense. The crude birth rate is therefore projected to recover somewhat in the early years of the 21st century. More generally, the decline in fertility rates results in a greater concentration of the population within the twenties and early thirties. These are the ages where the incidence of HIV-1 related mortality is highest. There is therefore a modest further upward pressure on the crude death rate, which acts to stem any recovery in natural population increase.

The projected effects of the HIV-1 epidemic on population age-structure are similar to those resulting from earlier simulations [78, 91] and are little affected by the different behaviour patterns. It should perhaps be recalled, at this point, that empirical estimates of the actual age-distribution of the Zimbabwe population in 1986 indicated that this already exhibited the characteristics of a population affected by HIV-1 and AIDS. While it is believed that other factors were more important prior to 1986, it would seem that the combined effects of the

Figure 7.7 Elements of population growth by year: model scenarios (c) and (e)

(a) *Scenario (c): no change in age-specific fertility rates*



(b) *Scenario (e): decline in age-specific fertility rates*

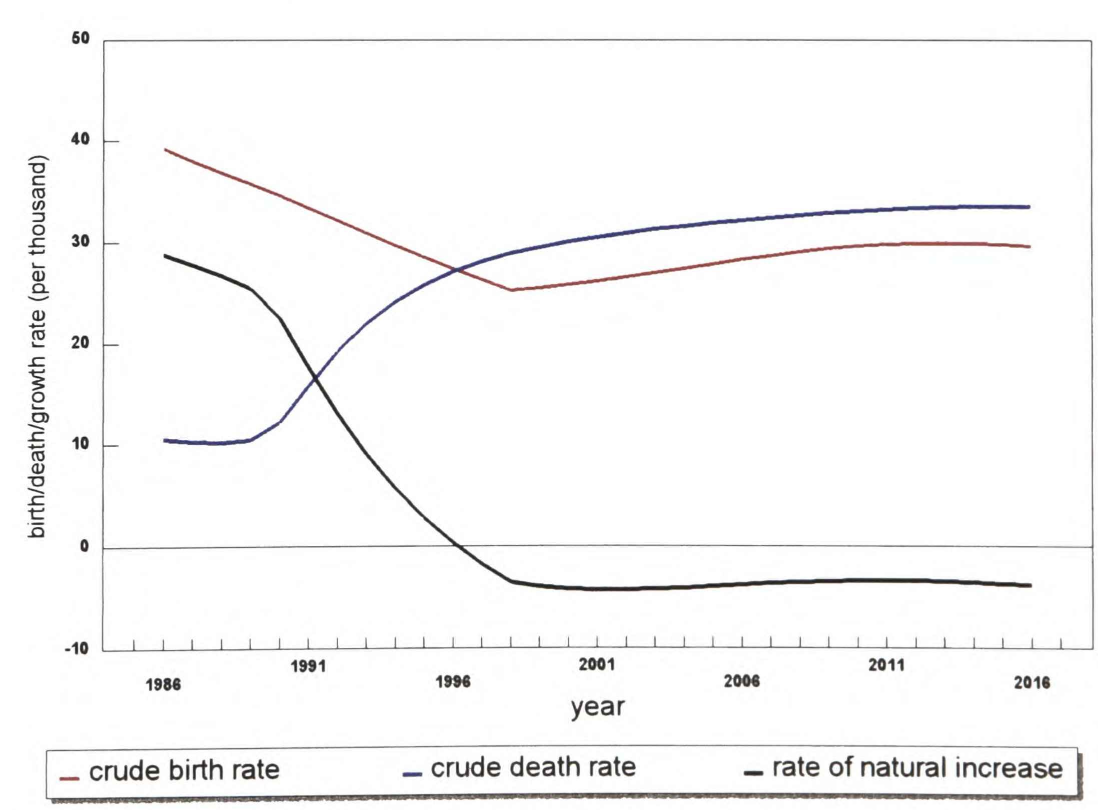
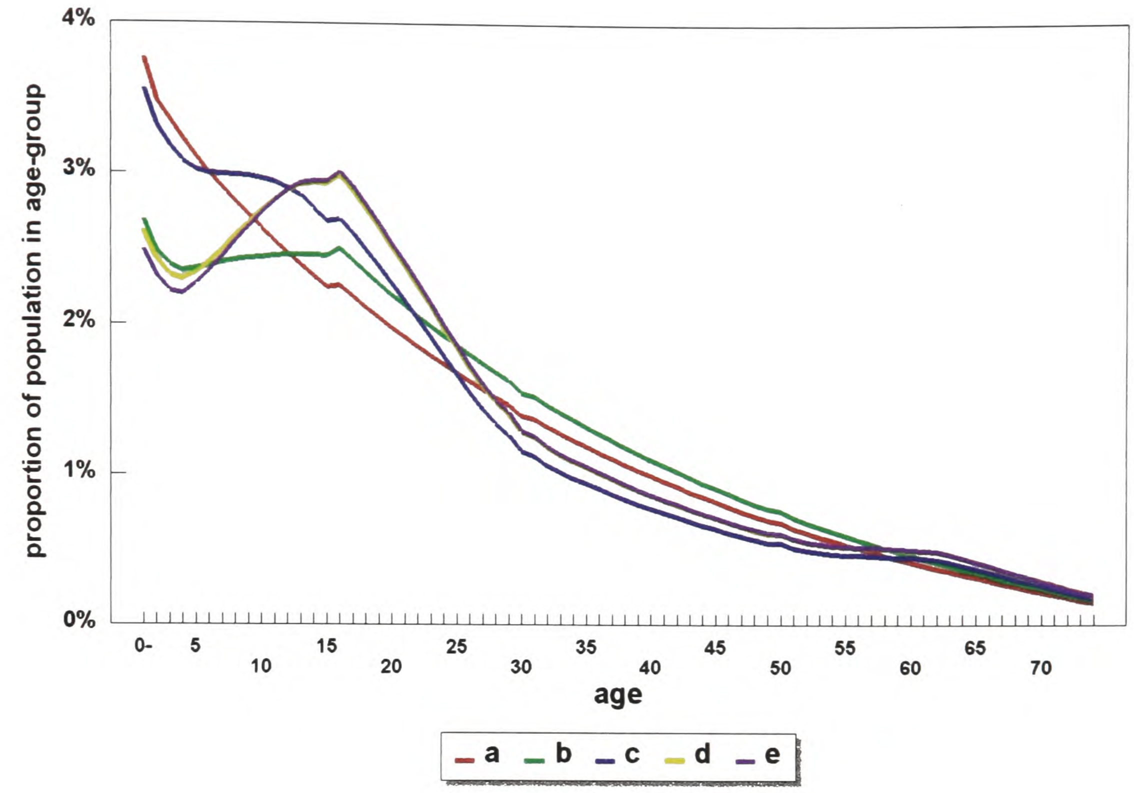
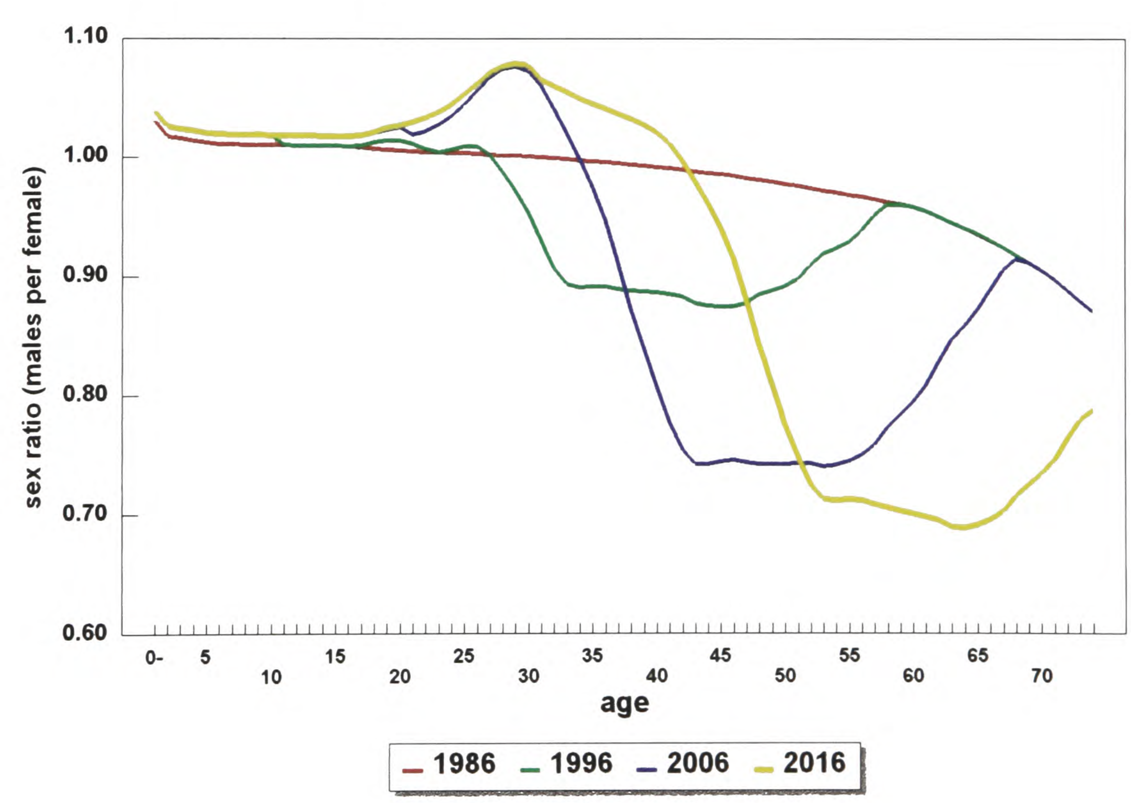


Figure 7.8 Population age and sex structure

(a) Population age structure after 15 years (males and females combined)



(b) Sex ratio by age and year of epidemic: scenarios (c) to (e)



HIV-1 epidemic and fertility decline, may serve to entrench and intensify pre-existing patterns within the age- distribution of the population.

Figure 7.8(b) shows the projected impact of the HIV-1 and fertility change scenarios on the gender composition of the population. In earlier work, HIV-1 epidemics were shown to have the potential to cause significant shortages in adult females, due to the higher rate of male-to - female transmission and the younger ages at infection experienced by women [78, 91]. However, as has already been seen, the predominant behavioural patterns currently found in Zimbabwe result in a faster HIV-1 epidemic among men. The simulation results indicate that a modest shortfall of women may still arise later in the epidemic, but that the earlier and ultimately perhaps more significant effect could be a deficit of older adult males.

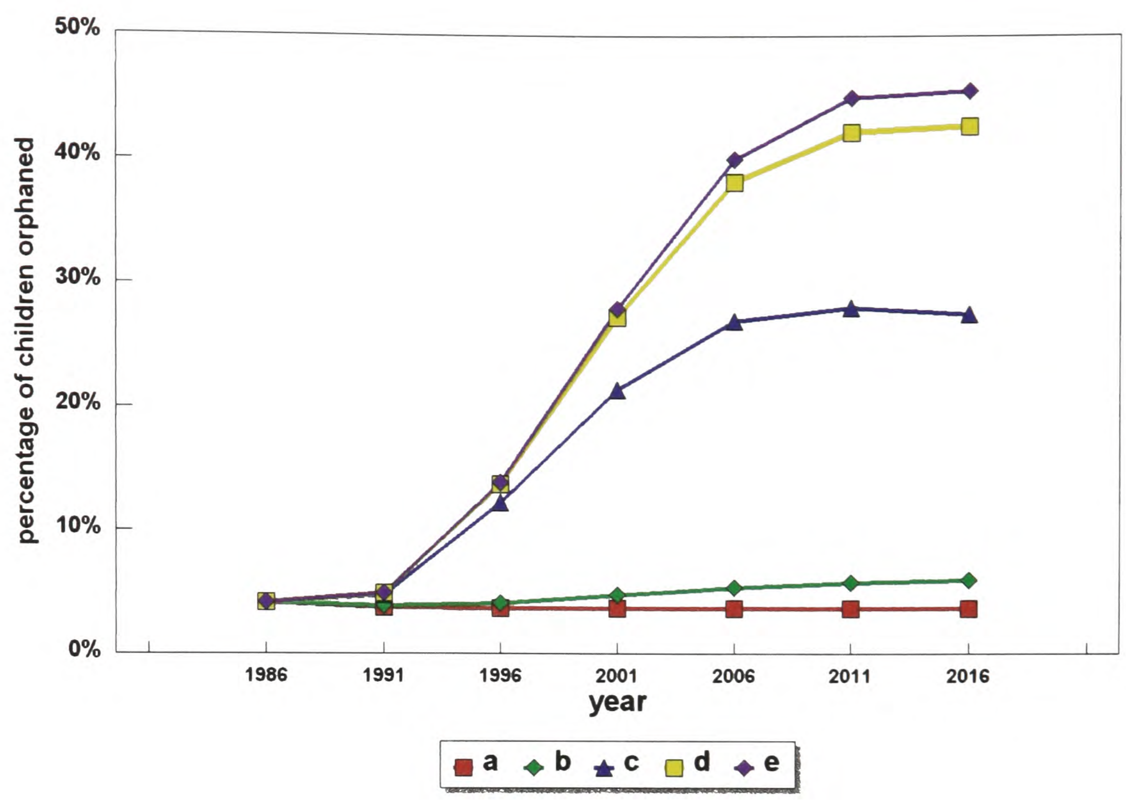
7.6.5 Maternal Orphanhood

Given the levels of mortality current in 1986, 3.6 per cent of children between the ages of 0 and 14 years at last birthday would be expected to have lost their mothers - scenario (a). Reducing fertility results in a greater proportion of older children within this age-group and therefore slightly higher levels of orphanhood - Figure 7.9(a). Where there is an HIV-1 epidemic but no fertility decline, maternal orphanhood increases to 28 per cent, 20 years into the simulation. The level and pattern of increase are consistent with those projected in earlier simulations [91].

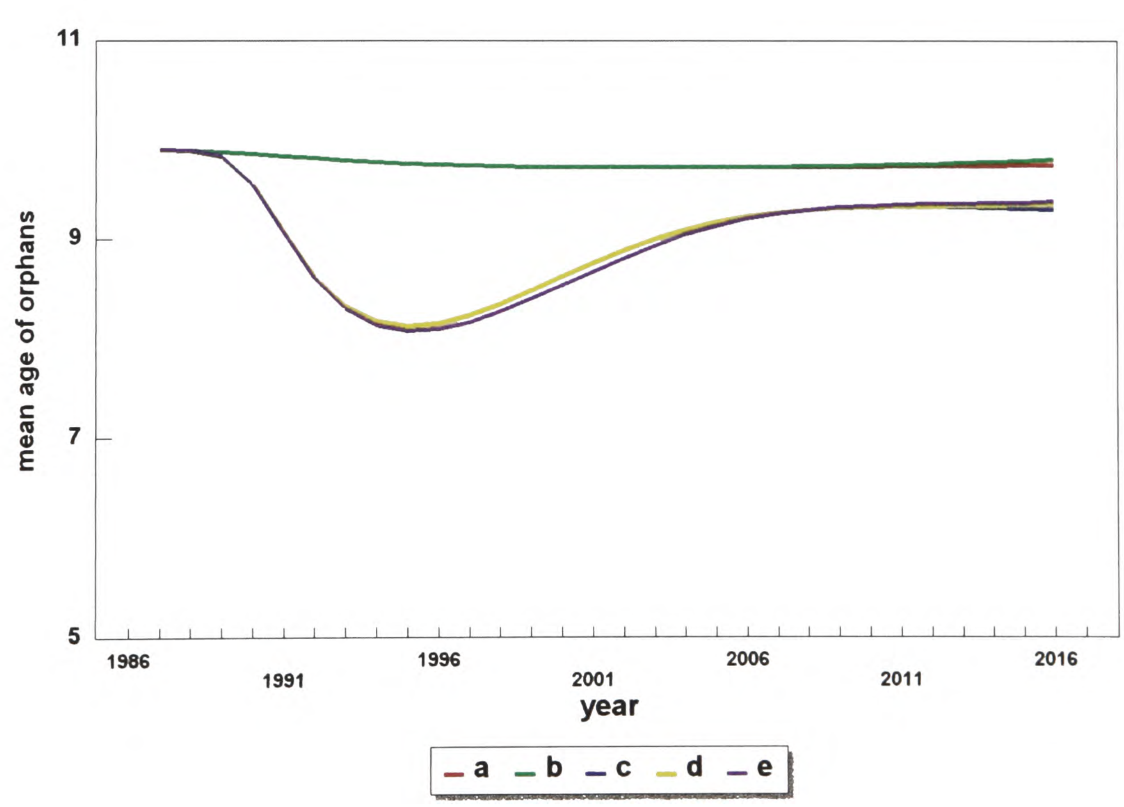
When fertility decline is included in the model, the projected levels of orphan prevalence increase significantly, due to the shift in the age-distribution of children under 15 years of age. The results of scenario (e), show that if childbearing is more concentrated at older ages, *ceteris paribus*, orphanhood levels are liable to increase further. This is because, if mean age at motherhood rises, mothers will tend to be older and thus at greater risk of having died. In addition, this shift results in lower actual fertility, as less women achieve their ultimate potential numbers of births. This accentuates the ageing in the age-distribution of the child population and results in higher proportions being orphaned.

Figure 7.9 Maternal orphanhood among children aged 0-14 years by year of epidemic

(a) Proportions of Children Orphaned



(b) Mean Age of Current Orphans



Projected changes in the mean age of orphans over time are illustrated in Figure 7.9(b). In the absence of an HIV-1 epidemic, a mean age of just under 10 years might be expected. When HIV-1 is included in the model, the orphan population becomes younger, particularly during the early stages of the epidemic. This is because periods of exposure to the risk of maternal death are similar for children of all ages in this initial period. As the epidemic progresses, the orphan population ages. However, it never quite reaches the pre-existing level, because of the excess mortality experienced by children infected with HIV-1 [91]. Inclusion of the fertility decline in the model - scenario (d) - makes little difference to the mean age of orphans. This scenario involves a reduction in the mean age at motherhood so that children are liable to be marginally older when their mothers die. In scenario (e), where the mean age at motherhood is higher, the small increase in the age of orphans disappears.

These results on prevalence and mean age of orphans, are particularly sensitive to the assumptions on rates of perinatal transmission and mortality among uninfected and infected orphans. Higher perinatal transmission and increased orphan mortality would each be expected to result in smaller proportions of children orphaned and a younger orphan population.

7.7 Sensitivity Analysis: Impact on Projected Demographic Changes of Variations in Biological and Behavioural Parameter Settings

7.7.1 Overview and Rationale for the Sensitivity Tests Conducted

A series of five further simulations have been run, to explore the sensitivity of the results just presented, to variations in the intermediate biological and behavioural determinants. The basis for each of these tests is summarized in Table 7.5.

The settings used in scenario (e), have been used for the baseline projections. One determinant only was adjusted by 20 per cent, in each case. With the current model, it was only possible to introduce these from the beginning of the period simulated. The test scenarios therefore result in different initial HIV-1 epidemics to that projected in the baseline scenario.

Table 7.5 Tests conducted to investigate the sensitivity of the projected trends in HIV-1 prevalence, adult mortality and population growth to (20%) variations in key biological and behavioural parameters

Test	**Parameter adjusted**
1	**Longer post-HIV-1 infection survival period**
2	**Perinatal transmission reduced**
3	**Less partner change among high activity groups***
4	**More assortative mixing - less contacts between high and low activity groups**
5	**Lower heterosexual transmission rates**

* see text for details

Note: All tests were conducted using simulation scenario (e). In each case one parameter was adjusted by 20% from the beginning of the epidemic. The direction of each adjustment was selected to be consistent with responses to possible HIV-1 control interventions. All other parameters were held constant.

Different combinations of parameter settings could have been used to generate a similar epidemic to that resulting from the baseline scenario. However, the objective, here, was to explore the nature and scale of influence of each determinant on the epidemic and on its demographic consequences, under plausible conditions for the other key parameters. The exercise illustrates the relative importance of the different determinants and also provides some clues as to the reasons for variations in the scale and pattern of epidemics in different populations. This was felt to be more useful in the current context than an attempt to generate and investigate alternative parameter fits to the observed epidemic.

A second, but subsidiary objective, was to study the potential impact of HIV-1 and AIDS control interventions. The directions of the parameter adjustments were selected so as to be consistent with possible changes resulting from HIV-1 interventions. The test results therefore provide some clues as to the potential impact of such interventions. However, because they are introduced from the start of the simulations, the extent of their impact, from this standpoint, is liable to be greatly exaggerated, particularly in the short to medium-term [84].

7.7.2 Specification of Individual Sensitivity Tests

The first test investigates the effects of a lengthening of the period between HIV-1 infection and death from HIV-1 related causes. Each of the stages of infection, including the final period with AIDS, were treated as having been extended by 20 per cent. It is conceivable that post-infection survival periods are longer in Zimbabwe than has been assumed in the baseline simulation. If testing and counselling services [103, 318, 319] are expanded and case management of the health of infected individuals is improved, it is possible that some lengthening of the mean survival period could be achieved.

Test 2 explores the impact of reduced perinatal transmission rates. Lower levels of perinatal transmission are generally observed in Western populations [52] and viable means of reducing the rates currently seen in sub-Saharan Africa may be discovered [103]. Furthermore, there is also some variation in reported levels of transmission within Africa [313]. In this simulation, the overall risk of perinatal transmission has been reduced from 35 per cent to 28 per cent. In both the test and original scenarios, the risk of perinatal transmission is taken as being constant, by stage of maternal infection. It is assumed that women cease to be sexually active when they develop AIDS, so the risk of an infant's being conceived by a woman with AIDS is effectively zero.

The next test, test 3, explores the effect of lower levels of sexual partner change among high activity classes. The proportions of men and women in each sexual activity class were kept constant, but heterogeneity in sexual activity between the classes was reduced. This was achieved by reducing the ratios of partner acquisition from 8:4:3:1 to 6:3:2.5:1 for males and from 49.995:2:1:0.01 to 34.995:2:1:0.01 for females. As a result, the mean number of sexual partners per annum is reduced from 3 to 2.4. The median number of partners for men is reduced slightly - from 2.33 to 2 - but there is no effect on the median for women. The pattern of mixing between age-groups and activity classes was left unaltered.

The impact of variation in mixing patterns is examined in test 4. This is done by reducing the indices of mixing between different age (e_1) and activity groups (e_2) from 0.60 to 0.48 - ie: by making mixing more assortative. Changes of this nature would be consistent with reductions in the numbers of men having contacts with commercial sex workers.

The final test investigates the impact of lower rates of heterosexual transmission of HIV-1 infection. Twenty per cent reductions are made in the risks of transmission per partnership at each stage of infection. Similar reductions are made in the risks of male-to-female and female-to-male transmission. Reduced heterosexual transmission rates would be consistent with higher levels of condom use and reductions in the prevalence of other sexually transmitted diseases. A modest counter-effect could occur, if numbers of casual relationships decline, and it is indeed the case that the chances of infection are influenced by numbers of sexual acts in short partnerships [50].

7.7.3 Sensitivity Test Results

The HIV-1 Epidemic

The progress of the HIV-1 epidemic among adult men and women under each of the test scenarios and original scenario (e) is shown in Figure 7.10. With the exception of the change in perinatal transmission (test 2), the changes in the biological and behavioural determinants each have a significant effect on the rate of development and/or ultimate size of the epidemic. The longer survival period (test 1) results in higher HIV-1 prevalence, because infected individuals remain in the population for longer periods and because they are therefore liable to cause larger numbers of secondary infections. In this test, the increase in survival period was spread evenly across the stages of infection. If the increase were concentrated within the asymptomatic period, when infected individuals are believed to be less infectious, the excess HIV-1 prevalence would be expected to be smaller.

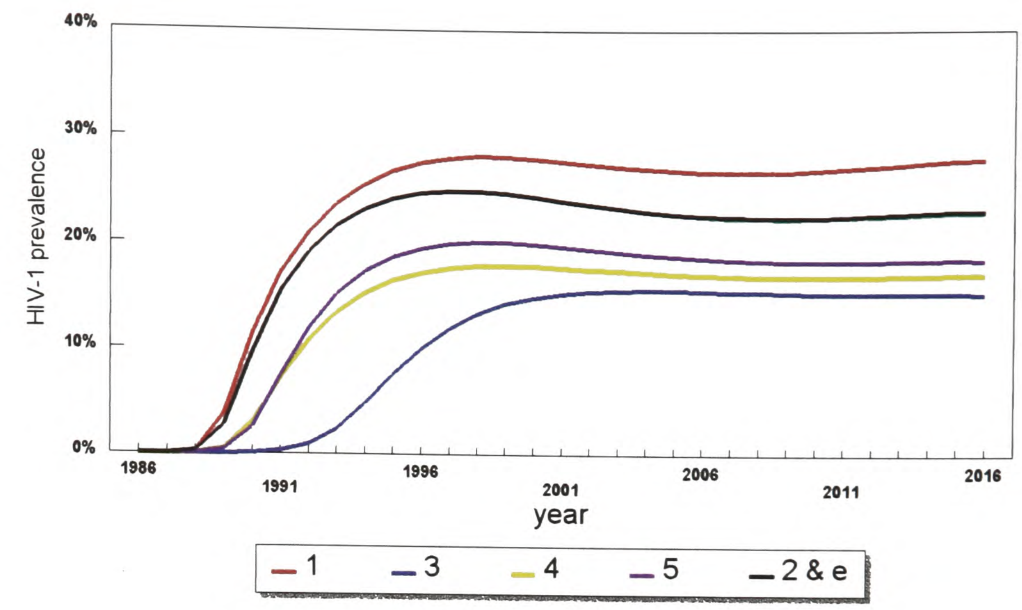
Lower sexual partner acquisition rates among high activity classes (test 3) give rise to a much slower and ultimately smaller epidemic. More assortative mixing and reduced rates of heterosexual transmission per partnership result in similar reductions in the scale of the epidemic. Ultimately, the scale of the epidemic in test scenarios 3-5 is relatively similar. The impact of the different sensitivity test scenarios appears to be slightly greater for women. With the exception of test scenario 1, the ratio of male-to-female HIV-1 prevalence levels tends to be slightly higher than in the baseline scenario - Figure 7.10(c).

Mortality Impact

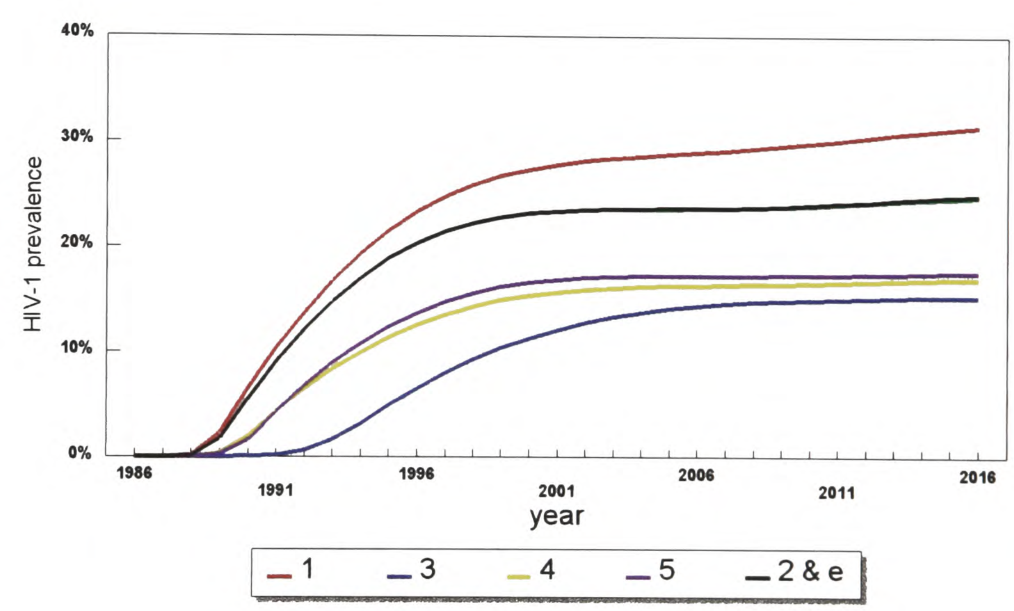
Figure 7.11 shows the effects of the various parameter adjustments on the trend in ${}_{30}p_{20}$, the probability of surviving from age 20 to age 50. Lengthening the post-infection survival time, results in small increases in mortality: the effect of a higher proportion of the population becoming infected outweighs that of more infected individuals surviving beyond age 50 years. Reducing the risk of perinatal transmission has no effect. The other adjustments result in lower mortality. The change in rates of partner acquisition brings about the greatest reduction,

Figure 7.10 HIV-1 prevalence by year of epidemic: sensitivity analysis

(a) Males aged 15-49 years



(b) Females aged 15-49 years



(c) Ratio of prevalence among males and females

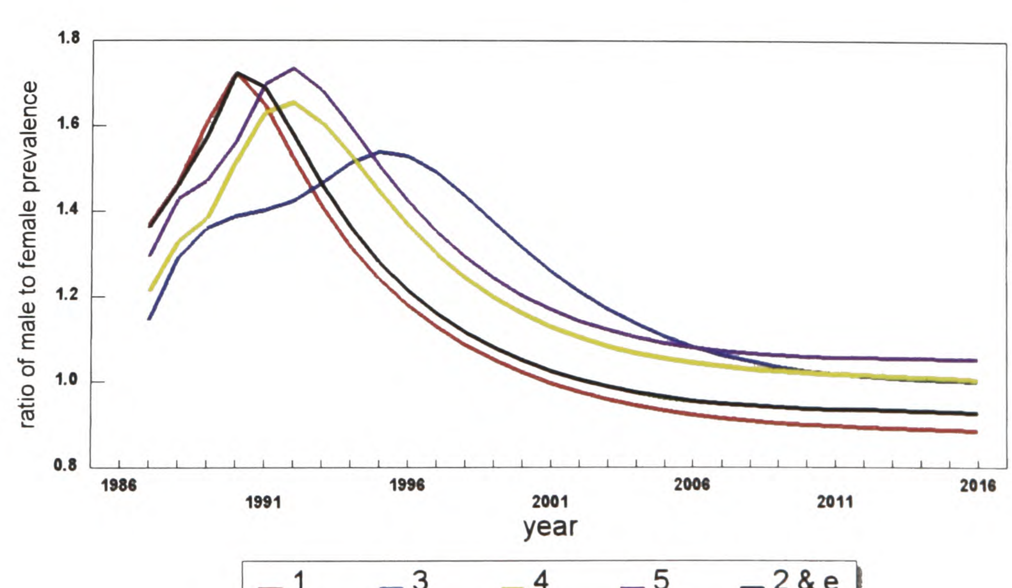
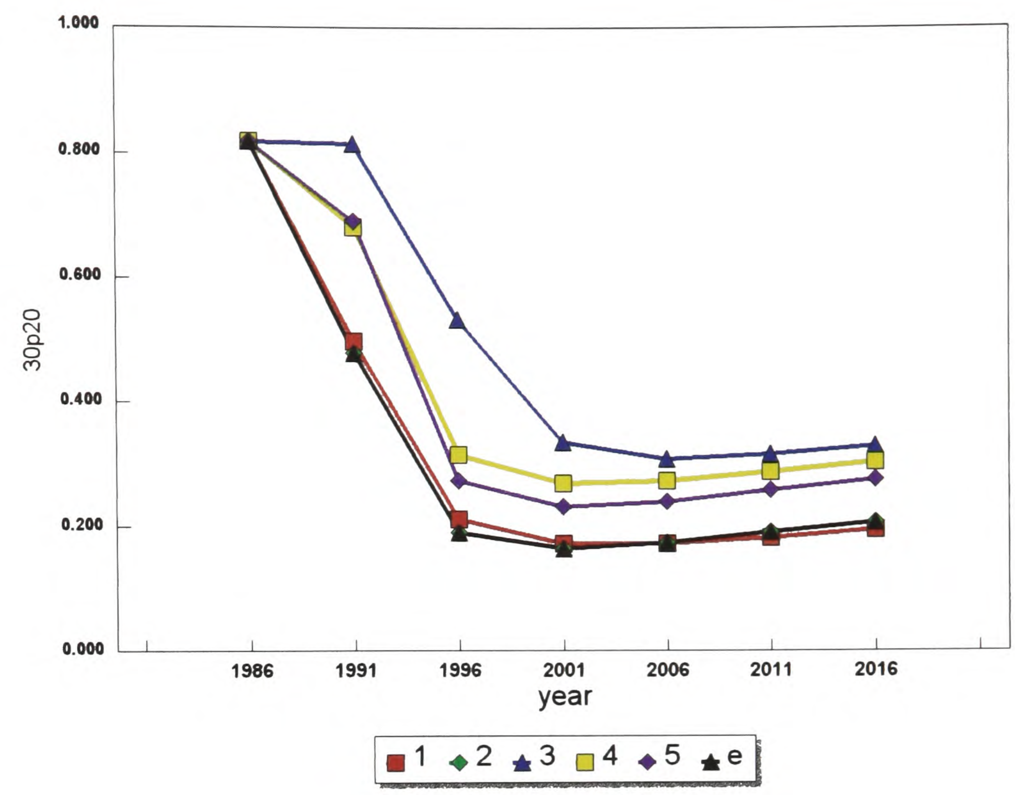
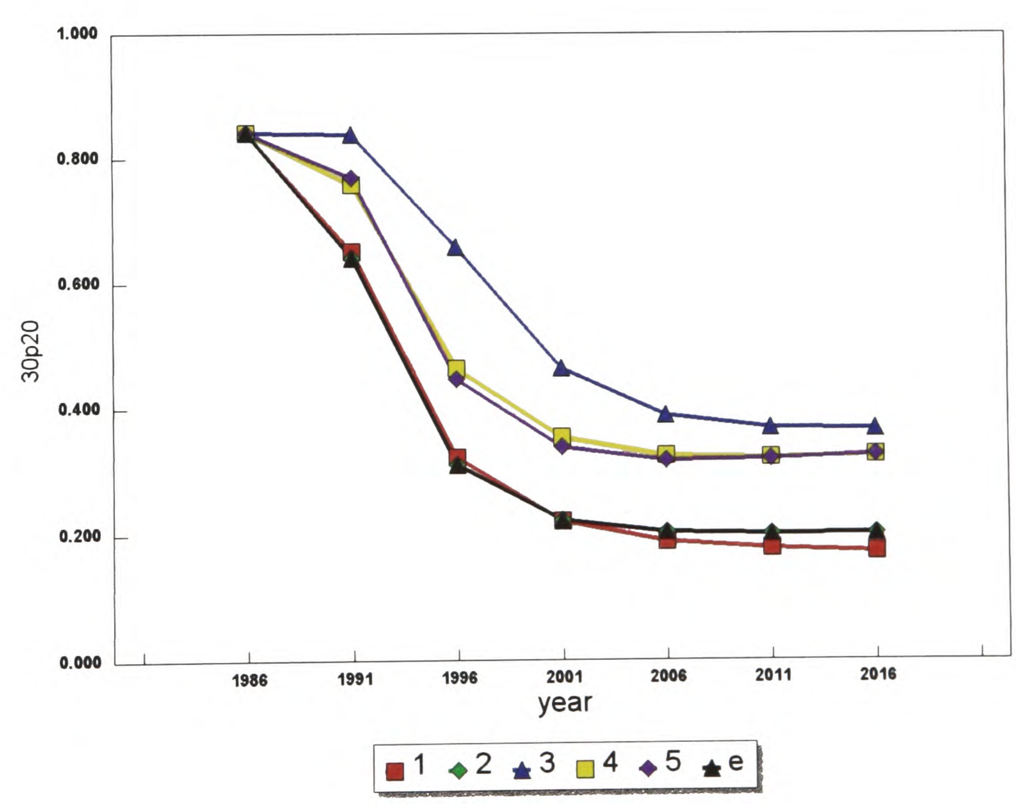


Figure 7.11 Probability of surviving from age 20 to age 50 (**30p20**) by gender and year of epidemic

(a) *Males*



(b) *Females*



as might be expected, given the smaller HIV-1 epidemic which is generated. However, even in this case, the absolute increases in mortality resulting from the simulated epidemic are extremely substantial - life expectancy at birth reduces from 55.3 years to 36.6 years for males and from 58.6 years to 39.7 years for females. The relative effects of the different test scenarios are similar for males and females. In absolute terms, they tend to result in slightly greater improvements for women.

Population Growth and Size

The impact of the various test scenarios on population growth and population size is illustrated in Figure 7.12. Reducing the rate of perinatal transmission and increasing the survival period after HIV-1 infection have very little effect on growth rates. In each of these cases, long term population growth becomes negative. The remaining three test scenarios converge to a similar positive, but much reduced, level of population growth. The extra reduction in growth over and above that resulting from the underlying fertility decline - scenario (b) - amounts to 61 per cent of that projected in the original scenario (e). Test 3, which generated the slowest epidemic, takes longer to bring about low population growth and results in rather higher population size over time.

7.8 Discussion and Conclusions

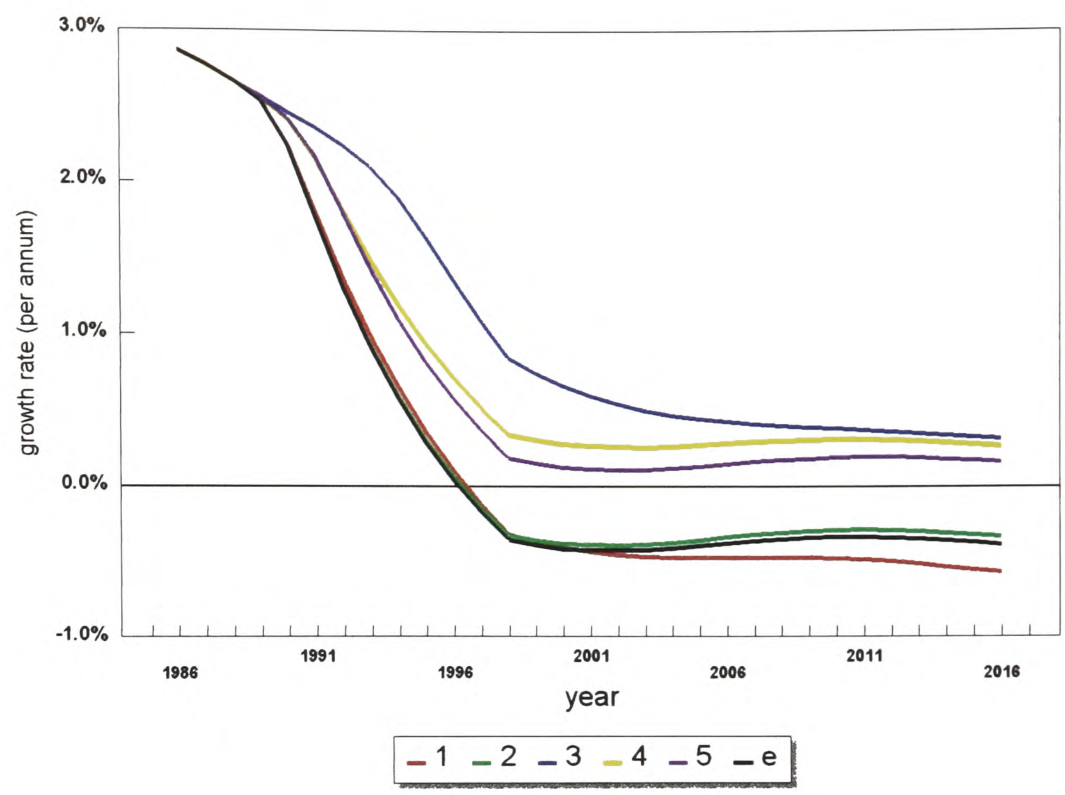
7.8.1 Effects of Combining Fertility Decline with an HIV-1 Epidemic

Strong evidence now exists for an ongoing fertility decline in Zimbabwe. It is therefore necessary to take this into account when studying the potential demographic impact of the HIV-1 epidemic in the country. It is also possible that the HIV-1 epidemic may accelerate and/or alter the shape of this fertility decline.

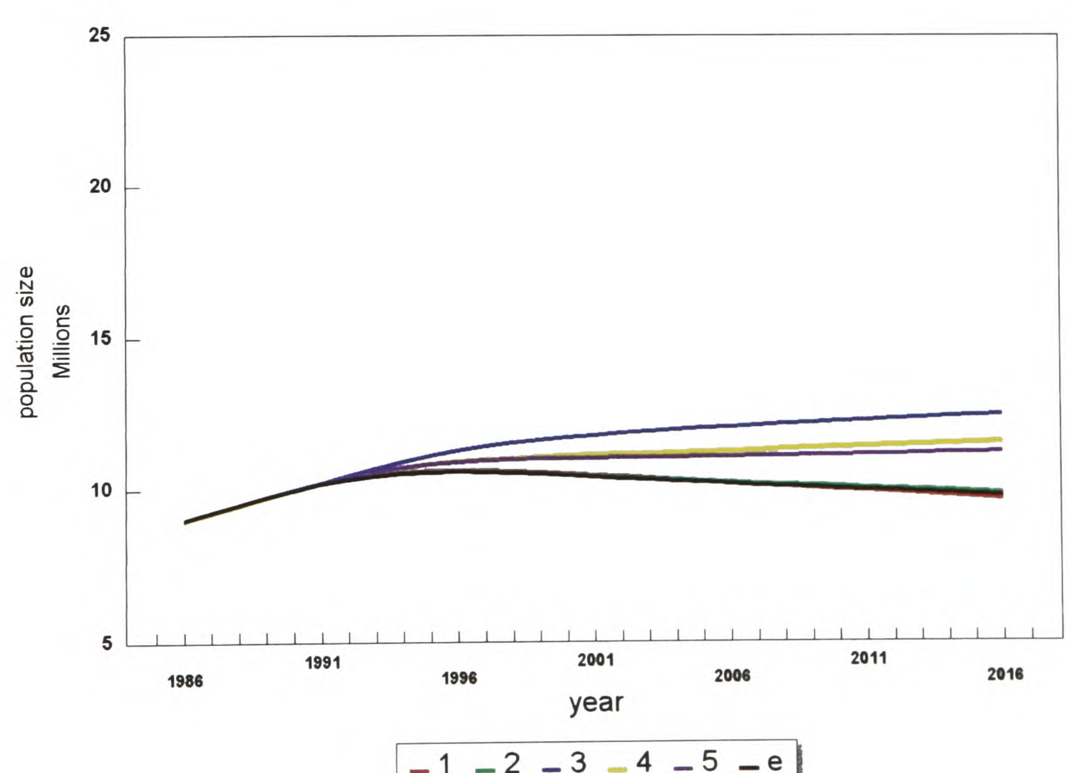
In the presence of fertility decline, HIV-1 epidemics are clearly more likely to result in negative population growth. Low rates of growth are also liable to be sustained for longer

Figure 7.12 Population growth and population size by year: sensitivity analysis

(a) Population Growth



(b) Population Size



periods in these circumstances. Fertility decline will accentuate the impact of HIV-1 epidemics on population age-structure in the medium-term and will give rise to even higher levels of orphanhood. To the extent that the HIV-1 epidemic accelerates and sustains the decline in fertility, these changes will be greater in magnitude. If there is also a shift towards older childbearing, this would result in lower overall fertility and would again add to the changes in age-distribution. Fertility declines only appear to affect the age-distribution of orphans when they involve a change in the mean age at maternity. Such a change would need to be large to result in a significant effect.

7.8.2 Sensitivity of Results on Demographic Impact to Variations in the Determinants of HIV-1 Epidemics

Findings from the sensitivity analyses indicate that the pace and extent of demographic change are both sensitive to variations in the biological and behavioural determinants of HIV-1 epidemics. However, the ultimate patterns of demographic change appear to be relatively little affected. Current estimates for some of the key parameters continue to be surrounded by a high level of uncertainty. In a number of cases, no specific estimates were available for Zimbabwe, and data from other African and even Western populations had to be used. There is therefore a continuing need for caution in interpreting the simulation results. While the parameter settings applied generate an HIV-1 epidemic, which is consistent with what is known of the true epidemic to date, the same result might have been attained by using a different combination of parameter settings. For example, a longer survival period following infection, combined with lower heterosexual transmission rates or *vice versa*. Such a combination would be expected to result in slightly less severe demographic consequences. The net effects would be relatively small in this case, because the two adjustments would largely cancel each other out. An alternative reading of the sentinel surveillance data might be that the HIV-1 epidemic has not yet peaked, but is perhaps merely plateauing following saturation within particular population groupings [4]. In this case very different combinations of parameter settings would be required and the demographic consequences would be expected to vary significantly. However, this would seem to be an unlikely scenario in the Zimbabwe context, given the size the existing epidemic has already reached and the information available about predominant behaviour patterns.

7.8.3 Implications of the Sensitivity Test Results for HIV-1 Control Programmes

The general picture is that large changes in the key determinants are needed to bring about significant reductions in the demographic impact of the epidemic. This is particularly the case given that the HIV-1 epidemic has already reached such large proportions. The existing widespread prevalence of infection means that major increases in mortality are inevitable in the short to medium-term and makes the further spread of infection more difficult to control. Combinations of interventions may be most effective and, in some circumstances, can act synergistically [41]. The intervention, which would appear to have the most potential for reducing the long-term demographic impact of the HIV-1 epidemic in Zimbabwe, would be one which reduced unprotected contacts between men with relatively low numbers of partners and commercial sex workers - ie: a combination of test scenarios 4 and 5.

7.8.4 Specific Implications for the Future Demography of Zimbabwe

Zimbabwe is clearly in the midst of one of the most severe HIV-1 epidemics yet experienced. The demographic consequences are only just emerging, but will almost certainly be profound. Mortality rates appear set to increase rapidly over the next 5-10 years. As a consequence population growth will fall sharply and significant distortions will appear in the age and sex composition of the population. These changes will be accentuated by the parallel declines in fertility.

The available sentinel surveillance data on HIV-1 prevalence indicates that there are significant regional variations in the current extent of the epidemic. These may be due to differences in the timing of onset of the epidemic in different areas and/or to differences in behaviour patterns. For example, the lower current level of HIV-1 prevalence in the Rusitu Valley compared to that recorded in the Honde Valley could reflect its more remote location and lower level of development. This could have resulted in a later and slower introduction of the epidemic. The data available on recent mortality levels and trends is limited. However, there are suggestions that women in Rusitu are relatively more affected by the epidemic than their counterparts in the Honde Valley *vis-a-vis* men. If this were indeed the case, the simulation results show that it could be explained by differences in the heterogeneity of sexual activity, by gender, and by differences in mixing patterns.

The nature and extent of recent and future behaviour changes in response to the HIV-1 epidemic are poorly understood and are not accounted for in the model simulations. The results presented in Chapters 3, 4 and 6 provide some evidence that behaviour changes have begun to take place and that further changes might be expected, as the full effects of the epidemic become more apparent locally. However, it is difficult to assess the sustainability and future extent of these changes. To a large degree, the damage has already been done. The demographic impact of the HIV-1 epidemic over the next ten years or so is now reasonably predictable, in the absence of a major medical breakthrough. However, behaviour changes now, which are sustained into the future, would be expected to reduce the longer-term scale and demographic consequences of the epidemic.

The socio-economic consequences of the projected demographic changes have not been investigated in any depth in this study. However, the combined impact of high rates of adult morbidity and mortality, dramatically increased levels of orphanhood and a disfigured population age and sex-distribution will place extreme strains on current social and economic structures.

7.8.5 Implications for other sub-Saharan Countries

The simulations presented in this chapter have been developed to represent the Zimbabwe situation and care must be taken not to extrapolate the results too widely. However, there are a number of points which emerge, which would seem to be of wider relevance.

Considerable variations have been reported in the impact of the HIV-1 epidemic between different populations in the sub-Saharan region [320]. Findings from the current and earlier studies emphasise how important behaviour patterns can be in determining the size and shape of HIV-1 epidemics and their demographic consequences [52]. For example, the pattern of behaviour found in Zimbabwe and in some other African countries - eg: Cote D'Ivoire [321] - results in a very different sex ratio among infected individuals, in the early years of an epidemic, from that which was found, when contrasting behavioural data from other African societies were applied in earlier simulations [78, 91]. The sensitivity analysis results re-emphasize how different patterns of behaviour can result in variations in both the pace and size of HIV-1 epidemics [30], even where overall rates of partner acquisition are held constant. The empirical results from this study reveal that different behaviour patterns - in this case, differences in marriage patterns provide the most clear-cut example - can exist between and indeed within neighbouring communities. It therefore seems highly likely that differences in the behavioural determinants account for much of the regional variation in the impact of the HIV-1 pandemic.

Differences in the biological determinants of the spread of HIV-1 may also contribute to the observed regional variation. The length of the survival period after infection with HIV-1 may vary, for example, as a consequence of different patterns of opportunistic diseases. Infectiousness rates may also vary, perhaps due to the presence of different strains of HIV-1 infection. Behavioural and biological factors could interact here, as it is believed that male circumcision may reduce infectiousness, possibly via the reduced incidence of other sexually transmitted diseases which act as co-factors in the transmission of HIV-1 [56-58]. Variations in the nature and extent of condom use would also result in differences in transmission rates through heterosexual intercourse.

Fertility decline is also thought to be under way in a few other countries in sub-Saharan Africa - Botswana and Kenya are examples. But there is still little or no evidence of a decline in the majority of countries. The wider relevance or otherwise of consideration of the combined effects of HIV-1 epidemics and fertility declines is therefore unclear. As was noted in Chapter 6 [106], the nature of any impact of the HIV-1 epidemic on the proximate determinants of fertility is likely to vary, according to the local culture. Pre-existing patterns and trends in contraceptive use are likely to be particularly important.

Finally, it should be noted that international migration has not been taken into account in the simulations. It has been an important factor in the demography of Zimbabwe, in the recent past, and could be so again in the future. The same may be true in many other countries in the region, especially in areas where there are civil wars, famines etc., which result in large numbers of refugees.

CHAPTER 8

Conclusions

Village Development Committee (VIDCO) Chairman, Nyatsanza Village, Honde Valley, 1995.

8

Conclusions

8.1 Introduction

Detailed conclusions on each of the topics covered by this document are given at the ends of the preceding chapters. This final chapter provides a brief summary and discussion of the main points arising from the study, with reference to the objectives set out in Chapter 1.

8.2 Recent Patterns and Trends in HIV-1 Prevalence and of Demographic Change in the Honde and Rusitu Valleys

HIV-1 prevalence has reached high levels among pregnant women in each of the two rural areas studied. Higher levels have been reported in some urban areas in Zimbabwe and elsewhere in sub-Saharan Africa, but rarely in rural locations. HIV-1 prevalence appears to be higher in the Honde Valley, particularly if Marange Apostolics are excluded from consideration, but differential impact of selection bias in the antenatal clinic data make comparisons between the two populations difficult [322].

Some evidence was found for recent reversals in the long-term improvements in infant and adult mortality. Increases in mortality were found to be concentrated in the 20-45 year age range, which, in the light of results from other empirical and theoretical studies, suggests that HIV-1 infections may be a significant factor. The trends in death registration, by cause of death, are consistent with this view.

Fertility appears to have been in decline in each of the study populations since the late 1970s. The decline in the Honde Valley seems to have begun more quickly than that in Rusitu, but is concentrated among non-Apostolics. In both areas, declines have been spread over all ages and have been accompanied by reductions in desired family size, increases in contraception and delayed marriage. The pill is the most popular method of contraception and there is little use of permanent methods of family planning. Condom use as a contraceptive is low but increasing. Levels of pre- and extra-marital fertility were low, if other long-term unions are treated as marriages.

Migration is common in both populations. This consists primarily of circular labour or other work-related migration and, for women, moves associated with marriage. Large numbers of men and women reported regular visits to urban areas.

8.3 Socio-Economic and Intermediate Determinants of Sexual Behaviour, HIV-1 Infection and Demographic Change

The quality of the quantitative data collected on sexual behaviour was mixed and confined to women. Therefore, it is only possible to derive limited information on the determinants of high-risk behaviour using these data. However, further useful insights were gained from the qualitative data obtained in the study. Extensive high-risk behaviour was noted, particularly among men and non-married women. The majority of men appear to have extra-marital relationships, often after drinking alcohol at bars and beerhalls. Men justified these relationships on grounds of labour migration and female post-partum abstinence. Many divorced women, as well as some single women and widows, are involved in commercial sex work. Most currently married women are understood to be strictly monogamous. Just under a third of women in both areas have polygynous husbands. In the Honde Valley, polygyny is closely associated with the Marange Apostolic religion. Condom use is generally regarded as unacceptable in long-term unions, but has recently gained more widespread approval within casual relationships, as a means of controlling sexually transmitted diseases. The extent of contemporary condom use in casual relationships is difficult to assess, given the association with alcohol consumption and possible reporting bias, but appears to be rising.

Apostolics abstain from drinking alcohol. Within the stricter sects, men are understood to refrain from extra-marital relationships, and use of modern contraceptives, including condoms, is prohibited. Secondary education is associated with better understanding and enhanced awareness of the risk of HIV-1 and AIDS, among women. There is also some evidence that greater knowledge and risk awareness increases the chances of behaviour change to avoid HIV-1 infection.

The faster spread of HIV-1 infections within the Honde Valley population is consistent with findings elsewhere, which indicate earlier spread in more urban and more developed areas - eg: Rakai, Uganda and Mwanza, Tanzania [115, 253]. HIV-1 infection among pregnant women was found to be associated with younger age and non-marriage. In Rusitu, women with secondary education are currently more likely to be infected. No data are available at present on HIV-1 prevalence by religion, migration history or husband's characteristics, factors which also seem likely to be significant determinants of female infection.

Mother's education, father's education (Rusitu) and religion (Honde) were important determinants of infant mortality, historically. However, the influence of religion, in particular, appears to have changed in recent years. Children of non-Apostolic parents seem to be at increasing risk of infant death relative to those with Apostolic parents. Analysis of recent levels and trends in adult mortality also provides indirect evidence that HIV-1 infections may have spread most rapidly among non-Apostolics in the Honde Valley and among males generally. The results from the mathematical model simulations show that this pattern of mortality change is consistent with the information obtained on behaviour patterns. However, these indicate that increases in female adult mortality will follow shortly. The relatively modest increases in mortality, to date, set against the high current levels of HIV-1 prevalence, *could* reflect a longer median incubation period than has been estimated for population sub-groups studied in Kenya and Uganda [10, 77]. Alternatively, this situation could indicate a recent rapid spread of HIV-1 infections into these areas.

8.4 Early Impact of the HIV-1 Epidemic on Trends and Patterns in the Proximate Determinants of Fertility

It was not possible to detect an overall effect of HIV-1 on fertility within the study populations. This may have been due, in part, to compensating adjustments in the proximate determinants. However, the principal reason, is that widespread changes in behaviour are unlikely to be seen until the impact of HIV-1 infections on morbidity and mortality is clearly visible, and is recognized and acknowledged by the local population. This stage has yet to be reached in the local AIDS epidemics. To a degree, full local recognition may be delayed by traditional and other religious beliefs regarding the nature of illness and appropriate health-seeking behaviour. Ethical constraints on the design of the study prevented any assessment of trends in fertility among infected and uninfected women.

Key socio-economic determinants of female fertility levels include age, marital status, education and religion. Each of these is believed to be associated with risk of HIV-1 infection. The association between secondary education and fertility was particularly strong. Increased secondary education among cohorts of women attending school after Independence, together with improved availability of family planning services, probably accounts for much of the recent decline in total fertility. Together with the past National Family Planning Council emphasis on short-term methods for child spacing rather than more permanent methods for prevention of further births, this trend in education would seem to explain the relatively even decline in age-specific fertility rates over all ages.

There is also a high degree of overlap between the intermediate determinants of HIV-1 epidemics and the proximate determinants of fertility - eg: in respect to the roles of abstinence, coital frequency, condom use, breastfeeding and so on. Some women appear to have adopted behaviour changes in response to the HIV-1 epidemic which have consequences for fertility and family planning programmes. The numbers of women involved are relatively small, but their actions could provide indications of the nature of the more extensive changes which might be expected in the future, as the AIDS epidemic develops. There was evidence of increased condom use and a shift towards preference for condoms rather than contraceptive pills. Some couples were using combinations of methods. Women with greater knowledge and awareness of the risks of HIV-1 and AIDS were more likely to have deferred sexual activity and marriage. Women who knew of the additional risk of perinatal transmission of HIV-1 infection due to lactation tended to breastfeed their children for shorter periods. Post-partum abstinence was cut short by women who feared their husbands might take other partners. Divorcees who were more aware of HIV-1 and AIDS were more likely to have remarried.

If the small marginal increase in risk of perinatal infection and the wider benefits of breastfeeding are stressed, these changes would tend to result in a slight acceleration in the pace of fertility decline, with a continued concentration of fertility at older ages. Reductions in breastfeeding and abstinence could be harmful to maternal and child health, but would have limited impact on fertility, given the high levels of contraceptive use which are now current among sexually active women. Marange Apostolic women, who are the main exceptions to this, were less likely to report themselves as being at risk of HIV-1 infection. The mathematical model simulations show that a delay in childbearing would tend to result in a modest additional reduction in population growth, beyond that which would be expected as a result of increased mortality and the more typical age-pattern of decline in total fertility.

The range of behaviour changes which can be adopted to avoid HIV-1 infection is limited. Essentially, this boils down to reduced partner change, abstinence and condom use. The socio-economic determinants of sexual behaviour change can be seen as a mixture of incentives and obstacles. Increased knowledge and awareness of the risks of HIV-1 infection appear to follow *inter alia* from greater education and close personal experience of AIDS, and strengthen the incentives. However, socio-economic pressures including cultural and religious norms, poverty and low status of women, may provide effective obstacles to behaviour change. For women, marital status appears to be an important determinant. For monogamous married women, consistent abstinence and condom use are unlikely to be viable, given the association between condoms and commercial sex, and the need to bear children. However, it should be noted, in passing, that condom use as a method of family planning could provide effective protection for many women, particularly if it is the case that infectiousness varies within the AIDS incubation period. If this were so, the peak infectiousness period would often coincide with a period of condom use. In theory, single, divorced and widowed women have more options. However, the particular social and economic pressures they face, can also result in their having unprotected sex with infected partners.

The study results indicate that some behaviour changes are occurring in spite of these obstacles. This may reflect the increase in female education and the growing strength of concern about AIDS. There were indications in the Honde Valley that women are now more prepared to question and challenge male behaviour and areas of traditional male dominance, including decisions on use of family planning methods.

8.5 Implications for the Development of Theoretical Models of the Determinants and Demographic Impact of HIV-1 Epidemics in sub-Saharan Africa

The limited information obtained on sexual behaviour indicates heterogeneity in rates of partner change among women in rural areas of Zimbabwe and relative homogeneity among men. The predominant mixing pattern appears to be dis-assortative, with men forming partnerships with women with high and low rates of partner change. Mathematical model simulations, based on this pattern of partner change, indicate an earlier epidemic and mortality increase among males. Little empirical data is available on HIV-1 prevalence among males, in the general population, but these findings are consistent with the observed patterns of AIDS and TB morbidity and of adult mortality. Different levels and patterns of partner change may be present in other populations and would be expected to give rise to different patterns of demographic change.

There was some evidence of behaviour change in response to the HIV-1 and AIDS epidemics, but this was difficult to quantify. If confirmed, these changes should be reflected in future model simulations of HIV-1 epidemics and their long-term demographic impact. Fertility has been declining in rural areas of Manicaland, as in other parts of Zimbabwe. Simulations confirm that fertility assumptions have a major effect on projected demographic trends and can accentuate the patterns of change associated with HIV-1 epidemics. Best estimates of future fertility trends, including age-specific changes, should be built into future projections. HIV-1 related changes which affect the proximate determinants of fertility, including possible biological effects, should be taken into account.

8.6 Best Estimates for the Future Demographic Impact of the HIV-1 Epidemic in Zimbabwe for Use in Health and Socio-Economic Development Planning

New national projections for Zimbabwe, based on information obtained in this study, were presented in Chapter 7. These indicate further increases in morbidity and mortality, particularly among women and young children, greatly reduced population growth, with negative growth a possibility if fertility continues to decline, an age-structure dominated by teenagers and people in their early twenties, relative shortages of older men and in the longer term, middle-aged women, and major increases in proportions of children currently orphaned, with a tendency towards younger orphans. In view of the projected changes in the age-structure of the population, *absolute* increases in numbers of orphans may be more modest.

Behaviour changes will moderate the projected demographic trends. However, it has been shown that these are slow to take effect [84] and the results of sensitivity tests carried out in this study, support the view that changes will need to be extensive to have a significant effect on the long-term demographic and social impact of the epidemic.