Joint United Nations Programme on HIV/AIDS

UNAIDS

UNHCR • UNICEF • WFP • UNDP • UNFPA
UNODC • ILO • UNESCO • WHO • WORLD BANK

Evidence for HIV decline in Zimbabwe:

a comprehensive review of the epidemiological data

Cover photo:
Traditional feast in Chirumbira, southern Zimbabwe.
Photo credit:UNAIDS/L.Alyanak
back cover photo:
Mrs. Esta Zimombe (right) works for FACT (Family AIDS Caring Trust), which organizes campaigns to make the local population more aware of the dangers of HIV infection. Here she is distributing free condoms near the market and bus station of Mutare, Zimbabwe.
Photo credit:UNAIDS/M.Szule-Kryzanowski

UNAIDS/05.26E (English original, November 2005)

WHO Library Cataloguing-in-Publication Data

Evidence for HIV decline in Zimbabwe : a comprehensive review of the epidemiological data.

"UNAIDS/05.26E".

1. HIV infections - epidemiology. 2. HIV infections - transmission. 3. Zimbabwe. I. UNAIDS

ISBN 92 9 173461 6 (NLM classification: WC 503.4.HZ7)

UNAIDS – 20 avenue Appia – 1211 Geneva 27 – Switzerland
Telephone: (+41) 22 791 36 66 – Fax: (+41) 22 791 41 87
E-mail: unaids@unaids.org – Internet: http://www.unaids.org

Evidence for HIV decline in Zimbabwe: a comprehensive review of the epidemiological data

Joint United Nations Programme on HIV/AIDS
UNAIDS
UNHCR • UNICEF • WFP • UNDP • UNFPA
UNODC • ILO • UNESCO • WHO • WORLD BANK

Acknowledgements

UNAIDS would like to acknowledge the contributions of Dr. Simon Gregson, Imperial College, London, UK and Biomedical Research and Training Institute, Harare, Zimbabwe, in preparing this document.

UNAIDS would like to also acknowledge the following groups of people for their contributions:

For providing data and assisting with data analysis: E. Corbet (BRTI/LSHTM), S. Greby (CDC Zimbabwe), G. Bicego (CDC), M. Wellington (CEPHI), A. Chikutsa (CSO), S. Dube, A. Mahomva, E. Gonese (MOHCW), T. Mapako (NBTS), C. Makufa (PACT), N. Taruberekera (PSI), C. Benedikt (UNFPA), S. Saito (UNICEF), F. Cowan (UCL), R. Mutsandira, G. Woelk (ZICHIRE), J. Hargrove (ZVITAMBO). T. Hallett (ICL) developed and ran the mathematical model simulations, R. Dorrington (University of Cape Town) kindly provided analyses for the section on mortality, and B. Zaba and E. Slaymaker (LSHTM) provided a template for the analysis of median age at first sex. Data from MEASURE Evaluation, FHI, JSI, PSG and private sector sources were also made available and included in the review process.

For discussions in the 7th June 2005 Zimbabwe stakeholders meeting, Harare: E. Corbet (BRTI/LSHTM), S. Hader, S. Greby (CDC Zimbabwe), A. Chikutsa (CSO), D. Whyms (DfID), L. Dart, I. Araujo (IOM), A. Mahomva, E. Gonese, G. Ncube (MOHCW), T. Mapako, L. Marowa (NBTS), C. Makufa (PACT), Y. Madan, N. Taruberekera (PSI), K. Dehne (UNAIDS), C. Benedikt, S. Manyenya, A. Schuller (UNFPA), R. Monasch, T. Mah, N. Moodie (UNICEF), P. Halpert (USAID), R. Mutsandira (ZICHIRE), J. Hargrove (ZVITAMBO).

For discussions in UNAIDS Reference Group on Estimates, Modelling and Projections: participants in the November 2004 Harare meeting of the Reference Group.

CONTENTS

1.0 INTRODUCTION

1.1 Background

Zimbabwe has experienced one of the largest HIV epidemics in the world. The first case of AIDS was identified in 1985 and by 1990—the first year of national antenatal-clinic based surveillance—HIV prevalence was estimated to already exceed 10%. The country's first national estimate, produced in 2003, indicated that HIV prevalence amongst adults had reached 24.6% (range 20–28%)[1]. In part, the scale of the epidemic at country level reflects it's widely disseminated nature. HIV prevalence in small towns, farming estates and mines located in rural areas (35%) exceeds that in the major cities (28%), whilst transmission into and within subsistence farming areas is also extensive (21%).

This pattern of spread almost certainly reflects aspects of the country's relatively high level of development, colonial legacy and local culture[2,3]. Thus, for example, men, especially, have frequently taken up employment in cities, towns, plantations and mines, and have utilized the country's well-developed transport infrastructure to maintain and make regular visits to their families in their traditional rural homes. Large income and gender inequalities have led to the establishment of local sexual networks that facilitate transmission even in rural areas[4]. However, now that the realities of the epidemic are well recognized, it is possible—and to be hoped—that other aspects of development, such as the country's still high levels of secondary school education, will contribute to an accelerated decline in HIV infection rates[5].

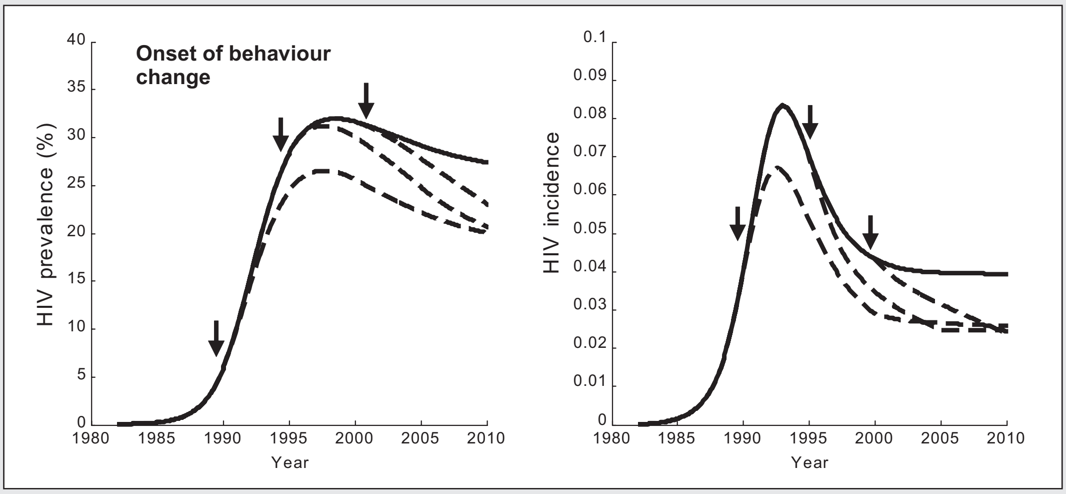
Recent data from the national antenatal clinic surveillance system suggest that HIV prevalence has indeed begun to fall in Zimbabwe in recent years[6]. However, caution is warranted since trends in antenatal clinic data can be subject to bias or changes in the nature or rigour of surveillance methods.

A decline in HIV prevalence at the national level is intrinsically a positive and an important development in that it represents a reduction in the burden of infection within the population. If maintained, this is likely to translate into lower mortality within a timescale of five to ten years. However, a decline in HIV prevalence is neither a necessary nor a sufficient indication of programme impact. Rapid declines in HIV prevalence are unlikely to arise through the natural dynamics of HIV epidemics and can therefore be taken as indicative of substantial intentional changes in behaviour. Such changes in behaviour will, at least in part, reflect a combination of knowledge of the basics of modes of HIV transmission linked to a growing personal experience of the realities of AIDS morbidity and mortality.

A further complication is the complex relationship between the timing of behaviour change and trends in HIV prevalence and incidence[7]. Both prevalence and incidence of HIV infection can rise and fall naturally during the course of an HIV epidemic as infection spreads into and within different population risk groups[8].

Figure 1

Mathematical model projections of the impact of a change in sexual behaviour commencing in 1990, 1995 and 2000 on trends in: (a) HIV prevalence, and (b) HIV incidence. In each case, the change in behaviour is a doubling of condom use and a 25% reduction in sexual partnerships occurring over a five-year period from the year of commencement.



For each measure, behaviour change early in an epidemic can lead to a slowing in the rate of increase (Figure 1). Equally, behaviour change may occur after an epidemic has reached its natural peak, in which case, it will tend to accelerate the subsequent decline. Thus, behaviour change may hasten, sustain and reinforce declines in HIV incidence and prevalence but the timing of its onset may precede or follow the timings of onset of the declines in HIV incidence and prevalence. In view of these complex relationships, particular caution is needed before interpreting a short-term decline in HIV prevalence as a sign of behaviour change or programme impact.

Despite these difficulties, some reasonable indications of the contribution of behaviour change to reducing the burden of infection can be drawn where it is possible to delineate the temporal trends in HIV incidence, mortality and selective migration amongst infected individuals—which together determine the trends in HIV prevalence—and where patterns and trends in sexual behaviour can also be analysed.

In this report, we assess the validity of the decline in HIV prevalence observed at antenatal clinics in Zimbabwe by examining these data closely from an epidemiological perspective and by assessing their consistency with epidemiological and behavioural information from a range of other national sources and in-depth local community studies. Using the available behaviour data and comparison of observed trends in HIV prevalence with counterfactual trends in HIV prevalence—i.e. those expected in the absence of behaviour change—generated by fitting an epidemiological model, we assess the plausibility that behaviour change has contributed to the recent trends in HIV prevalence and incidence.

1.2 Objectives

The objectives of the report are:

- to determine whether there is evidence for a stabilization or decline in HIV prevalence in Zimbabwe;
- to determine the contributions of recent trends in HIV incidence and HIV-associated mortality to trends in HIV prevalence; and
- to assess the contribution of past and recent changes in sexual behaviour to recent trends in HIV prevalence and incidence.

It was not intended to establish the contributions of different programmes to trends in HIV infection and associated behaviours in the current exercise.

1.3 Approach and Methods

The findings in this report are based on information collected in an epidemiological review of data on the HIV epidemic in Zimbabwe carried out between November 2004 and June 2005. Given the aim of assessing temporal trends, it was not feasible or appropriate to collect new primary data. Instead, a review of secondary sources was conducted in a manner intended to be as comprehensive as possible, drawing upon data from all known HIV epidemiological surveillance sources. In addition, data were sought from programmes and research studies not conducted primarily for surveillance purposes but in which it was thought useful surveillance data might have been obtained for routine monitoring and evaluation purposes or as a by-product of the scientific research.

As a first step, a list of organizations and contacts believed to be potential sources of surveillance data was drawn up and formal request letters were sent by UNAIDS. These letters were followed up with e-mail requests and meetings were held between members of the review team and the organizations concerned to identify and obtain copies of the relevant data. In many cases, secondary analyses of the original data had to be conducted, since the data had not been prepared or analysed for surveillance purposes. This was done either by the organization that collected the data or by the review team.

On receipt of data from the contributing organizations, the review team synthesised and analysed the data obtained on HIV prevalence and incidence, mortality and sexual behaviour.

A secondary aim of the review was to seek to establish an international and local consensus on the findings on recent trends in the HIV epidemic in Zimbabwe. To this end, two stakeholder meetings were held to review the data obtained and analyses conducted. On 16th November 2004, findings from the main data sources were presented and considered at an international meeting of the UNAIDS International Reference Group on Estimates, Modelling and Projections held in Harare. On 7th June 2005, a further one-day meeting was held at the UNAIDS offices in

Harare. This meeting was attended by leading local and locally-based HIV research scientists and representatives of the sponsoring organizations, the United States of America Centers for Disease Control and Prevention, United Nations Family Planning Association, the World Health Organization, the Zimbabwe Ministry of Health and Child Welfare, major bilateral donors, and other organizations that had contributed data for the exercise. Participants at the meeting conducted a detailed and comprehensive review of the data on trends in HIV prevalence, HIV incidence, mortality and sexual behaviour change, and agreed on interpretations for each of these major aspects. The material presented at these meetings and supplementary data and analyses recommended by participants for inclusion in the review are summarized in this report. The interpretations placed on this material at these meetings form the basis for the conclusions presented in this report.

2.0 RECENT TRENDS IN HIV PREVALENCE

2.1 Data Sources

To date, the Zimbabwe Young Adult Survey 2001-2002[9] is the only nationally-representative source of population-based data on HIV prevalence. This survey has been useful for calibrating levels of HIV prevalence estimated from antenatal clinic surveillance and other sources and in generating and validating national estimates. However, the purpose of the current review is to evaluate *trends* rather than levels in HIV prevalence in the general population. Currently, these can only be inferred from those observed in pregnant women attending for check-ups at antenatal clinics and from data on other population subgroups. Fortunately, Zimbabwe has national antenatal clinic surveillance data dating back to 1990 and a wealth of data on HIV prevalence trends from other national programmatic sources (e.g. prevention of mother-to-child transmission and voluntary counselling and testing) as well as in-depth localized scientific research studies.

In this section, we present and review these data grouped by the population subgroup for which they were obtained. In each case, issues of interpretation, including the effects of any data quality concerns and sources and changes in bias, were considered carefully in the review. These are described briefly in this report before conclusions are drawn on the overall evidence for the population subgroup or data type in question. Conclusions on evidence for change in HIV prevalence in the general population were derived by triangulating the evidence from the different population subgroups and are presented in the final section of the report.

2.2 Pregnant Women

2.2.1 Introduction

Collection of national HIV surveillance data at antenatal clinics on an unlinked anonymous basis was first recommended by the World Health Organization in 1989[10] as being a convenient, inexpensive and ethical means of obtaining data on trends in HIV prevalence within the general adult population in generalized epidemics. Despite HIV prevalence typically being higher in women than in men and a number of other biases in data from pregnant women, subsequent studies have found that HIV prevalence in the latter is generally quite close to that amongst male and female adults combined[11]. Nevertheless, the male-female ratio of infection and the effects of other biases caused by factors such as the concentration of pregnancy and HIV-infection risks amongst those who are more sexually active at young ages and sub-fertility in HIV-infected women at older ages can change over the course of an epidemic[12,13]. Trends in HIV prevalence measured in national surveillance systems may also be affected by changes in site selection or categorization and changes in data collection and laboratory procedures. Thus, trends in HIV prevalence measured in pregnant women must be interpreted carefully and validated whenever possible.

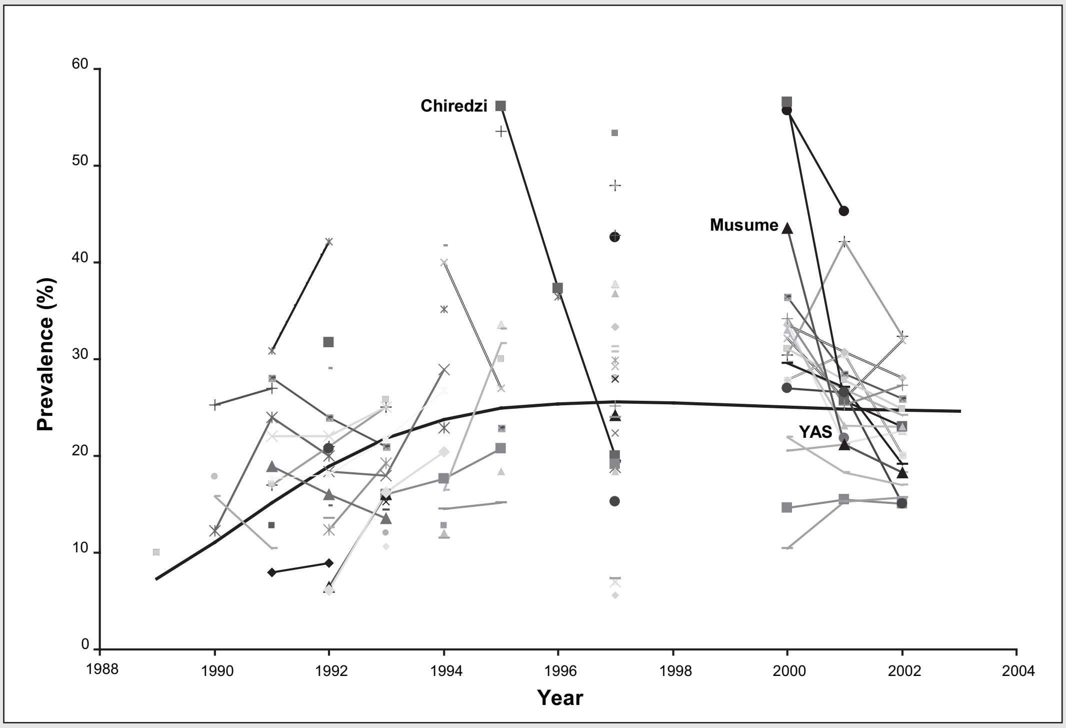
Data on trends in HIV prevalence among pregnant or postnatal women are available in Zimbabwe from the national surveillance system, from the national prevention of mother-to-child transmission programme records, and from research studies conducted in Harare and Manicaland, Zimbabwe's eastern province. The evidence from each of these sources is reviewed in the following sections.

2.2.2 National Antenatal Clinic Surveillance

The national HIV surveillance system was established in Zimbabwe in 1990. In the early years, the selection of sites changed somewhat from year to year and few details are accessible on the field and laboratory methods used. For some sites (e.g. Chiredzi and Musume), large fluctuations were observed between successive rounds of surveillance. However, HIV prevalence appears to have continued to increase steadily in the early to mid-1990s and to have stabilized at some point in the late 1990s (Figure 2).

Figure 2

Estimates for individual sites included in Zimbabwe's national antenatal clinic HIV/AIDS surveillance system, national estimate from the Zimbabwe Young Adult Survey (YAS) 2001-2002, and trends in HIV prevalence in adults aged 15–49 years as projected in EPP[1]. *Reproduced from Mugurungi et al. 2005*[14].

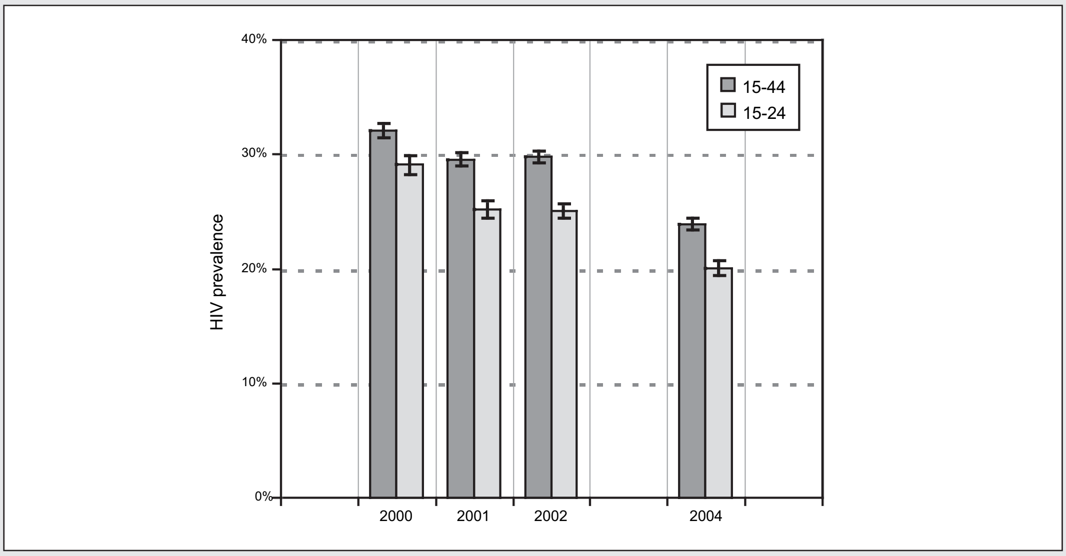


Improved methods of HIV surveillance were introduced in 2000 which incorporated expanded coverage, particularly in rural settings, more consistent site selection and field procedures, and detailed documentation of the procedures used[15]. For HIV testing, a Genscreen test was utilized in 2000. However, evaluations of this test undertaken in the 2002 round of surveillance, indicated that it had a low specificity under the field conditions found in Zimbabwe and typically produced over-estimates of HIV prevalence[16]. Whilst a new test algorithm was adopted to establish levels of HIV prevalence amongst antenatal clinic attendees, the Genscreen test was still applied in subsequent years so that trends in HIV prevalence could be assessed on a consistent basis.

The trends in HIV prevalence observed for 15–44 year-olds and 15–24 year-olds in the national antenatal clinic surveillance system between 2000 and 2004 based on the Genscreen test are shown in Figure 3.

Figure 3

Trend in HIV prevalence (with 95% CIs) 2000–2004, obtained through crude aggregation of data collected in the Zimbabwe national HIV/AIDS antenatal clinic surveillance system, based on the Genscreen test. *Adapted from Zimbabwe Ministry of Health and Child Welfare, ANC Surveillance Report 2004*[6].

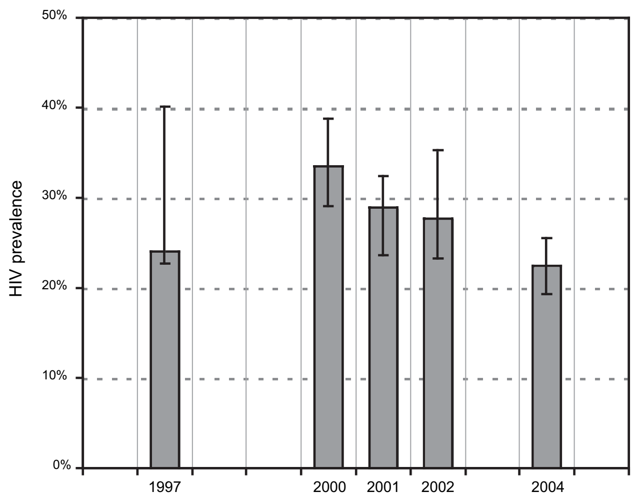


Substantial declines in HIV prevalence in the 15–44 year-old (from 32% to 24%) and 15–24 year-old (29% to 20%) age-groups were observed over the period 2000 to 2004 ($p<0.001$). Between 2002 and 2004, similar declines to those obtained using the Genscreen test were observed when the new combined test algorithm was applied[6].

In a separate analysis, conducted in 2004 by the World Health Organization[17], data from locations included consistently in the national HIV surveillance programme between 1997 and 2002 were examined. It was concluded that there was no evidence for a decline in HIV prevalence in Zimbabwe. However, addition of the data for these locations for 2004 indicates a peak in HIV prevalence in 2000 followed by a steady decline (Figure 4).

Figure 4

Median (and IQR) HIV prevalence measured in 12 national HIV surveillance locations, 1997–2004. *Adapted and updated from Asamoah-Odei et al. 2004*[17].



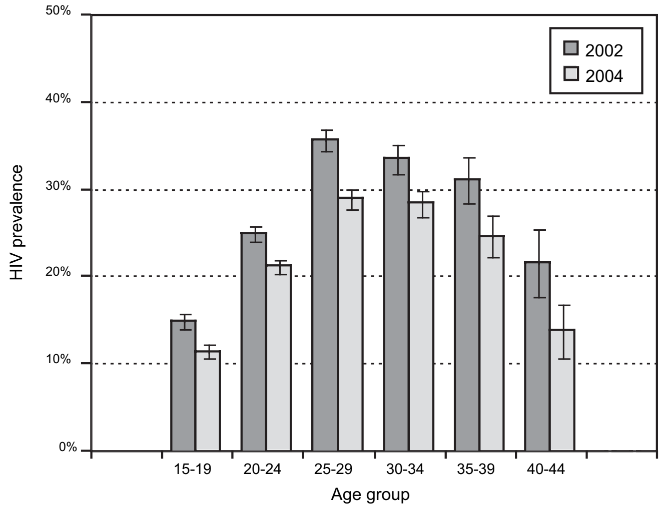
The declines seen between 2002 and 2004 in both the overall data and the data from the 12 consistent locations[a] are particularly striking. Furthermore, the consistency of the declines in HIV prevalence seen across age-groups between 2002 and 2004 is somewhat surprising (Figure 5). Typically, declines in HIV prevalence, resulting from either the natural dynamics of HIV epidemics or the impact of interventions, occur initially in the younger age-groups where most individuals have had little previous exposure to infection and HIV prevalence reflects recent incidence. In older age-groups, ageing of persons infected at younger ages into these age-groups tends to offset the effects of mortality and reduced HIV incidence. This was the pattern of change observed between 2000 and 2002[6].

Increased sub-fertility at older ages can produce the observed effect but seems unlikely to have a substantial effect at such an advanced stage of an epidemic. Increased knowledge of HIV status

a The clinics surveyed changed after 1997 in two locations. In the current analysis, Chiredzi was replaced by Sakubva, Mutare, since the data for the former were incomplete and showed an implausible trend, whilst consistent data from Sakubva were available from 1997 onwards. The diagnostic test used in 1997 may have differed from the Genscreen test used from 2000 onwards.

Figure 5

Comparison of HIV prevalence (with 95% CIs) by five-year age-group, 2004 *vs*. 2002, based on the combined test algorithm. *Adapted from Zimbabwe Ministry of Health and Child Welfare, ANC Surveillance Report 2004*[6]. Note: the age-pattern of change based on the Genscreen test is very similar.



following expansion of voluntary counselling and testing services at prevention of mother-to-child transmission sites and other integrated and freestanding centres (s2.3) could be beginning to affect the antenatal clinic surveillance data. This could occur through pregnancy avoidance and selective out-migration among infected women. Whilst uptake of voluntary counselling and testing services has only recently begun to increase, some women who have not been tested but who suspect they are infected could have chosen to adopt family planning[18] or to migrate to countries where antiretroviral treatment services are currently more accessible (s3.3). Such changes in participation in the antenatal clinic surveillance system could plausibly be concentrated in the (smaller) older age-groups and therefore do not necessarily invalidate the impression that HIV prevalence did decline overall between 2002 and 2004.

The alternative possibility that the decline in HIV prevalence between 2002 and 2004 reflected changes in data quality must be considered. Some minor improvements to storage and transport arrangements were introduced in 2004 but no changes were made in site selection or laboratory procedures. Selective avoidance of surveillance clinics that now offer prevention of mother-to-child transmission services by women who knew or suspected they may be infected with HIV does not seem to have been a problem since the decline in HIV prevalence between 2002 and 2004 was similar at surveillance sites without (Binga and Bindura) and with (all other sites) prevention of mother-to-child transmission services. There was no difference between HIV prevalence in prevention of mother-to-child transmission clients (21.8%) and in all clients (21.3%) at the sentinel surveillance sites that offered prevention of mother-to-child transmission services in 2004.

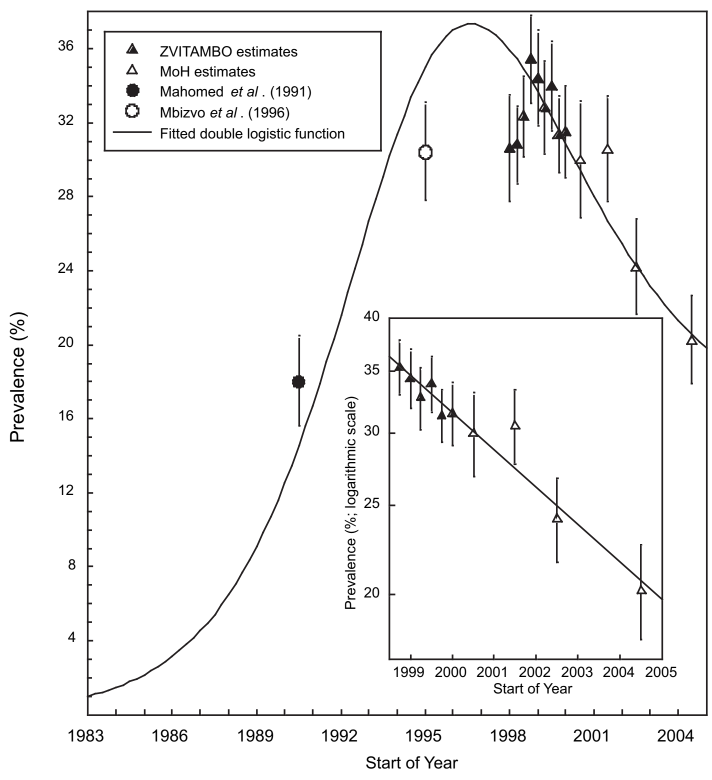
2.2.3 Local Scientific Research Studies

Some light can be shed on the uncertainties evident in the national HIV antenatal clinic surveillance data by examining findings from more in-depth, albeit localized, scientific investigations of trends and patterns in data collected from pregnant women.

The first study linked detailed HIV prevalence data collected from postnatal women recruited into the Zimbabwe Vitamin A for Mothers and Babies (ZVITAMBO) Trial in Harare between November 1997 and January 2000, with routine HIV surveillance data collected from women attending antenatal clinics in Harare in periods prior to and subsequent to the trial (Figure 6)[19].

Figure 6

Trend in HIV prevalence (with 95% CIs) among women attending maternity clinics in greater Harare, 1991–2002. Fitted curve is a double logistic function. HIV prevalence estimates for the ZVITAMBO Trial were calculated from data pooled over 3-month intervals. Inset: changes in prevalence after the end of 1998. Regression line: $Y = 38.1\ e^{-0.0938t}$ where *t* is the time in years since the beginning of 1998. *Reproduced from Hargrove et al. 2005*[19].

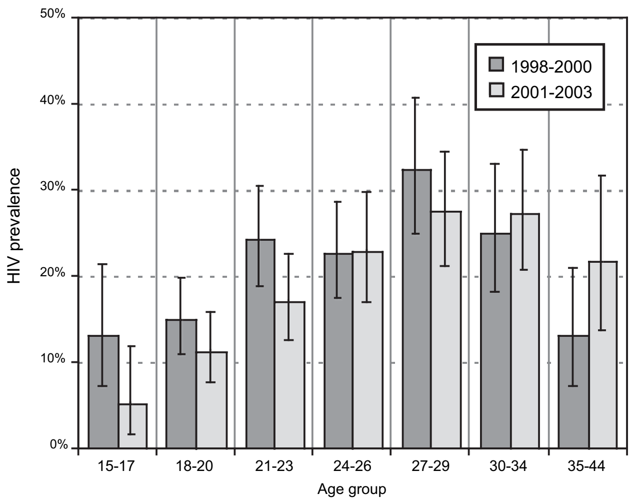


The researchers noted that the age-distribution of pregnant women became younger over time which may, in part, reflect increasing HIV-associated sub-fertility in older infected women as the epidemic aged as well as secular declines in birth rates unrelated to the HIV epidemic[20]. However, even after controlling for age, the results indicated that HIV prevalence in pregnant and postnatal women in the capital city peaked in the late 1990s and fell consistently and substantially thereafter.

The second study was undertaken in rural areas of Manicaland, Zimbabwe's eastern province. Pooled data on HIV prevalence in pregnant women attending local antenatal clinics collected in 12 sites over the period July 2001 to March 2003 were compared with similar data collected three years earlier (Figure 7).

Figure 7

Change in HIV prevalence (with 95% CIs) in women attending antenatal clinics in rural Manicaland, by three-year age-group, 2001–2003 *vs.* 1998–2000. *Gregson et al. 2005*[21].



Overall, HIV prevalence declined from 21% to 19% (p>0.05) over the three-year inter-survey period. HIV prevalence declines in most age-groups up to the late 20s were partially offset by increases in the older age-groups. The overall decline in HIV prevalence and the pattern of change by age were also seen in data collected in parallel surveys conducted in the general population in the same locations. HIV prevalence amongst men and women fell from 19.5% to 18% (p=0.01) and from 26% to 22% (p=0.015), respectively[22].

2.2.4 Prevention of Mother-to-Child Transmission Programme Records

Roll-out of the national prevention of mother-to-child transmission of HIV infection programme in Zimbabwe began in 2002. Subsequent increases in programme coverage mean that data are potentially available from a large number of pregnant women. In addition, data from this source can have an advantage over data from routine antenatal clinic surveillance in that they provide information on male partners who agree to be tested. However, prevention of mother-to-child transmission data may be subject to additional biases if women with HIV infection are disproportionately drawn to or avoid antenatal clinics that offer prevention of mother-to-child transmission services.

Data from programme records indicated that HIV prevalence in female prevention of mother-to-child transmission clients increased from 22% (n=22 187) to 24.5% (n=48 662) between 2002 and 2003 before falling again to 22% (n=54 742) in 2004. The figure for 2004 is close to but slightly lower than that obtained in the national antenatal clinic HIV surveillance survey for the same year (i.e. 24%). The increase in HIV prevalence apparent between 2002 and 2003 may reflect expansion of the programme into areas of higher HIV prevalence. Examination of trends in sites included in the programme from 2002 through to 2004 might have revealed whether this was the case. However, it proved impossible to do this since the early programme records did not permit disaggregating the data for 2002 and 2003 by antenatal clinic site.

HIV prevalence in male partners also increased from 30% (n=338) to 34% (n=1821) before stabilizing at 33.5% (n=2001) in 2004. The proportions of male partners tested were consistently low (less than 5%) so these levels and trends may be particularly subject to bias. Potential reasons for the higher HIV prevalence seen in male partners than in the pregnant women themselves include selective testing amongst men who suspect they are infected and wish to obtain treatment and the typically large age-gaps between male and female partners in sexual relationships.

2.3 Voluntary Counselling and Testing Clients

A national network of high quality voluntary counselling and HIV testing “New Start” centres was established by Population Services International (PSI), in association with the Ministry of Health and Child Welfare, between 2000 and 2004. These centres are largely located in urban areas with some being freestanding and others being integrated into health service facilities.

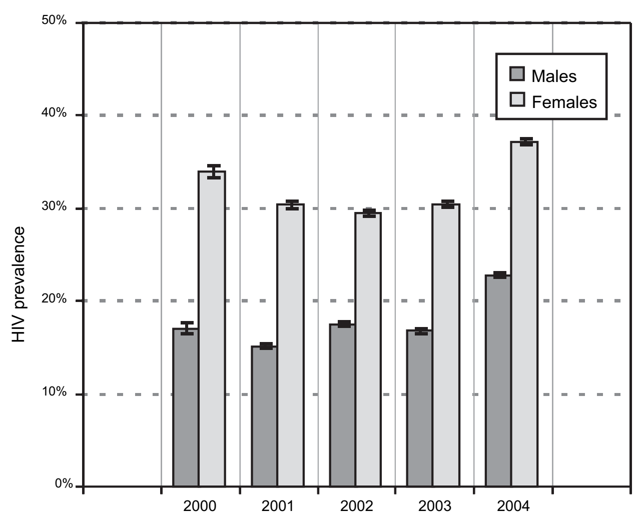
Currently, 20 sites have been established. The total number of clients per year increased from 2000 in 1999 to 164 000 in 2004. The male-to-female sex ratio of voluntary counselling and testing service clients fell from 1.27 in 2001 to 1.04 in 2004. Approximately 50% of clients are under 25 years of age and a similar proportion had never been married at the date of testing. Both the age-profile and the marital status profile of clients remained reasonably stable between 2002 and 2004 (PSI statistics).

Data were available from these voluntary counselling and testing centres on trends in HIV prevalence amongst both men and women and can be disaggregated by sex, age and type of centre. In addition, data were available on the main categories of reasons given for seeking counselling and testing from 2002. In the current review, we analysed data from the eight sites (two freestanding[b] and six integrated) that had been operating continuously from 2000 through to 2004.

The total number of clients seen at these centres increased from 9136 in 2000 to 40 418 in 2002 and 59 032 in 2004. HIV prevalence was consistently lower in men than in women attending for counselling and testing (Figure 8). HIV prevalence in male attendees was stable at around 17% from 2000 to 2003 but rose significantly to 23% in 2004. HIV prevalence in female attendees declined from 34% to 29.5% between 2000 and 2002 before rising to 30.5% in 2003 and, more steeply, to 37% in 2004.

Figure 8

HIV prevalence (with 95% CIs) in men and women seeking voluntary counselling and testing at eight PSI New Start centres, 2000–2004. *Source: PSI Zimbabwe*.



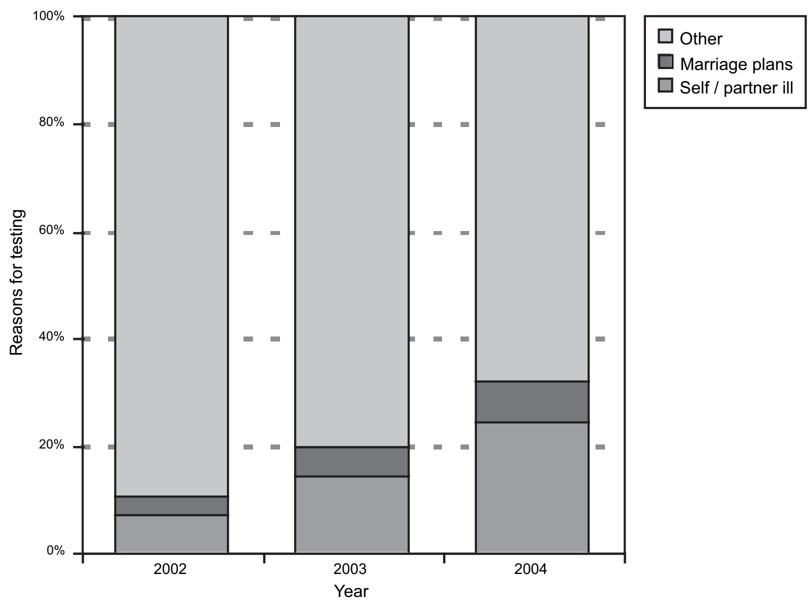
As would be expected, HIV prevalence was higher amongst persons who attended for counselling and testing at centres integrated with clinical services (28.5%) than in those who visited freestanding centres (23.6%). The rise in HIV prevalence between 2003 and 2004 was more pronounced at the integrated centres.

b The freestanding sites included a busy centre in the middle of Harare that accounted for 56% of the total clients seen at the eight sites between 2000 and 2004.

Overall, the proportion of clients who reported attending for counselling and testing due to sickness or their partner's being unwell rose from 7% in 2002 to 24% in 2004 (Figure 9). This rise is thought to be due primarily to increases in awareness of antiretroviral therapy and perception that effective treatment could be available but may also reflect further increases in HIV-related morbidity (see section 3.2 on recent trends in mortality).

Figure 9

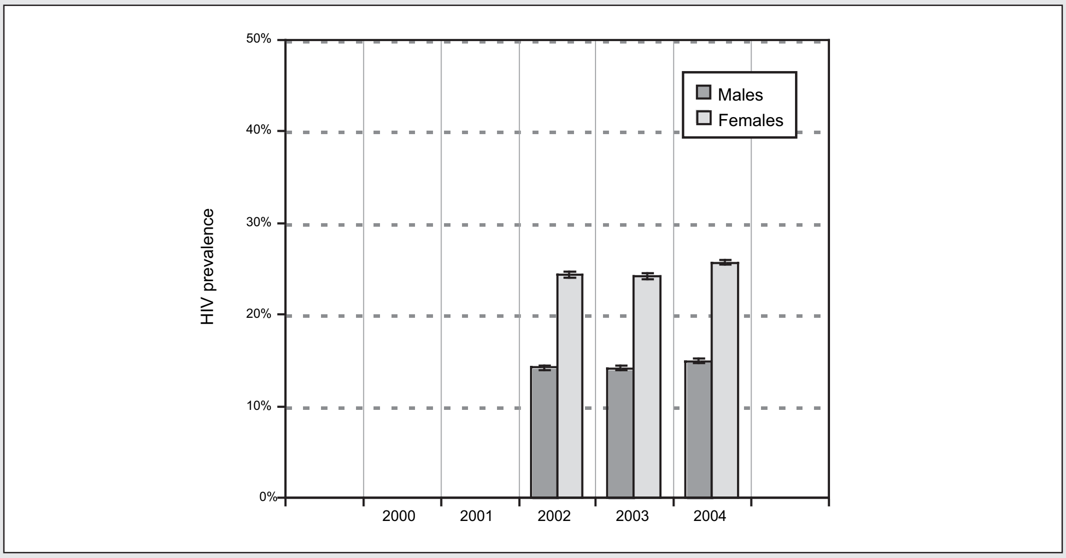
Reasons for seeking counselling and testing at eight PSI New Start centres, 2002–2004. Clients coming to confirm they do not have window-period infections ("re-testers") have been excluded. *Source: PSI Zimbabwe.*



When these individuals are removed from the statistics, the rise in HIV prevalence in voluntary counselling and testing clients between 2002 and 2004 is largely eliminated (Figure 10). Under-reporting of sickness as a reason for seeking counselling and testing could account for the remaining discrepancy in the recent HIV prevalence trends seen in the counselling and testing and antenatal clinic surveillance records.

Figure 10

HIV prevalence (with 95% CIs) in men and women seeking counselling and testing at eight PSI New Start centres for reasons other than sickness or partner's ill-health, 2002–2004. *Source: PSI Zimbabwe.*



Voluntary counselling and testing data were also reviewed from a large hospital (St. Theresa's Hospital) in Masvingo. These data showed a high prevalence of HIV infection in clients tested but there was no change between 2003 (39%, n=902) and 2004 (38%, n=2681) (data supplied by PACT). In both years, treatment was provided for opportunistic infections but antiretrovirals were not available.

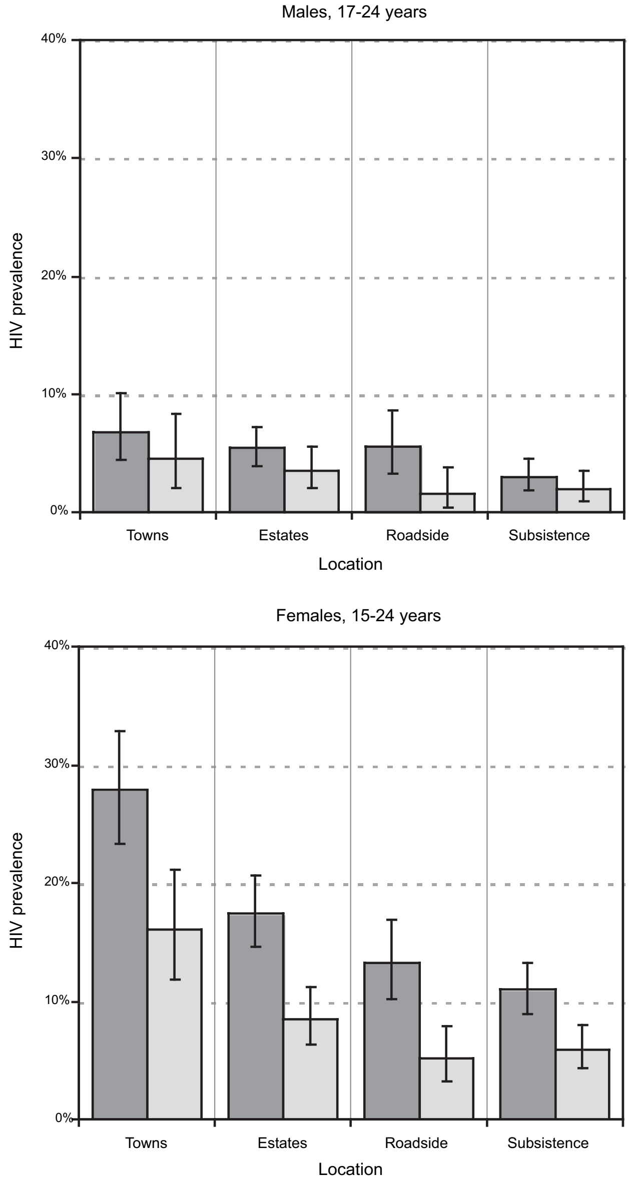
2.4 Youth

In addition to the antenatal surveillance data reviewed earlier (s2.2.2), HIV prevalence data in young people were available from three research studies.

Data on males aged 17–24 years and females aged 15–24 years from a phased general population survey were reviewed for four socioeconomic strata in Manicaland (source: Manicaland HIV/STD Prevention project, Biomedical Research and Training Institute). Overall, between 1998–2000 and 2001–2003, HIV prevalence declined from 4.9% to 2.7% in males (age- and location-adjusted OR, 0.55, p=0.002) and from 15.9% to 7.9% in females (AOR, 0.51, p<0.001). The declines recorded in the different socioeconomic strata are shown in Figure 11.

Figure 11

Declines in HIV prevalence (with 95% CIs) in young males and females in a three-year inter-survey period, in four socioeconomic strata in Manicaland, east Zimbabwe, 1998–2000 vs. 2001–2003. *Adapted from Gregson et al. 2005* [21].



In Form 2 school students participating in the pilot and baseline surveys in the Regai Dzive Shiri Study, HIV prevalence fell amongst boys and girls from 5% (15/299) and 2.6% (6/233) in 2000 to 0.6% (20/3521) and 0.9% (31/3270) in 2003, respectively (source: Regai Dzive Shiri Study). However, HIV prevalence was assessed using urine samples in the pilot study and dried blood spot samples in the baseline survey. The researchers suspect that the urine-based tests yielded a number of false positives. The decline in HIV prevalence apparent from this comparison is therefore likely to be exaggerated.

In 18 growth points covered in the pre-baseline and baseline surveys in the ZiCHIRe Study[23], HIV prevalence in young people aged 15–29 years was stable in males—13.3% (48/360) in 2001 vs. 13.5% (215/1587) in 2003—and increased in females—30.3% (142/468) vs. 33.3% (522/1569). However, again, the comparison is not strictly valid since respondents were recruited from households in the pre-baseline survey and from bottle stores, markets and other locations within the growth points in the baseline survey.

3.0 COMPONENTS OF HIV PREVALENCE CHANGE

3.1 HIV Incidence

3.1.1 Difficulties in Estimating Trends in HIV Incidence in the General Population

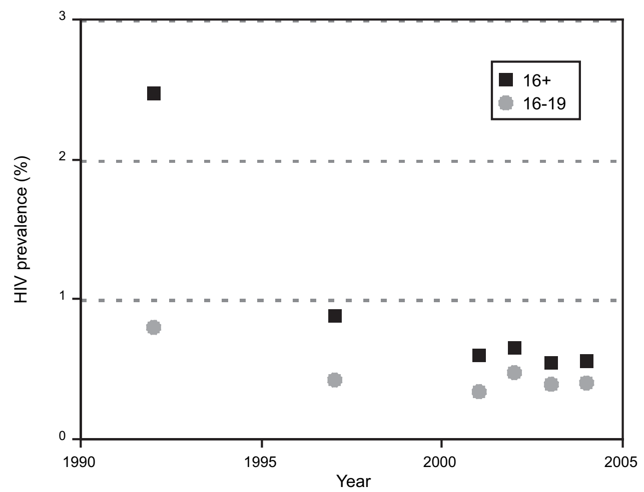
Currently, the only possibilities for assessing trends in HIV incidence in the general population in Zimbabwe are to examine trends in “window period” infections and HIV prevalence in young donors recorded by the national blood transfusion (NBTS) programme. It has been suggested that trends in HIV prevalence in young adults (15–24 year-olds) closely reflect trends in HIV incidence[24,25] since: (i) typically, few 15 year-old children are infected; and (ii) the incubation period for AIDS is longer in people infected at young adult ages[26, 27].

In Zimbabwe, medical histories and data on risk behaviours for HIV infection have been collected and used to exclude individuals with a heightened risk of HIV from donating blood since the late 1980s. These procedures have been tightened up over time so that, in general, not only do HIV prevalence levels amongst blood donors understate true levels in the general population but trends over time observed in the data (Figure 12) may overstate the extent of genuine declines. An additional limitation is that, because screening procedures are so effective, the levels of both window period infections and HIV prevalence in young adults are very low. This means that extremely large sample sizes would be needed to detect genuine temporal changes.

These problems may be less severe in the 16–19 year age-group which has been targeted for donations by the national blood transfusion service. Sample sizes are quite large in this age-group—26 000 in 1992 and around 50 000 per annum since 1997—and relatively few individuals are excluded by the screening procedures (no precise figures are available currently). Nevertheless, it is difficult to read too much into the recent trends in HIV prevalence, even in this age-group since levels of infection have been extremely low since 1997.[c]

Figure 12

Trends in HIV prevalence in blood donors aged over 16 years and 16–19 years, 1992–2004. *Source: Zimbabwe National Blood Transfusion Service.*

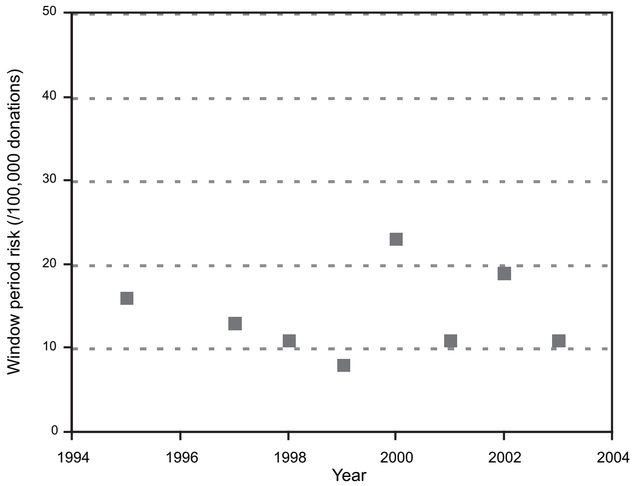


For similar reasons, trends in HIV incidence inferred from NBTS data on repeat testers assessed as having been in the "window period" of seroconversion at their last test[28] may be unreliable. These estimates are shown in Figure 13. They indicate that the overall level of window period risk is low and changed little over the period 1995–2003.

c For example, HIV prevalence in this age-group in a general population sample in the research study sites in Manicaland averaged 3.6% between 1998 and 2003 compared to the level of under 0.5% seen in the national blood donor data.

Figure 13

Estimated "window period" risk for new HIV infections in repeat blood donors, Zimbabwe, 1995–2003. *Source: Zimbabwe National Blood Transfusion Service.*

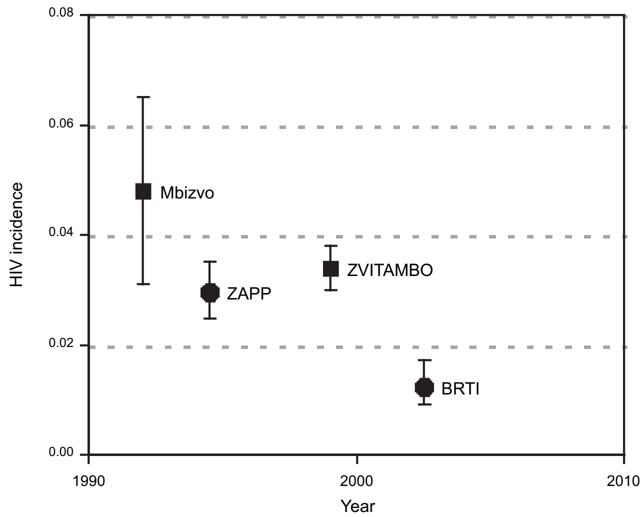


3.1.2 HIV Incidence in Urban Populations

Whilst the data for the general population in Zimbabwe are currently inconclusive, some useful insights can be derived from data collected in localized research studies conducted in specific population subgroups, most notably in Harare (Figure 14).

Figure 14

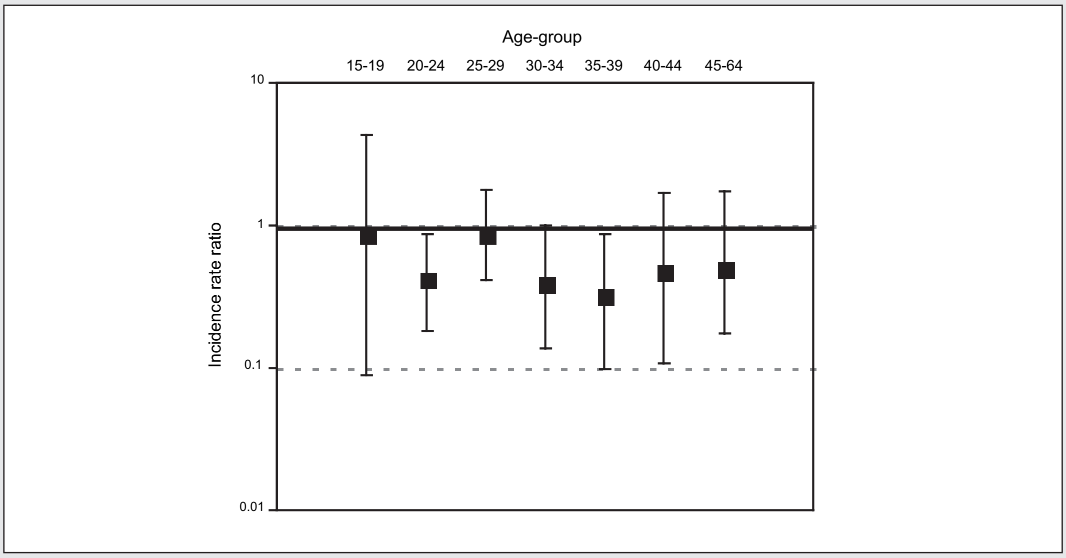
HIV incidence estimates (with 95% CIs) for postnatal women (■) and male factory workers (•), Harare, Zimbabwe. *Sources: see text.*



HIV incidence measured in women attending for check-ups at postnatal clinics in Harare fell from 4.8% in 1992 to 3.4% in 1999 [19, 29]. HIV incidence in male factory workers in the same city fell from 3.0% in 1994-1995 [30] to 1.3% in 2002-2003 (source: ZIMPACT Study, Biomedical Research and Training Institute). There were differences in the age-composition of the study populations used for the earlier and later estimates in each of these comparisons. However, declines in HIV incidence in most age-groups were observed for both population subgroups (comparison for male factory workers shown in Figure 15).

Figure 15

Incidence rate ratios (95% CIs) for HIV infection, 2001–2004 *vs.* 1993–1996, by five-year age-group, in male factory workers, Harare, Zimbabwe. *Source: ZIMPACT Project, Biomedical Research and Training Institute, Harare.*



3.1.2 HIV Incidence in Rural Populations

As yet, it is not possible to make similar comparisons for rural populations. However, single point estimates are available from the study in Manicaland which put HIV incidence at 1.9 (95 cases/5062 person-years) in men initially aged 17–54 years and 1.7 (123/7057) per 100 person years in women initially aged 15–44 years, over the period 1998–2003[14]. Furthermore, HIV incidence must have been higher in these areas during the early 1990s for HIV prevalence to have reached the levels observed in the late 1990s (i.e. 19% and 25% in males and females, respectively). Thus, it seems almost certain that HIV incidence has declined in at least some rural parts of the country.

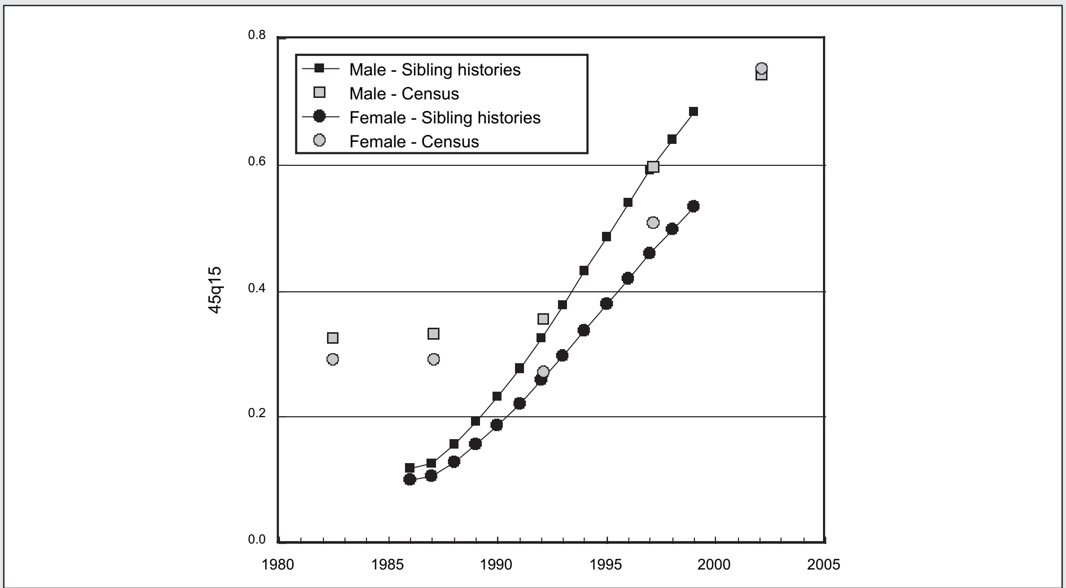
3.2 Mortality Trends

Estimates of mortality levels and trends were obtained from reports of deaths in the household and brother and sister (sibling) survival made in national censuses and surveys and from local vital registration and population cohort data. Data from each of these sources are subject to bias due to incomplete coverage, under-reporting, incorrect recall and/or age-misreporting. However, by making plausible adjustments for these biases where possible and by triangulating the estimates generated from the different various sources, we were able to obtain some useful clues as to recent trends in death rates in Zimbabwe.

Mortality began to rise in urban areas of Zimbabwe in the late 1980s[31] and in rural areas in the early- to mid-1990s[32]. Estimates from sibling survival histories indicate that the probability of death before age 60 years in males and females who survive to age 15 years had increased to 0.73 and 0.57, respectively, by the year 2000 (Figure 16)[33, 34].

Figure 16

Probability of death between ages 15 and 60 years ($_{45}q_{15}$) estimated from sibling survival histories collected in the Zimbabwe Demographic and Health Surveys, 1988–1999 (*Timæus and Jasseh, 2004* [34]); and household data collected in national censuses 1982 (*Zimbabwe Central Statistics Office, 1982* [35]), 1992, 1997 and 2002 (*R. Dorrington, personal communication*).



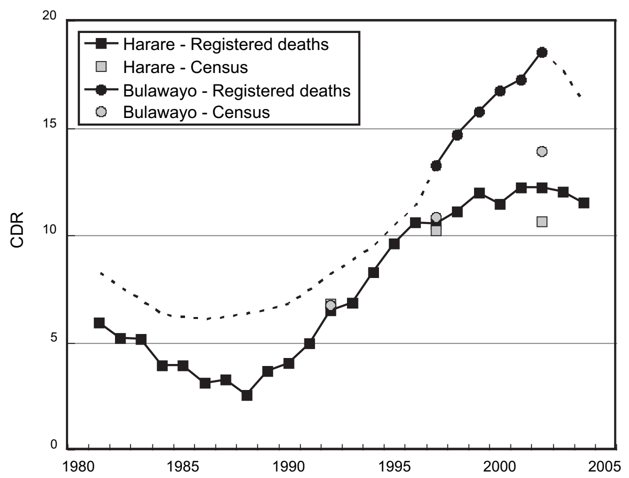
Comparison of the estimates obtained using the sibling history method with vital registration data suggest that the former provide under-estimates of the levels of adult mortality present in periods more distant from the survey date[34]. The same picture is evident from the comparison with estimates from household reports in the national censuses shown in Figure 16. The sibling history estimates for Zimbabwe, therefore, probably exaggerate the rate at which adult death rates rose during the late 1980s and early 1990s. During the 1990s, the sibling history and Census estimates are encouragingly consistent and indicate a rapid and substantial rise in adult mortality. By 2002, estimates based on the national Census data suggest that, at current death rates, only one in four men and women reaching the age of 15 years could expect to survive to age 60.

Earlier independent analyses of vital registration data also indicated that adult mortality changed little between 1984 and 1989 but had increased markedly in the age-range 20–64 years by 1995. Much of this increase could be accounted for by the rise in HIV-related causes of death[36].

Of particular interest for the current review is whether adult mortality has stabilized since 2000 or has contributed to the subsequent fall in HIV prevalence. In Harare, the crude death rate, estimated from vital registration data, stabilized after the mid-1990s (Figure 17). The City Health department reported that this was due in part to a greater propensity to return to rural homes prior to death[37] following the economic downturn and an increased emphasis in policy towards home-based care for the terminally-ill. However, national Census data also indicate a reduction in the rate of increase in the death rate between 1997 and 2002. In Bulawayo, the crude death rate continued to rise up to 2002. From 2003, there was a switch from the use of vital registration records to use of burial records. It is not possible, therefore, to establish whether death rates have now begun to stabilize.

Figure 17

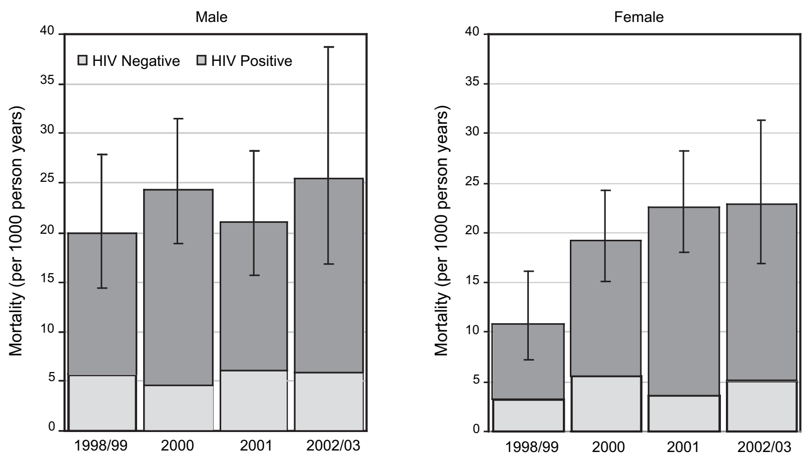
Trends in crude death rate, Harare and Bulawayo, 1980–2004. *Adapted from Harare and Bulawayo City Health Annual Reports and Zimbabwe National Census 1992 and 2002 and Inter-Censal Demographic Survey 1997 reports*. Note: for Bulawayo, the estimates for periods prior to 1997 were copied by hand from the 1997 annual report. Those for 2003 and 2004 are derived from burial records rather than registered death records.



Data from the rural research sites in Manicaland (Figure 18) suggest that overall adult mortality has remained constant since 2001 with female mortality having caught up with male mortality over the period 1998–2001.

Figure 18

Annual mortality rates and proportions of deaths to HIV positive individuals, Manicaland, Zimbabwe, 1998–2003, from household census and population cohort study data. *Source: Manicaland HIV/STD Prevention Project, Biomedical Research and Training Institute, Harare* [38].

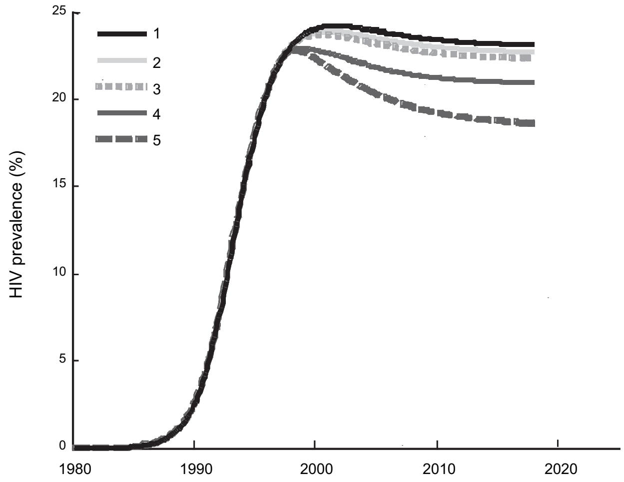


3.3 International Migration

Selective international migration of HIV-positive individuals can contribute to changes in national levels of HIV prevalence (Figure 19) and it is known that migration of Zimbabweans to the Diaspora has been extensive since the late 1990s. However, to cause a reduction in HIV prevalence comparable to that seen in Zimbabwe since 2000, extreme assumptions have to be made. For example, the final scenario shown in Figure 19 reflects a situation in which 10% of the national population migrates every year, persons with AIDS are 20-times more likely to migrate than uninfected individuals, *and*, if, for example, 10% of asymptomatic HIV-positive individuals are aware of their status, they are three times as likely to migrate as uninfected individuals.

Figure 19

Mathematical model projections of the potential impact of international out-migration on recent trends in HIV prevalence in Zimbabwe: (1) no migration; (2) linear increase in migration from 0–5% of the total population per annum, 1997–2000, followed by constant 5% migration per annum; (3) linear increase in migration from 0–10% of the total population per annum, 1997–2000, followed by constant 10% migration per annum; (4) as for (3) except that HIV-positive persons with symptomatic infection (AIDS) are 20-times more likely to migrate than uninfected individuals; (5) as for (4) except that non-symptomatic HIV-positive individuals are also (on average) 20% more likely to migrate than uninfected individuals. All scenarios assume no intentional behaviour change.

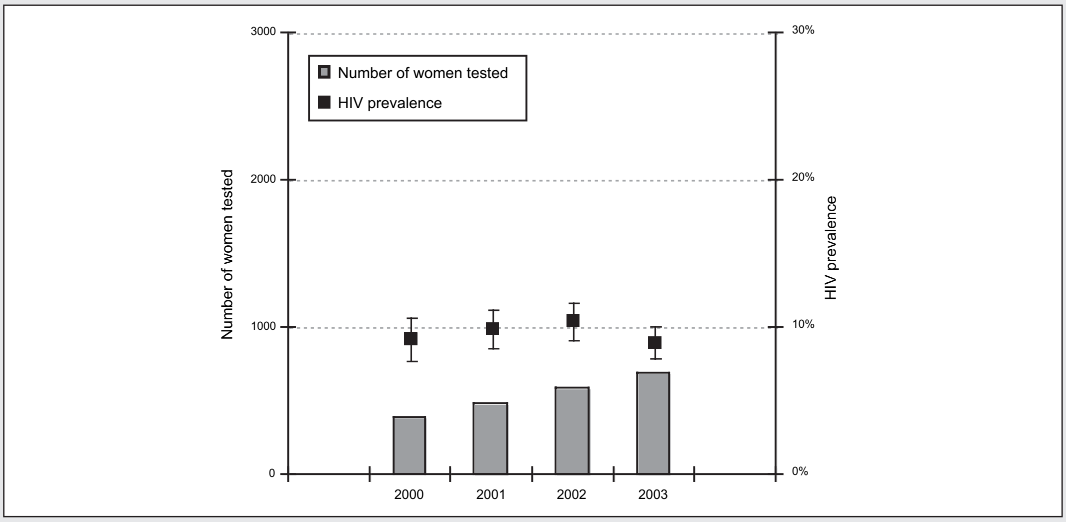


There are understood to be two main destinations of recent migrants from Zimbabwe: the United Kingdom (UK), Australasia and other western countries; and South Africa, Botswana and other neighbouring countries in the southern and central Africa region. Data from the 2001 National Census indicate that there were 18 497 and 21 882 Zimbabwean-born men and women, respectively, aged 16–64 years, living in England and Wales [39]. Whilst these figures include individuals who came to the UK prior to the mid-1990s, they are likely to be serious under-estimates and the true total almost certainly increased substantially between 2001 and 2004. Nonetheless, it is interesting to note that the numbers of Zimbabwean-born pregnant women tested for HIV infection in the UK rose gradually but not dramatically between 2000 and 2003 (Figure 20). No comparable data could be found for other western destinations or the southern and central African regions.

In all, 1200–1500 Zimbabwe-born individuals are currently newly-diagnosed with HIV infection per annum in the UK and, again, the total appears to be rising gradually [Source: Health Protection Agency statistics, 2005]. Of these individuals, approximately 40% each year were symptomatic at diagnosis. If, as we suspect, the total number of Zimbabweans living in other western countries is smaller than the number residing in the UK, the level of migration of symptomatic HIV-positive individuals from Zimbabwe to western countries must be low. Given that antiretroviral treatment (especially for non-nationals) is more difficult to obtain in neighbouring African countries, it seems likely that the overall rate of migration of symptomatic individuals from Zimbabwe must also be quite low.

Figure 20

HIV prevalence (with 95% CIs) in Zimbabwe-born women at delivery in the United Kingdom, 2000–2003. Includes women tested in London (except South-West London), and the South-East and North-West regions of England. *Source: Health Protection Agency (unlinked anonymous testing of neonatal dried blood spots for maternal HIV infection).*



Amongst healthy individuals, international migrants may have had different levels of vulnerability to HIV infection than non-migrants before they left Zimbabwe. Prior vulnerability to infection could also differ according to the destinations of the migrants concerned. Data on HIV prevalence in pregnant Zimbabwe-born women living in the UK was stable at around 9–10% between 2000 and 2003 (Figure 20) which suggests that HIV prevalence in Zimbabweans migrating to western countries could be *lower* than amongst non-migrants. This may be because higher socioeconomic status individuals are disproportionately represented amongst migrants to the UK and western countries because of the travel costs involved and the easier access afforded to professionals and students. Migrants to southern and central African countries probably have a different profile due to the shorter distances and greater possibilities for unauthorized border-crossings. Recent data from Manicaland show that rural-urban migrants currently have similar socioeconomic characteristics and vulnerability to HIV prior to migrating to non-migrants[40]. The same may be true for healthy migrants to neighbouring countries particularly given their current good health and the limited prospects of increased access to cheap antiretroviral treatment.

In summary, international migration is believed to have been extensive and the possibility that it contributed in a small way to the decline in HIV prevalence cannot be ruled out given the limited data available. Nonetheless, the evidence available does not support the view that the overall level of migration and (particularly) the degree of over-representation of symptomatic and asymptomatic HIV-positive individuals amongst migrants needed to cause a decline in national HIV prevalence in the absence of behaviour change has occurred in Zimbabwe.

4.0 EVIDENCE FOR SEXUAL BEHAVIOUR CHANGE

4.1 Data Analysis Considerations

HIV in adults in Zimbabwe is acquired predominantly through heterosexual transmission[41]. As was noted in the introduction, the relationship between the timing of sexual behaviour change and the timing of onset of declines in HIV prevalence and incidence is not straightforward. In particular, changes in behaviour occurring early in an HIV epidemic, if sustained, can contribute to deceleration and decline in HIV transmission. Therefore, although the data on HIV prevalence suggest that the epidemic may have peaked and begun to decline around the year 2000, this report reviewed the evidence for sexual behaviour change from the earliest date, after the onset of the epidemic, for which data could be found.

In considering the contribution of sexual behaviour change to trends in HIV infection, it was kept in mind that a number of different forms of behaviour change can occur during the course of an epidemic[42] which would have different implications for interpretation of trends observed in different types of data. These forms of behaviour change can include the following.

- Behaviour change amongst a cohort of individuals due to ageing and progression through the natural lifecycle.
- Conscious adoption of modified behaviours amongst specific individuals within a birth cohort.
- New behaviour patterns adopted by new cohorts of individuals entering and progressing through the sexually-active age-range.
- Reduced risk-behaviour at the population level resulting from disproportionately high mortality due to AIDS amongst individuals with the riskiest lifestyles.

The first of these would occur even in the absence of an HIV epidemic and must therefore be controlled for in study design, data analysis and interpretation of results. If the changes involved are constant over time, this can be done simply by comparing individuals who are currently aged within a fixed age-range at a series of different time points. If not—for example, delays in marriage occurring due to deteriorating economic conditions—caution will need to be taken in interpreting the results.

The second and third forms of behaviour change listed could be genuine responses to the HIV epidemic and associated HIV prevention programmes. However, they could also result, at least to some extent, from other wider processes of socioeconomic development. For example, development frequently results in reductions in desired family size followed by delayed onset of sexual relations and increased use of modern methods of contraception including condoms[43].

The fourth form of "behaviour change" is non-intentional and is unrelated to HIV prevention efforts. Other things being equal, the selective removal of individuals who have above-average rates of sexual partner change from the population through HIV-related mortality will cause a reduction in the mean rate of partner change within the population as a whole[44]. Unless the sexual partnerships these people would have offered had they remained alive are replaced through an increase in sexual activity amongst those who survive, there may be a further reduction in the overall mean rate of partner change. This is because the individuals with whom the deceased individuals would have formed partnerships will have a lower rate of sexual partner change than they would otherwise have done[42]. The effects of selective HIV-associated mortality on trends in sexual behaviour observed at the population level can only be assessed in cohort studies but need to be kept in mind when findings from other study designs are considered.

4.2 Sources of Variation and Bias in Data on Sexual Behaviour Change

A number of different types of bias can be present in data on sexual behaviour and were considered in assessing the data available on trends in sexual behaviour in Zimbabwe over the course of the HIV epidemic, these included the following.

- Social desirability bias: changes in willingness to reveal details of sensitive personal behaviours can occur over time—perhaps as a result of increased knowledge and awareness about HIV/AIDS—and distort trends in behaviour derived from self-reports.
- Recall bias: can distort observed levels of risk behaviour reported over longer time periods but is unlikely to change substantially over time and, therefore, is less likely to cause distortions in observed trends in behaviour.
- Participation bias: differences in levels and patterns of participation in successive rounds of surveys or between different surveys can distort observed changes in behaviour.
- Measurement bias: differences in indicators used can distort comparisons of behaviours made in different surveys. Common difficulties include different definitions of terms such as "regular partner" and differences in the length of periods over which behaviours are measured (e.g. in the last month versus in the last 12 months). Bias can also result from differences in questionnaire structure (e.g. in the use of skip rules) and question wording.
- Data quality: comparisons made between data collected in different surveys can be distorted by variations in data quality resulting from differences in fieldwork and data editing and evaluation procedures.

4.3 Data Sources

A number of national population-based surveys have been conducted in Zimbabwe since the late 1980s in which detailed data on sexual behaviour have been collected. These include the Zimbabwe Demographic and Health Surveys 1988[45], 1994[46] and 1999[20], a series of biannual knowledge, attitudes, practices and beliefs surveys commissioned by Population Services International (PSI) between 1997 and 2003 [47–50], the National Youth Reproductive Health Survey (ZNFPC) 1997[51], the Zimbabwe Young Adult Survey 2002–2002[9], and a national youth survey undertaken by UNICEF in December 2004[52].

Each of these surveys was cross-sectional in nature. The Demographic and Health surveys used standardized procedures but some changes in the questions on sexual behaviour were made between survey rounds. The topics covered in successive PSI surveys were broadly consistent but different consultants were used each time which resulted in some inconsistencies in sampling, questionnaire design and, possibly, field procedures. The UNICEF survey was conducted to provide baseline data for child support programmes and over-sampled districts in which these programmes were being implemented. However, other comparison districts were also included and the survey is regarded as sufficiently representative for the current purpose. The surveys differed in the age-ranges covered but most collected data on individuals in the age-range 15–29 years. Given the focus of the current report on trends and, thus, the need to make comparisons over time, this age-range was used in the analyses presented.

Indicators of each of the three main potential forms of sexual behaviour change were calculated and compared for the different national surveys noted above, for each sex separately. For evidence of change in sexual abstinence, two indicators were examined: (i) proportion of 15–24 year-olds reporting sexual experience; and (ii) median age at first sex amongst 15–24 year-olds (using a standard survival analysis technique[53]). For evidence of change in sexual partner acquisition rates, the proportion of sexually-experienced 15–29 year-olds reporting one or more non-regular sexual partner in the past 12 months was examined. For this analysis, a non-regular sexual partner was defined as a non-marital, non-cohabiting sexual partner. For evidence of change in condom use, the proportion of 15–29 year-olds with a non-regular partner in the past 12 months who reported having used a condom at last sexual intercourse with such a partner was examined.

In addition to the national surveys, data on trends in behaviour in the general population cohort being followed in Manicaland were examined. These data were of interest in that they were collected from populations in which HIV prevalence had been found to decline between 1998 and 2003. Finally, the data reviewed on trends in sexual behaviour were considered in relation to data on trends in national condom distribution.

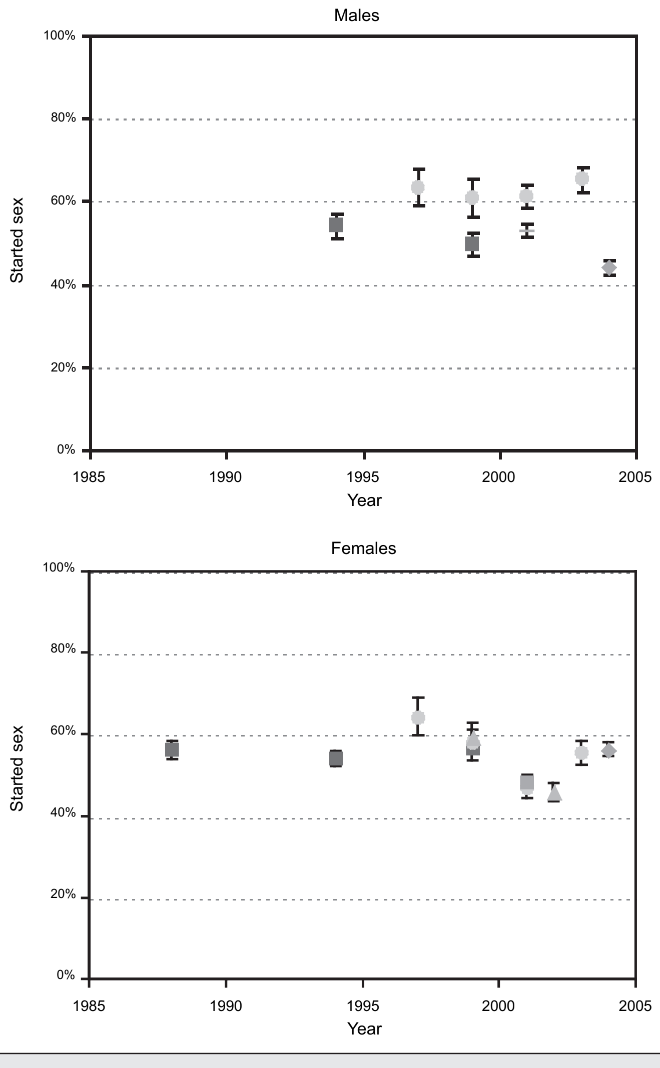
4.4 National Trends in Sexual Behaviour

4.4.1 Age at First Sex

Figure 21 compares the proportions of individuals aged 15–24 years who reported having started sexual relations at the time of the various surveys.

Figure 21

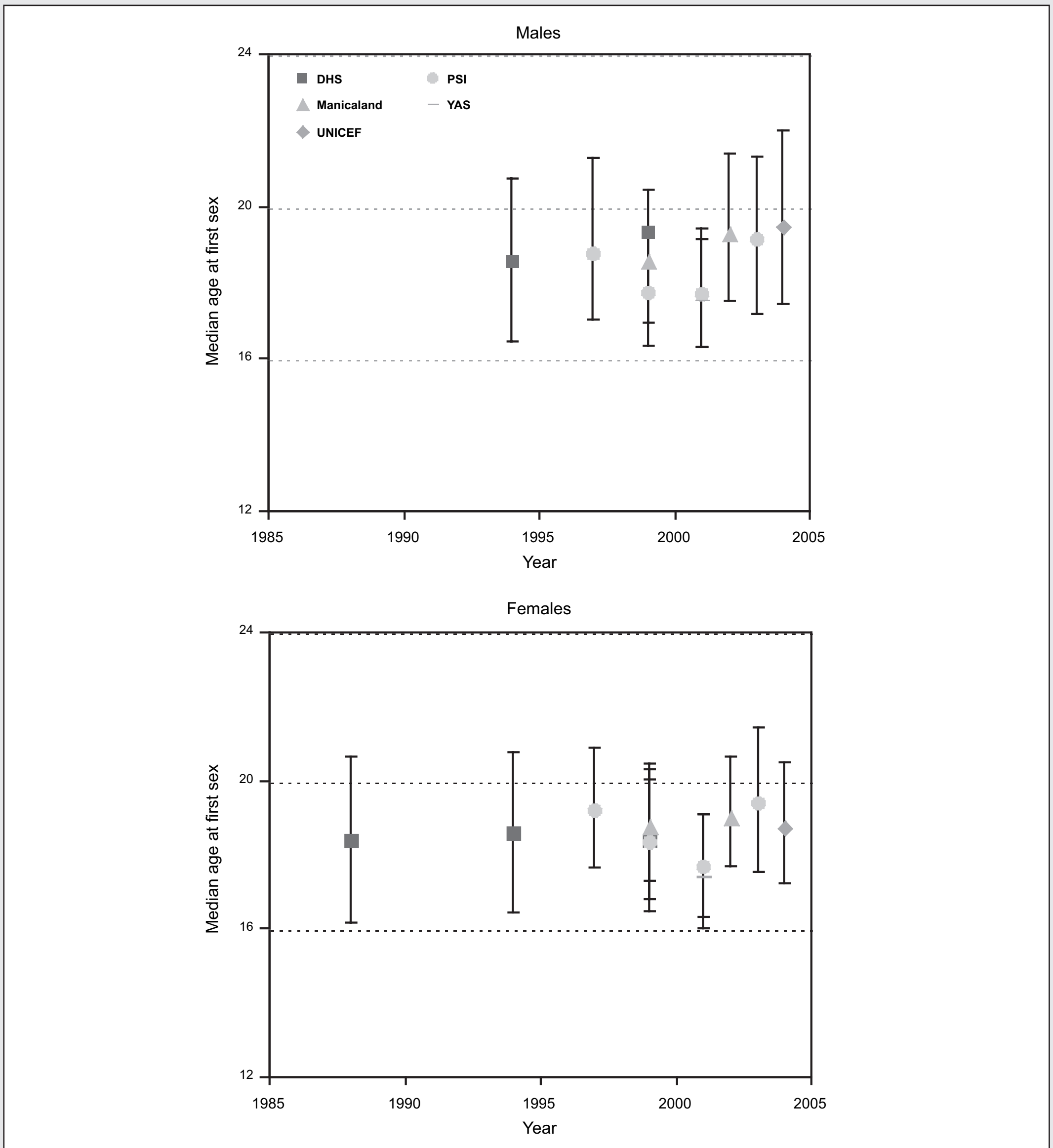
Proportions (with 95% CIs) of 15–24 year-olds reporting sexual experience by year of survey in national and local behaviour surveys (DHS ■, PSI ●, UNICEF ◆, Manicaland ▲, YAS —)



There is no clear evidence for an increase in age at first sex evident in the data for either males or females particularly since, in each case, the median age of survey participants is younger in the years when the proportions reporting having started sex are lowest. To adjust for differences in the age-distributions of those participating in the different surveys and to take account of the censoring of the data by the date of survey, median age at first sex (and inter-quartile ranges) was calculated for each survey where this was possible. The results are shown in Figure 22.

Figure 22

Median age at first sex (with IQRs) for respondents aged 15–24 years at date of survey calculated from national and local survey data using survival analysis (DHS ■, PSI ●, UNICEF ◆, Manicaland ▲, YAS —). Median age at first sex could not be calculated on a consistent basis for the ZNFPC 1997 survey; the survey report indicates median ages at first sex of 20.4 years for males and 20 years for females [51].

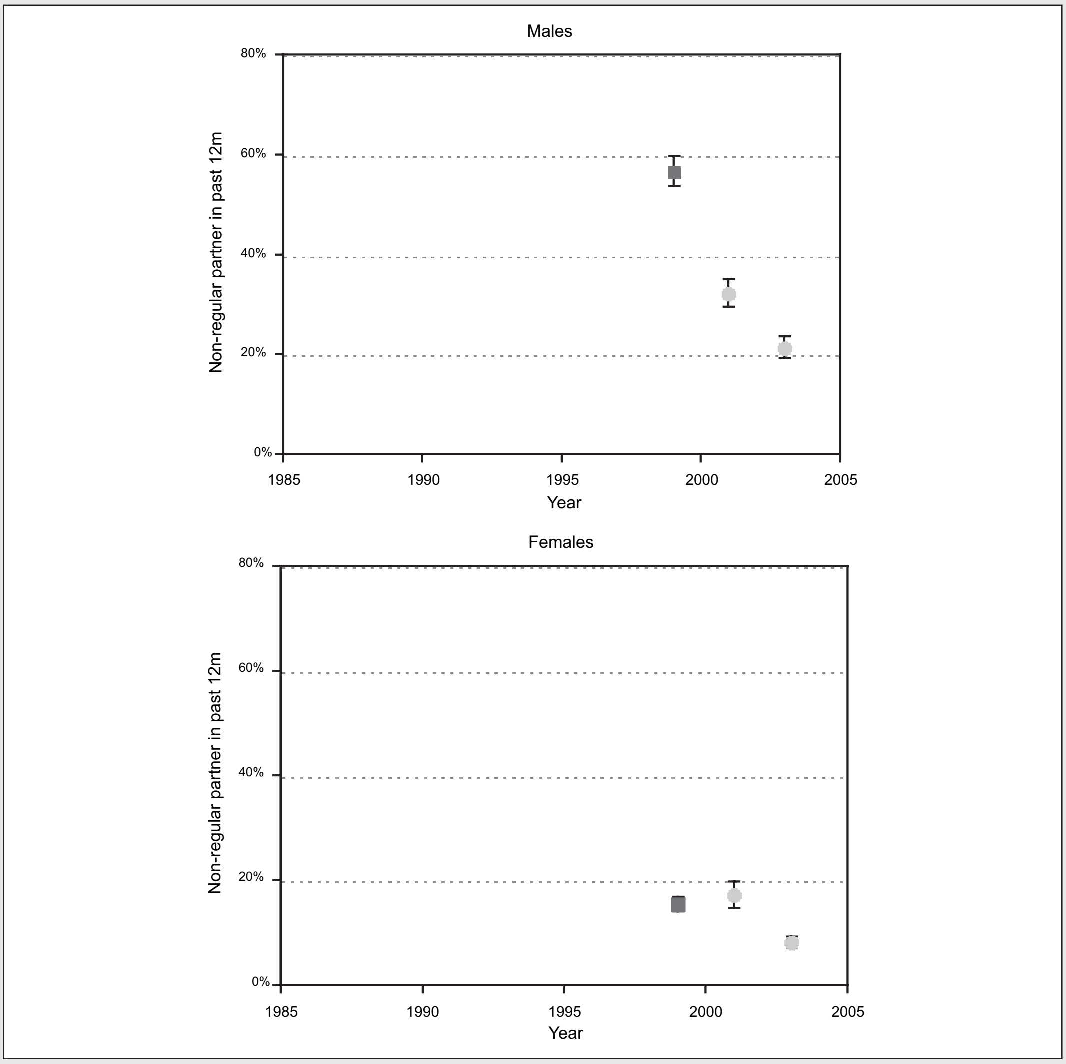


Encouragingly, for women, there is reasonable consistency between estimates obtained from different surveys conducted in the same years. For men, the PSI, Demographic and Health Survey and Manicaland estimates in 1999 differ somewhat—the latter, perhaps, because it is based on a rural sample. Age at first sex is generally slightly earlier in rural areas. The two male national estimates for 2001 are quite close. Considerable temporal variation is evident in the data but, again, no change in age at first sex is apparent for either sex.

4.4.2 Non-Regular Sexual Partnerships

Figure 23

Proportions (and 95% CIs) of respondents aged 15–29 years at interview reporting a non-regular sexual partner in past 12 months (DHS ■, PSI ●)



Differences between the indicators of "faithfulness" used in the different surveys meant that it was not possible to find a single indicator for which data were available over a wide range of time points.

Figure 23 shows the estimates that could be obtained for having one or more non-regular partners in the past 12 months. The data suggest a reduction in non-regular partnerships in the past 12 months occurred between 1999 and 2003, particularly amongst men. However, some caution is warranted since the indicator had to be calculated by combining responses to a number of different questions in 2003 whereas it was asked directly in 1999 and 2001.

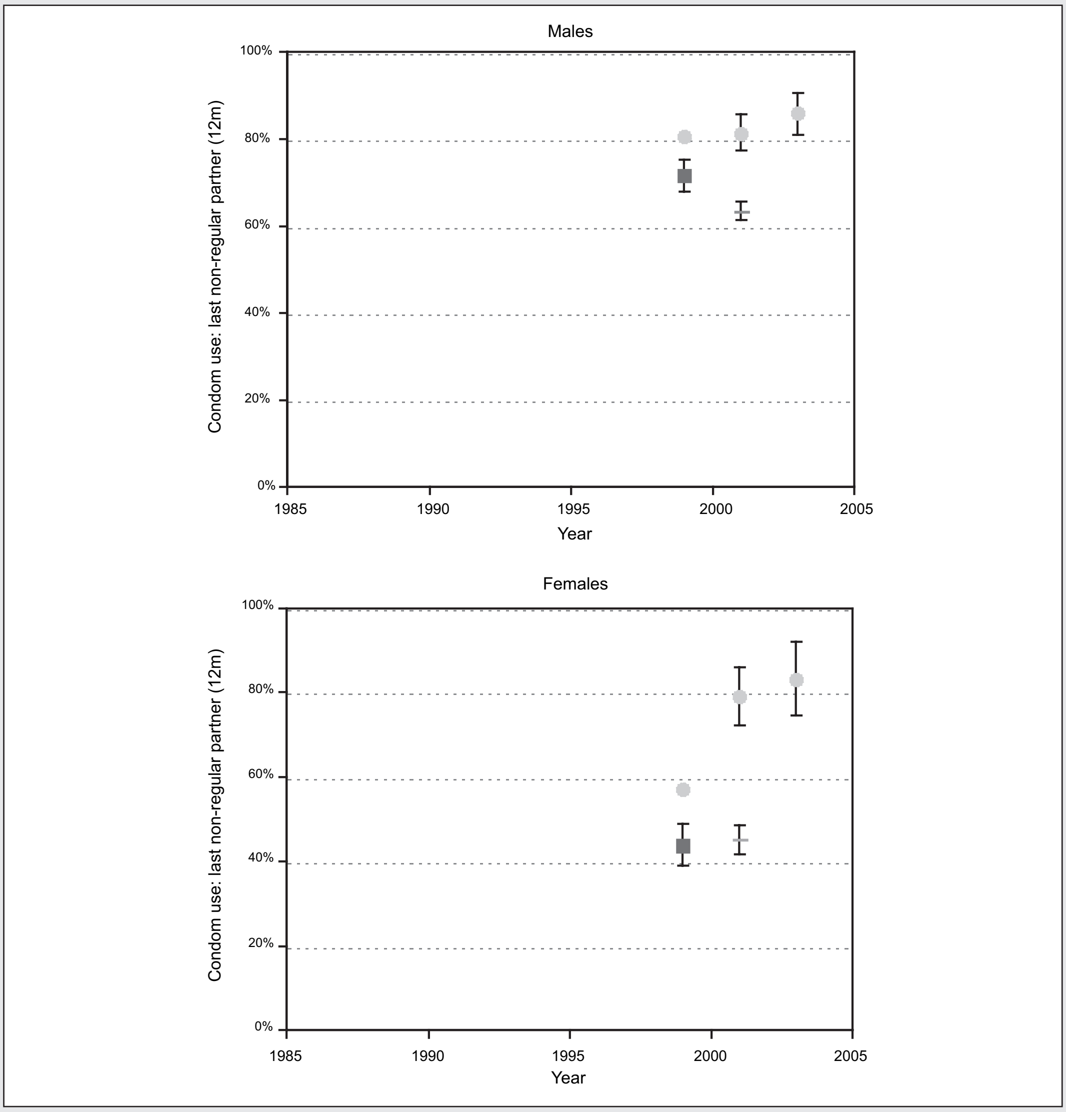
4.4.3 Condom Use with Non-Regular Sexual Partners

Whilst female condoms have been available through social marketing outlets in Zimbabwe in recent years, male condoms remain by far the more widely used (s4.6).

The most useful indicator for assessing the impact of condom use on HIV transmission would be consistent use with non-regular partners over a recent time interval. However, data on this indicator were not available from the national surveys. Therefore, an indicator based on condom use at last sex with a non-regular sexual partner in the past year was used. This indicator could be calculated for the three most recent PSI surveys, the 1999 Demographic and Health Survey, and the Zimbabwe Young Adult Survey (YAS). The results are shown in Figure 24.

Figure 24

Proportions (and 95% CIs) of respondents aged 15–29 years at interview with a non-regular sexual partner in past 12 months who reported using a condom during the last sex act with such a partner (DHS ■, PSI ●, YAS —)



The Young Adult Survey and Demographic and Health Survey estimates for both sexes are lower than those from the PSI surveys. Nevertheless, the data from all of the surveys indicate high levels of condom use with non-regular sexual partners[d]. Whilst keeping in mind the possibility of increases in social desirability bias over time and that three of the five surveys were sponsored by PSI—which is also the leading private sector supplier of condoms in Zimbabwe—it would appear that condom use

d A recent UNDP estimate put condom use at last high-risk sex amongst men and women aged 15–24 years in Zimbabwe at 69%—equal 3rd and 9th, respectively, of the 27 and 30 countries for which estimates were compared[48].

in non-regular sexual partnerships was already high by 1999 (the earliest date for which population survey data are available). Condoms have never been widely used for family planning purposes in Zimbabwe [45,46] so these results suggest there was a substantial increase in condom use in non-regular sexual partnerships during the 1990s. Such an increase could have contributed to the declines in HIV incidence (s3.1.2) recorded during this period and the subsequent fall in HIV prevalence (s2.2.2).

The PSI data suggest there may have been further increases in condom use with non-regular sexual partners since the year 2000.

4.5 Local Trends in Sexual Behaviour

Data were collected on changes in sexual behaviour in the in-depth study conducted in four socioeconomic strata in Manicaland (s2.2.3, s2.4 and s3.2) in which declines in HIV prevalence were recorded in men and women between phased baseline and follow-up surveys carried out between 1998–2000 and 2001–2003, respectively. The results are summarized in Table 1.

Table 1

Reductions in reported sexual risk behaviour between round one (R1: 1998–2000) and round two (R2: 2001–2003) of a population-based open cohort study in Manicaland, Zimbabwe. Males: 17–54 years; females: 15–44 years. AHR, hazards ratio adjusted for age and location; µ, mean number of partners. *Gregson et al. 2005* [21].

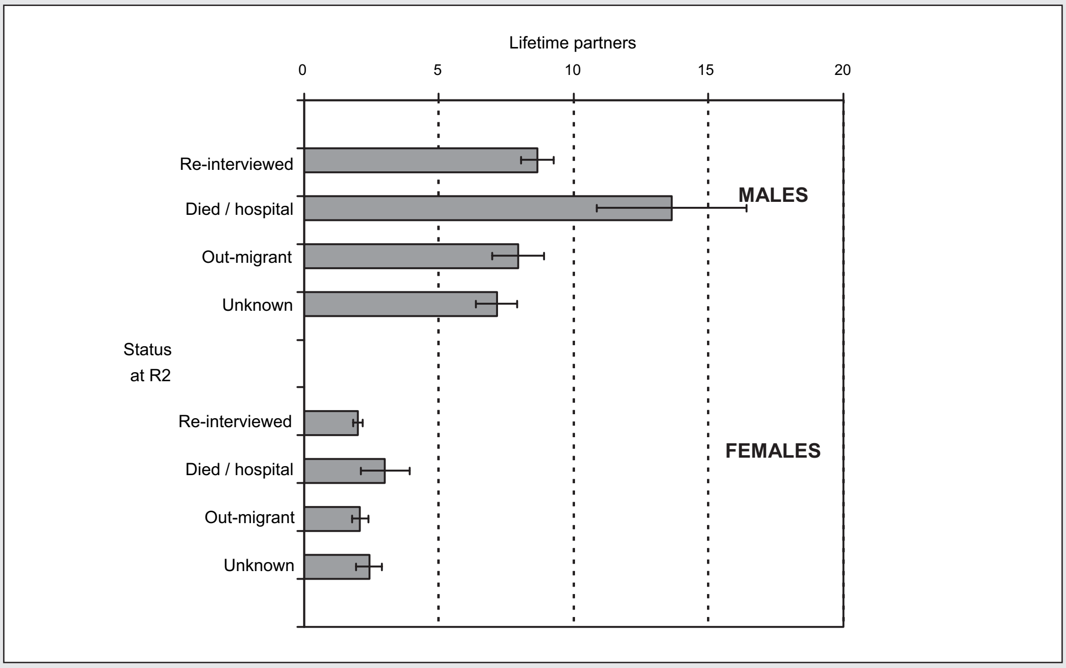
	Males				Females			
	R2	**R1**	**AHR**	***p***	**R2**	**R1**	**AHR**	***p***
Started sex (m: 17-24; f: 15-24	27%	45%	0.55	*<0.001*	9%	21%	0.48	*<0.001*
New partners in past year (µ)	0.57	1.10		*<0.001*	0.22	0.29		*0.01*
Partners in past month (µ)	0.75	0.77		*<0.001*	0.64	0.67		*0.044*
Current partners (µ)	0.94	1.09		*<0.001*	0.80	0.85		*<0.001*
Casual sex in past month	13%	26%		*<0.001*	6%	8%		*0.292*
Unprotected sex with recent casual partner	58%	59%		*0.931*	63%	79%		*0.002*

The study used an informal confidential voting interview (ICVI) method to improve the reliability of the data on sexual behaviour[54]. The results provide evidence that postponement of onset of sexual relations and reductions in rates of sexual partner change contributed to the recent fall in HIV prevalence. As was seen in the national survey data, reported condom use with non-regular (casual) partners was quite high at the time of the baseline survey in Manicaland[e]. Again, this suggests that substantial behaviour change during the 1990s may be contributing to the current decline in HIV prevalence.

e It was not possible to compute a directly equivalent measure of condom use from the Manicaland Study data to that calculated for the national surveys. Instead, a more conservative measure, unprotected sex with a casual (partner of less than 12 months duration—i.e. a broad definition) was calculated—this indicator equates to 1 minus the proportion of respondents with at least one casual partner who report consistent condom use during all sex acts with such a partner in the past 2 weeks.

Figure 25

Mean (and 95% CIs) number of lifetime sexual partners reported at round one by survival and residence status three years later at round two. *Adapted from Gregson et al. 2005* [21].



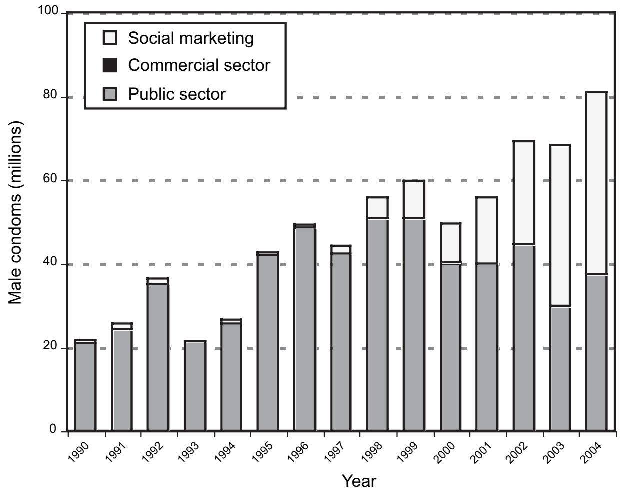
The impact of selective mortality on observed trends in sexual behaviour was also investigated in this study. The results shown in Figure 25 show that mortality is indeed greater in persons with higher numbers of sexual partners. Thus, some of the decline in the mean rates of sexual partner change noted in Table 1 may be due to mortality as well as to deliberate adoption of safer practices. A similar phenomenon could be at work at the national level.

4.6 National Trends in Condom Distribution

The national and local survey data each suggest that increasing levels of condom use in non-regular sexual relationships during and since the 1990s have contributed to the recent decline in HIV prevalence. However, as was noted earlier (s4.2), trends in reported sexual behaviour can be distorted by increases in bias. Whilst reconciliation of numbers of condoms distributed with survey data on levels of condom use is complex[55], triangulation of broad trends in data on condom distribution and use can help to establish the credibility of the latter.

Figure 26

Male condom distribution, Zimbabwe, 1990–2004. *Adapted from ZNFPC, PSI and UNFPA, 2005*[56].

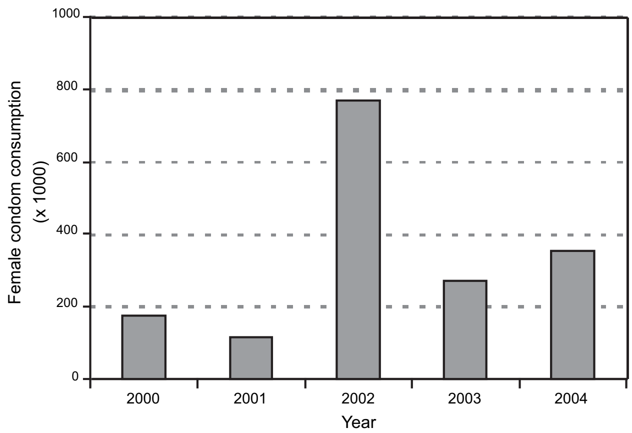


Numbers of male condoms distributed in Zimbabwe by year since 1990 are shown in Figure 26. These show a tripling in condom distribution during the 1990s and further increases over the past five years. During the 1990s, the public sector was the principal provider but social marketing now accounts for more than a half of all condoms distributed. Public sector supplies include condoms made available through family planning and primary healthcare clinics in rural areas and, in 2004, one third of social marketed condoms were distributed in rural areas[56]. These trends—and particularly the fact that most condoms are now purchased—lend extra weight to the survey evidence for a substantial increase in condom use during and since the 1990s.

Female condoms have also been available in Zimbabwe through Zimbabwe Family Planning Council, Ministry of Health and Child Welfare, and social marketing outlets. However, the numbers distributed are low relative to the numbers of male condoms (Figure 27).

Figure 27

Female condom distribution, Zimbabwe, 2000–2004. *Adapted from ZNFPC, PSI and UNFPA, 2005*[56].

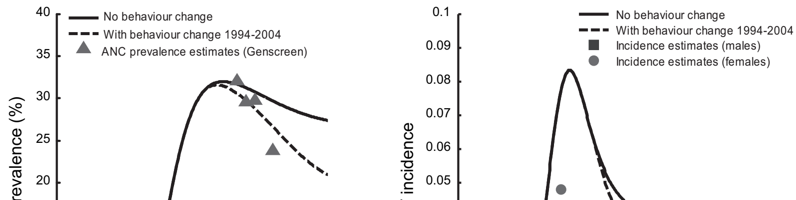


4.7 Triangulation of Trends in HIV and Sexual Behaviour

Mathematical models can be used to examine the internal consistency of observed trends in HIV prevalence, HIV incidence and sexual behaviour. In Figure 28, the simulated trends in HIV prevalence and incidence expected in the absence ("counterfactual trends") and presence of behaviour change are compared with the available empirical estimates. Whilst neither of the model simulations fits very closely to the data, the scenario with behaviour change is the more consistent of the two.

Figure 28

Empirical estimates for HIV prevalence (national) and HIV incidence (urban) compared with trends projected in the absence (solid line) and presence (dashed line) of sexual behaviour change. Behaviour change modelled is a doubling in condom use and a 25% reduction in sexual partnerships occurring evenly between 1994 and 2004.



5.0 CONCLUSIONS

In the light of the data available for examination in the epidemiological review, most of which are reproduced in this report, the following principal conclusions were drawn regarding recent trends in the HIV epidemic in Zimbabwe.

HIV prevalence in Zimbabwe declined over the period 2000–2004. This conclusion is based on the evidence from national antenatal clinic-based HIV surveillance, the in-depth studies of postnatal women in Harare (where the decline in HIV prevalence probably started as early as the late 1990s), and the general population data from rural areas in Manicaland. The trends in HIV prevalence indicated by the data from other national sources are subject to bias due to the effects of the scale-up of programmes (e.g. prevention of mother-to-child transmission and voluntary counselling and testing) and changing perceptions about the possibility of treatment (e.g. voluntary counselling and testing). Nevertheless, these trends, taken together with the epidemiologically unexpected age-pattern of decline in HIV prevalence seen in the national antenatal clinic data between 2002 and 2004 call for some caution in interpretation. It is possible that the recent decline in HIV prevalence was less pronounced than is indicated by the national antenatal surveillance data. Furthermore, additional years of data are required before it can be established whether the decline in HIV prevalence is temporary or would—in the absence of widespread treatment—be long-term.

The decline in national HIV prevalence between 2000 and 2004 resulted from a combination of declining HIV incidence and rising adult mortality occurring from the mid- and early-1990s, respectively. Nationally, adult mortality probably continued to rise after 2000 but the drop in HIV prevalence in young antenatal attendees indicates that recent further falls in HIV incidence have contributed to the overall decline in HIV prevalence. In Harare and rural Manicaland—the parts of the country for which the most comprehensive and detailed data are available—adult mortality appears to have stabilized, albeit at extremely high levels. In each case, substantial declines in HIV incidence occurred during the 1990s and have been sustained in subsequent years. International migration seems unlikely to have made a substantial contribution to the decline in HIV prevalence.

Sexual behaviour change has contributed to the declines in HIV prevalence and HIV incidence in Zimbabwe. In particular, a substantial increase in condom use with non-regular partners and an increase in faithfulness have contributed to the decline. The national data on trends in sexual behaviour, whilst generally extensive, are erratic, probably due to variations in bias resulting from the use of differing survey procedures and underlying trends in social desirability bias. Nonetheless, the high level of condom use reported in 1999 strongly suggests a substantial increase during the 1990s and further increases are reported since the year 2000. The veracity of this trend is supported by the data on national distribution of male condoms. The data from local scientific research studies in Manicaland indicate recent delays in onset of sexual activity, reductions in rates of sexual partner change and, for women with high rates of partner change, further increases in consistent condom use.

Additional new data are likely to become available over the next 12 months. In particular, data on HIV prevalence and sexual behaviour are being collected in the nationally-representative Zimbabwe Demographic and Health Survey 2005. Comparisons with similar data collected in the Young Adult Survey survey in 2001-2002 will provide important new evidence on contemporary trends in HIV prevalence and behaviour in the 15–29 year age-group. Comparison of estimates based on data collected in the 2005 and 1999 Demographic and Health surveys will also provide information on recent trends in adult as well as early childhood mortality.

A further important development will be the planned application of the BED test[57] to specimens collected in the Demographic and Health Survey 2005, national antenatal clinic surveillance, and local longitudinal studies with stored samples. This exercise could yield a much clearer picture of trends in HIV incidence in Zimbabwe from the late-1990s onwards.

REFERENCES

1. Zimbabwe Ministry of Health and Child Welfare. Zimbabwe National HIV and AIDS Estimates 2003. In. Harare: Zimbabwe Ministry of Health and Child Welfare; 2003:28.
2. Bassett MT, Mhloyi M. Women and AIDS in Zimbabwe: the making of an epidemic. *International Journal of Health Services* 1991,21:143-156.
3. Sanders D, Sambo A. AIDS in Africa: the implications of economic recession and structural adjustment. *Health Policy and Planning* 1991,6:157-165.
4. Gregson S, Zhuwau T, Anderson RM, Chimbadzwa T, Chandiwana SK. Age and religion selection biases in HIV-1 prevalence data from antenatal clinics in Manicaland, Zimbabwe. *Central African Journal of Medicine* 1995,41:339-345.
5. Gregson S, Waddell H, Chandiwana SK. School education and HIV control in sub-Saharan Africa: from discord to harmony? *Journal of International Development* 2001,13:467-485.
6. Zimbabwe Ministry of Health and Child Welfare. ANC Surveillance Report 2004. In. Harare: Zimbabwe Ministry of Health and Child Welfare; 2005.
7. Garnett GP, Garcia-Calleja JM, Rehle T, Gregson S. Behavioural data as an adjunct to HIV surveillance data. *Sexually Transmitted Infections* 2005,In press.
8. Anderson RM, May RM. Transmission dynamics of HIV. *Nature* 1987,326:137-142.
9. Zimbabwe Ministry of Health and Child Welfare, Zimbabwe National Family Planning Council, National AIDS Council Zimbabwe, Centers for Disease Control and Prevention Zimbabwe. The Zimbabwe Young Adult Survey 2001-2002. In. Harare, Zimbabwe: Zimbabwe Ministry of Health and Child Welfare and Centers for Disease Control and Prevention, Zimbabwe; 2004.
10. Chin J, Mann J. Global surveillance and forecasting of AIDS. *Bulletin of the World Health Organization* 1989,67:1-7.
11. Grassly NC, Morgan M, Walker N*, et al.* Uncertainty in estimates of HIV/AIDS: the estimation and application of plausibility bounds. *Sexually Transmitted Infections* 2004,80:i31-i38.
12. Gregson S, Garnett GP. Contrasting gender differentials in HIV-1 prevalence and associated mortality increase in eastern and southern Africa: artefact of data or natural course of epidemics? *AIDS* 2000,14:S85-S99.
13. Fylkesnes K, Ndhlovu Z, Kasumba K, Mubanga Musonda R, Sichone M. Studying dynamics of the HIV epidemic: population-based data compared with sentinel surveillance in Zambia. *AIDS* 1998,12:1227-1234.
14. Mugurungi O, Gregson S, McNaghten AD, Dube S, Grassly NC. HIV in Zimbabwe. In: *HIV, Resurgent Infections and Population Change in Africa*. Edited by Glynn JR, Carael M: Springer; 2005.
15. Zimbabwe Ministry of Health and Child Welfare. ANC Surveillance Report 2000. In. Harare: Zimbabwe Ministry of Health and Child Welfare; 2000.
16. Zimbabwe Ministry of Health and Child Welfare. ANC Surveillance Report 2002. In. Harare: Zimbabwe Ministry of Health and Child Welfare; 2004:38.
17. Asamoah-Odei E, Garcia Calleja JM, Boerma JT. HIV prevalence and trends in sub-Saharan Africa: no decline and large subregional differences. *The Lancet* 2004,364:35-40.
18. Gregson S, Zhuwau T, Anderson RM, Chandiwana SK. HIV-1 and fertility change in rural Zimbabwe. *Health Transition Review* 1997,7:89-112.
19. Hargrove JW, Mahomva A, McNaghten AD*, et al.* Declining HIV prevalence and incidence in women attending maternity clinics in greater Harare, Zimbabwe. *Submitted* 2005.

20. Machirovi LM. Zimbabwe Demographic and Health Survey, 1999. In. Harare: Zimbabwe Central Statistical Office and Macro International; 2000.
21. Gregson S, Garnett GP, Nyamukapa CA*, et al.* HIV decline associated with behaviour change in eastern Zimbabwe. *Submitted* 2005.
22. Mundandi C, Garnett GP, Voeten HACM, Nyamukapa CA, Habbema JDF, Gregson S. Sexual behaviour change, spatial mobility and stabilisation of the HIV epidemic in eastern Zimbabwe. *XV International HIV/AIDS Conference*. Bangkok, July 2004 2004.
23. Zimbabwe Community Health Intervention Research Project. Zimbabwe Phase 1 Results: Summary Report. In. Harare: ZiCHIRe; 2003.
24. UNAIDS. Reaching regional consensus on improved behavioural and serosurveillance for HIV: report from a regional conference in East Africa. In. Geneva: UNAIDS; 1998.
25. Zaba B, Boerma T, White R. Monitoring the AIDS epidemic using HIV prevalence data among young women attending antenatal clinics: prospects and problems. *AIDS* 2000,14:1633-1645.
26. Darby SC, Ewart DW, Giangrande PLF, Spooner RJD, Rizza CR. Importance of age at infection with HIV-1 for survival and development of AIDS in UK haemophilia population. *The Lancet* 1996,347:1573-1579.
27. Morgan D, Malamba SS, Maude GH*, et al.* An HIV-1 natural history cohort and survival times in rural Uganda. *AIDS* 1997,11:633-640.
28. Zimbabwe National Blood Transfusion Service. Annual Report 2002/2003. In. Harare: Zimbabwe National Blood Transfusion Service; 2003.
29. Mbizvo M, Kasule J, Mahomed K, Nathoo K. HIV-1 seroconversion incidence following pregnancy and delivery among women seronegative at recruitment in Harare, Zimbabwe. *Central African Journal of Medicine* 2001,47:115-118.
30. Mbizvo M, Machekano R, McFarland W*, et al.* HIV seroincidence and correlates of seroconversion in a cohort of male factory workers in Harare, Zimbabwe. *AIDS* 1996,10:895-902.
31. Murimwa-Moyo IM. Mortality levels, patterns and trends in the city of Harare, Zimbabwe [MSc in Medical Demography]: London School of Hygiene and Tropical Medicine; 1991.
32. Gregson S, Zhuwau T, Anderson RM, Chandiwana SK. The Early Socio-Demographic Impact of the HIV-1 Epidemic in Rural Zimbabwe. In: Blair Research Institute and Oxford University; 1996.
33. Feeney G. The impact of HIV/AIDS on adult mortality in Zimbabwe. *Population and Development Review* 2001,27:771-780.
34. Timaeus IM, Jasseh M. Adult mortality in sub-Saharan Africa: evidence from Demographic and Health Surveys. *Demography* 2004,41.
35. Zimbabwe Central Statistics Office. Zimbabwe 1982 Population Census: Main Demographic Features. In. Harare: Zimbabwe Central Statistics Office; 1982.
36. University of Zimbabwe, Zimbabwe Ministry of Health and Child Welfare, Blair Research Institute. The National Burden of Disease and Cost Effectiveness of Health Services in Zimbabwe 1997: Volume 1 - Burden of Disease (3rd Draft). In. Harare: University of Zimbabwe; 2001.
37. Harare City Health Department. Annual Report 2004. In. Harare: Harare City Health Department; 2005.

38. Lopman BA, Barnabas R, Hallett TB, *et al.* Assessing adult mortality in HIV-1 afflicted Zimbabwe: Manicaland 1998 - 2003. *Bulletin of the World Health Organization* 2005,Submitted.
39. Office for National Statistics. Census 2001: National Report for England and Wales. In. London: TSO; 2003.
40. Mundandi C, Vissers D, Voeten HACM, Habbema JDF, Gregson S. No difference in HIV incidence and sexual behavior between migrants and non-migrants in Manicaland, Zimbabwe. *Submitted* 2005.
41. Lopman B, Garnett GP, Mason PR, Gregson S. Evidence of absence: injection history and HIV incidence in rural Zimbabwe. *Public Library of Science* 2005,2:142-146.
42. Garnett GP, Gregson S, Stanecki KA. Criteria for detecting and understanding changes in the risk of HIV infection at a national level in generalized epidemics. *Sexually Transmitted Infections* 2005,In press.
43. Cleland J, Wilson C. Demand theories of the fertility transition: an iconoclastic view. *Population Studies* 1987,41:5-30.
44. Boily M-C, Lowndes CM, Gregson S. Population-level risk factors for HIV transmission and 'the 4 Cities Study': temporal dynamics and the significance of sexual mixing patterns. *AIDS* 2002,16:2101-2102.
45. Mandishona GM. Zimbabwe Demographic and Health Survey, 1988. In: Zimbabwe Central Statistical Office; 1989.
46. Parirenyatwa CN. Zimbabwe Demographic Health Survey, 1994. In: Zimbabwe Central Statistical Office; 1995.
47. Population Services International. Knowledge, Attitudes, Beliefs and Practices on HIV/AIDS in Zimbabwe, 1997. In. Harare: Population Services International; 1997.
48. Population Services International. Knowledge, Attitudes, Beliefs and Practices on HIV/AIDS in Zimbabwe, 1999. In. Harare: Population Services International; 1999.
49. Population Services International. Knowledge, Attitudes, Beliefs and Practices on HIV/AIDS in Zimbabwe, 2001. In. Harare: Population Services International; 2001.
50. Population Services International. Knowledge, Attitudes, Beliefs and Practices on HIV/AIDS in Zimbabwe, 2003. In. Harare: University of Zimbabwe; 2003.
51. Zimbabwe National Family Planning Council. National Youth Reproductive Health Survey, 1997. In. Harare: ZNFPC; 1999.
52. UNICEF, Zimbabwe Ministry of Public Service Labour and Social Welfare. Orphans and Vulnerable Children Baseline Survey, November-December 2004. In. Harare: UNICEF; 2005:Draft report.
53. Zaba B, Pisani E, Slaymaker E, Boerma JT. Age at first sex: understanding recent trends in African demographic surveys. *Sexually Transmitted Infections* 2004,80 (Suppl II):28-35.
54. Gregson S, Mushati P, White PR, Mlilo M, Mundandi C, Nyamukapa CA. Informal confidential voting interview methods and temporal changes in reported sexual risk behaviour for HIV transmission in sub-Saharan Africa. *Sexually Transmitted Infections* 2004,80 (Suppl II):36-42.
55. Meekers D, Van Rossem R. Explaining inconsistencies between data on condom use and condom sales. *BMC Health Services Research* 2005,5:http://www.biomedcentral.com/1472-6963-1475-1475.
56. ZNFPC, PSI, UNFPA, Expanded Theme Group/Partnership Forum on HIV and AIDS. Overview of Condom Programming in Zimbabwe (working draft). In. Harare: ZNFPC; 2005.
57. Parekh BS, Kennedy MS, Dobbs T, *et al.* Quantitative detection of increasing HIV type 1 antibodies after seroconversion: a simple assay for detecting recent HIV infection and estimating incidence. *AIDS Res Hum Retroviruses* 2002.

The Joint United Nations Programme on HIV/AIDS (UNAIDS) brings together ten UN agencies in a common effort to fight the epidemic: the Office of the United Nations High Commissioner for Refugees (UNHCR), the United Nations Children's Fund (UNICEF), the World Food Programme (WFP), the United Nations Development Programme (UNDP), the United Nations Population Fund (UNFPA), the United Nations Office on Drugs and Crime (UNODC), the International Labour Organization (ILO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), and the World Bank.

UNAIDS, as a cosponsored programme, unites the responses to the epidemic of its ten cosponsoring organizations and supplements these efforts with special initiatives. Its purpose is to lead and assist an expansion of the international response to HIV/AIDS on all fronts. UNAIDS works with a broad range of partners – governmental and nongovernmental, business, scientific and lay – to share knowledge, skills and best practices across boundaries.

Produced with environment-friendly materials