RECONCILING ANTENATAL CLINIC-BASED SURVEILLANCE AND POPULATION-BASED SURVEY ESTIMATES OF HIV PREVALENCE IN SUB-SAHARAN AFRICA

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CONTENTS

PREFACE

This report is based on a consultation organized by the Tropical Diseases Research Centre, Ndola, Zambia, UNAIDS and WHO in Lusaka, Zambia, from 17 to 18 February 2003. The consultation focused on the recent national surveys with HIV data collection in Mali, South Africa, Zambia and Zimbabwe. In addition, data from a survey in Zanzibar were presented. The results of the meeting form the basis for this report. During the report writing stage, national surveys in Burundi and Niger, both conducted in 2002, are also included. This report benefitted greatly from the inputs and comments by Nick Grassly, Simon Gregson, A. D. McNagten and Knut Fylkesnes.

1. INTRODUCTION

Background and objectives

Estimation of the number of people infected with HIV in countries, regions and globally is a very important process for purposes of advocacy, programme planning and evaluation. In the early nineties HIV/AIDS estimates were made globally and by regions. However, since 1997 country-specific HIV estimates have been developed. In countries with generalized epidemics, (defined as a prevalence of at least 1% among pregnant women attending antenatal clinics), national HIV estimates are mostly based on data generated by surveillance systems that focus on pregnant women who attend a selected number of sentinel antenatal clinics. The major assumption is that prevalence among pregnant women is a good approximation of prevalence among the adult population of men and women (15-49 years). This assumption is based on direct comparisons of adult population and antenatal clinic HIV prevalence in the same communities in population-based studies. Other assumptions and adjustments are made to derive national HIV prevalence estimates. These methods have been described in the literature (UNAIDS Reference Group, 2002).

Recently, several countries have conducted national population-based surveys that include HIV testing and more countries are planning to do so in the near future. Technological developments, such as the use of blood-spotted filter paper or saliva (or rather oral mucosal transudate) for sample collection, have facilitated the collection of biological data in household surveys. Concerns about the accuracy of national estimates for adult female and male HIV prevalence generated by antenatal clinic-based surveillance systems and the need for more detailed data on the magnitude and distribution of HIV have stimulated the public health demand for more representative data on HIV prevalence for the whole population. Several publications in leading journals have looked at these issues (Glynn et al, 2001, Zaba et al, 2000, Gregson et al, 2002, Fylkesnes et al, 1998).

This publication is based on a consultation that was organized in Lusaka, Zambia, by UNAIDS, WHO and the Tropical Diseases Research Centre, Ndola, Zambia. At this meeting, practical issues and results from population-based surveys and estimates of adult HIV prevalence from recent national surveys in Mali, Zambia, Zimbabwe, and South Africa and a sub-national survey in Zanzibar were reviewed and compared to the results generated by antenatal clinic-based sentinel surveillance systems. This report also includes data from recent population-based surveys in Niger and Burundi, which were published shortly after the workshop. The main objectives of the workshop were: (1) to present comparisons of HIV prevalence estimates from surveys and from antenatal clinic-based surveillance conducted nationally and in defined geographical entities, (2) to present results from analysis with regard to non-response, and (3) to discuss how surveys can be used to improve national surveillance system-based estimates of HIV prevalence.

2. ANTENATAL CLINIC-BASED SURVEILLANCE SYSTEMS

- The primary purpose of antenatal clinic-based surveillance is the assessment of *trends* in HIV prevalence but antenatal clinic-based surveillance data are often used to estimate the *level* of HIV prevalence as well.
- The extent to which pregnant women attending antenatal clinics of the surveillance system are representative of all pregnant women in a country is affected by non-attendance at antenatal clinics, attendance at private clinics, and the location of surveillance clinics.
- Most country surveillance systems do not have good representation of smaller and more remote rural clinics.
- The HIV testing strategy for surveillance depends upon the expected HIV prevalence.
- Actual implementation of antenatal clinic-based surveillance varies considerably between countries.

In 1989 WHO recommended the establishment of HIV sentinel surveillance systems for HIV detection (Chin & Mann, 1989). Because of their accessibility for surveillance purposes, antenatal clinic attendees were proposed as target population. Most countries have set up HIV surveillance systems and, in countries with generalized epidemics, annual HIV serosurveillance in pregnant women attending antenatal clinics is the prime source of data on the spread of HIV (UNAIDS/WHO, 2000). This chapter describes the antenatal surveillance practices of selected countries and summarizes some of the issues that can arise when antenatal clinic-surveillance results are used for national estimates of HIV prevalence.

HIV surveillance in antenatal clinics has been implemented in 118 countries, including 39 of the 43 countries of sub-Saharan Africa. Blood is taken from pregnant women for diagnostic purposes, e.g. syphilis testing. The residual blood is de-linked from all but a few key characteristics that are insufficient for personal identification (e.g. age and location of clinic) and is tested for HIV. This method is called unlinked anonymous testing (WHO/GPA, 1989). During a limited period of the year blood for testing for HIV antibodies is collected from first time attenders usually until samples from a predetermined number of consecutive pregnant women are obtained. This allows estimation of point HIV prevalence for each sentinel site and of trends over time. More details can be found in revised technical guidelines for antenatal clinic-based surveys (CDC, WHO and UNAIDS - in preparation).

This chapter deals with the biases in relation to pregnant women. The questions as to the representativeness of pregnant women of all men and women are discussed in Chapter 3.

Estimating prevalence levels: issues of representativeness

The primary purpose of antenatal clinic-based surveillance is the assessment of *trends* in HIV prevalence. Therefore, consistency of methods and tools employed and especially the continuing participation of the same clinics is an essential feature of good surveillance systems[1]. However, since there are no other major sources of data to estimate the *level* of HIV prevalence in most countries, antenatal clinic-based surveillance data are also often used for this purpose.

There are several factors that can affect the extent to which pregnant women attending antenatal clinics in the surveillance system are representative of all pregnant women in the country. These

[1] The population covered by the same clinic can also differ over time, e.g. due to variation in outreach services, administrative changes or socioeconomic changes.

include non-attendance at antenatal clinics, use of private clinics, and the location of participating clinics.

First, if large proportions of pregnant women do not attend antenatal clinics, one has to be more cautious in generalizing the findings of the surveillance system to all pregnant women. In most countries with generalized epidemics more than 80% of women attend antenatal clinics. Women who do not attend antenatal clinics are often more rural, less literate, and older than women who utilize antenatal clinics. HIV prevalence among non-attending women is likely to be lower than among those attending, but the situation may vary from country to country.

A second limitation of surveillance systems is the exclusion of private clinics. In most countries the overwhelming majority of women attend public antenatal clinics and the impact of not including private clinics is small. Only in urban areas with large numbers of women using antenatal clinics it may make an important difference. South Africa is a an example of a country where a significant proportion of better off women use private clinics.

Third, because HIV prevalence tends to vary between urban and rural areas, the geographic location of the antenatal clinics becomes very important. National surveillance systems are usually based on a convenience sample of clinics. The country is stratified into administrative or other type of regions and urban and rural clinics are selected from the different strata for the national surveillance system. Such a system cannot be considered as representative for the whole antenatal population.

In this process of selecting clinics, one of the most important issues is the location of the rural clinics. Most clinics referred to as rural in national surveillance systems are located in small towns or large villages and are not typical of rural settings. Mid-size health facilities are selected as rural antenatal clinics, because the goal of surveillance is often to obtain 200-300 new antenatal attenders in a short time span, usually 8-12 weeks. These mid-size facilities are mostly rural hospitals or large health centres. Such facilities are often located in places with higher levels of economic activity and mobility and probably are also associated with higher HIV prevalence, as has been shown in several population-based studies (e.g. Bloom et al, 1999). However, in recent years, most countries have expanded their numbers of sentinel sites in order to include more rural areas.

Clinics can also be selected through more representative sampling methods. South Africa selects antenatal clinics through a sampling method called probability proportional to size (PPS) of the clinic. This requires specific information about each ANC clinic and the population it serves. An important difference with the more common methods of convenience sampling is that data from smaller rural antenatal clinics are also included.

Ensuring quality: laboratory procedures

In sentinel surveillance among antenatal clinic attendees venous blood has typically been collected from surveillance participants, serum is separated in the field and is transported to a reference laboratory for HIV antibody testing. For surveillance, the choice of the HIV testing strategy primarily depends on the expected prevalence level in the population examined (see Box 2.1).

Box 2.1 Recommended HIV testing strategies

Three strategies have been recommended for HIV antibody testing, requiring one, two and three different HIV tests respectively for strategies I through III (WHO and UNAIDS, 2001). The different testing strategies are recommended for differences in the HIV prevalence and for different surveillance designs. Since sentinel surveillance among antenatal clinic attendees is unlinked (except for a few variables), most countries use either testing strategies I (for prevalence >10%) or II (prevalence <10%). Still, actual performance of the HIV testing in surveillance critically depends on correct specimen collection, processing, and HIV testing according to the protocol. Quality control, both internal and external, is a critical element to judge the quality of the HIV surveillance results.

Strategy I:

- Requires one test.
- For use in diagnostic testing in populations with an HIV prevalence >30% among persons with clinical signs or symptoms of HIV infection.
- For use in blood screening, for all prevalence rates.
- For use in surveillance testing in populations with an HIV prevalence >10% (e.g., unlinked anonymous testing for surveillance among pregnant women at antenatal clinics). No results are provided.

Strategy II:

- Requires up to two tests.
- For use in diagnostic testing in populations with an HIV prevalence >30% among persons with clinical signs or symptoms of HIV infection or >10% among asymptomatic persons
- For use in surveillance testing in populations with an HIV prevalence >10% (e.g., unlinked anonymous testing for surveillance among patients at antenatal clinics or sexually transmitted infection clinics). No results are provided.

Strategy III:

- Requires up to three tests.
- For use in diagnostic testing in populations with an HIV prevalence <10% among asymptomatic persons.

Source: WHO and UNAIDS (2001)

Country Practices

Burundi's sentinel surveillance system was expanded in 1999 to include seven antenatal clinics, of which three are located in urban areas. HIV prevalence in the capital city Bujumbura was 16% in 2001, while the median HIV prevalence in a few sites outside the major urban areas was 4.5% in 2001.

Mali is an example of a country with a very limited surveillance system until recently. In 1997 the median HIV prevalence in the capital city was reported as 1.3%. For the period 1998-2001 data were only available from one antenatal clinic in the capital city for 1998 and four small surveys of sex workers. The prevalence in the antenatal clinic in Bamako for 1999 was 3% and increased to 5.8% in 2001. In 2001 a single rapid test was used.

In ***Niger***, a few sentinel antenatal clinics report irregularly on HIV prevalence among pregnant women. In 2000, median HIV prevalence of the five reporting sites was 2.3% with a range from 1% to 5.5%. In the capital city Niamey, HIV infection rates were 2% in 2000.

Since 1998, ***South Africa*** has used probability proportional to size (PPS) sampling. About 400 clinics in the nine provinces of South Africa carry out annual rounds of surveillance, which yield data on about 16,000 pregnant women. HIV prevalence estimates for all antenatal women in South Africa are directly obtained from these data. Trends for each of the nine provinces have

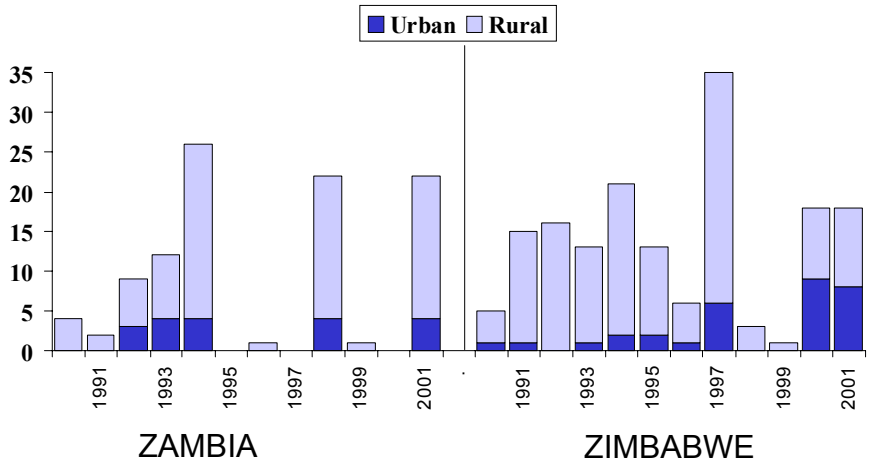
been remarkably robust during the past four years, with only small differences between the estimates in two consecutive years.

The Ministry of Health in ***Zanzibar*** operates a surveillance system independent of the mainland surveillance system of the United Republic of Tanzania on the two islands Unguja and Pemba, using a few antenatal clinics on both islands. Although prevalence data was registered 2.3% in 1993, more recent data in 2002 showed a prevalence rate of 1.4% in Pemba and 0.7% in Unguja.

Zambia's national HIV surveillance system is based on large surveys of antenatal clients. In 1994, 1998 and late 2001 national surveys were conducted of more than 10,000 pregnant women at more than 20 antenatal clinics in all nine provinces of the country (see Figure 2.1). The antenatal survey included at least one urban and one rural clinic in each province. The urban HIV prevalence was 28.5, 26.2 and 25.6% in 1994, 1998 and 2001 respectively. Rural prevalence was 12.1, 11.7, and 11.3% in the three rounds respectively. The overall national prevalence based on these stratified antenatal clinic-based results can be calculated by applying the population size by urban and rural residence (36% are urban according to the 2000 census), which gives 16% HIV prevalence in 2001.

Zimbabwe has followed a pattern similar to other African countries. ANC HIV surveillance has been conducted every 1-2 years since 1990 using the strategies recommended by WHO in more than 10 clinics outside major urban areas and a few clinics in major urban areas. Several sites have four or more data points in the last decade, but a large proportion only have surveillance data for a few years (see Figure 2.1). Many of the rural sites have been reporting extremely high HIV prevalence figures, notably those that are called 'growth points'. These are locations designated by the government as foci for rural development and are characterized by rapid population growth and high mobility. Since 2000, annual ANC HIV surveillance has been conducted and age-specific data have been collected.

Figure 2.1
Number of antenatal clinics reporting surveillance data
by year and location, Zambia and Zimbabwe



The examples from the five countries illustrate the range of operational surveillance systems in countries. Geographic coverage is an issue in all countries except South Africa. Continuity in reporting by specific sites is only partly achieved for most sites, but most sites have at least three data points during the last decade. Some systems focus on pulses: large surveys of antenatal women once every 3-4 years, others aim to obtain more regular annual or bi-annual reporting by sentinel sites. Countries with lower HIV prevalence tend to have less intensive HIV surveillance.

3. NATIONAL ESTIMATES

Four steps in estimating HIV prevalence from antenatal clinic data (UNAIDS/WHO method)

1. Fit two curves for all prevalence data for pregnant women in antenatal care in major urban areas and outside major urban areas and obtain median estimates of prevalence.
2. Reduce the median HIV prevalence in non-urban sites by 20% because of under representation of more remote rural clinics.
3. Assume that HIV prevalence among pregnant women is a good proxy for prevalence among all adults 15-49 and compute the national estimate of HIV prevalence by weighting the urban and rural estimates.
4. Assuming that the female male ratio of HIV prevalence is 1.2 to 1, compute the male and female HIV prevalence from the national estimate

The procedures used for the end of 2001 estimates are described in detail elsewhere (Walker et al, in press). A Reference Group on Estimates, Modelling and Projections provides guidance on ways to improve the procedures and assumptions used in preparing estimates of HIV/AIDS and its impact. This group is composed of researchers from various disciplines and meets yearly to review recent research that can help improve the estimates. In addition, the reference group also convenes special working groups to review areas of importance. The UNAIDS/WHO estimates of HIV/AIDS for countries in sub-Saharan Africa have been based on sentinel surveillance data for women in antenatal care.

Estimating prevalence among pregnant women (steps 1-3)

The first two steps aim to make the best possible estimate of the prevalence among pregnant women from the sentinel surveillance data of a limited number of clinics in the country. The extent to which pregnant women in antenatal clinics are representative for all pregnant women was discussed in Chapter 2. The under-representation of smaller and more remote rural clinics in the surveillance system is an issue in almost every country. As HIV prevalence is assumed to be lower in these rural areas, a 20% downward adjustment is made for most countries to obtain the rural estimate from the rural/semi-urban antenatal clinic data. As an example, data from 1998 in Zambia are shown in Figure 3.1. This figure shows the median HIV prevalence in urban sites, in sites outside of the major urban areas and the trend in the medians. In addition, the figure displays the national prevalence estimate derived from these data using Epidemic Projection Package (EPP) software.

From pregnant women to the whole adult population (15-49 years) (step 4)

The major assumption of the estimation method is that prevalence among pregnant women is a good proxy for prevalence among the sexually most active population (15-49) (step 3). This was based on evidence from several local household surveys that included antenatal clinics. Direct comparison of the results on adult male, adult female and both sexes with HIV prevalence observed among antenatal attenders in the same populations shows a remarkably consistent pattern. Prevalence among women 15-49 in the community is somewhat higher than prevalence among pregnant women, while male prevalence is somewhat lower. When both sexes are combined most prevalence estimates are very close to that of pregnant women attending the antenatal clinics (Figure 3.2). It has to be noted that the local household survey results are not the gold standard, even though they are derived from a much wider cross section of the population than antenatal clinic data. All population-based surveys, including local studies, have non-response bias, and this may affect the validity of the HIV prevalence estimates. In most studies, one-fifth or more of the adult population did not participate in the community survey.

Figure 3.1

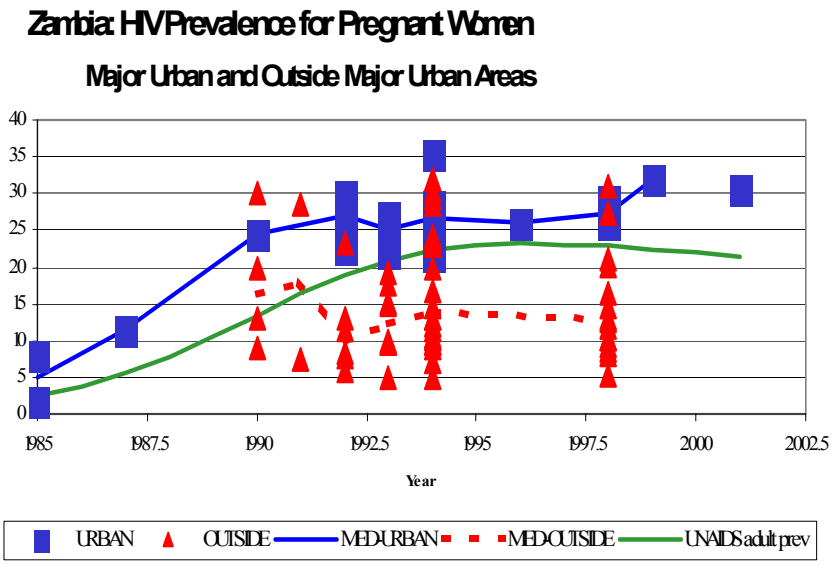
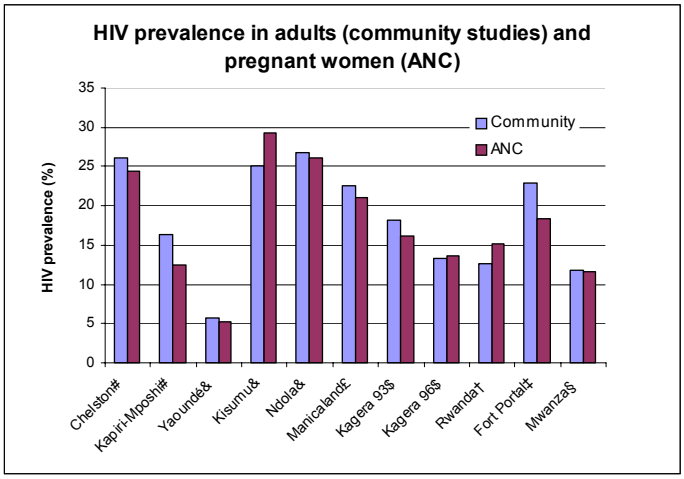


Figure 3.2

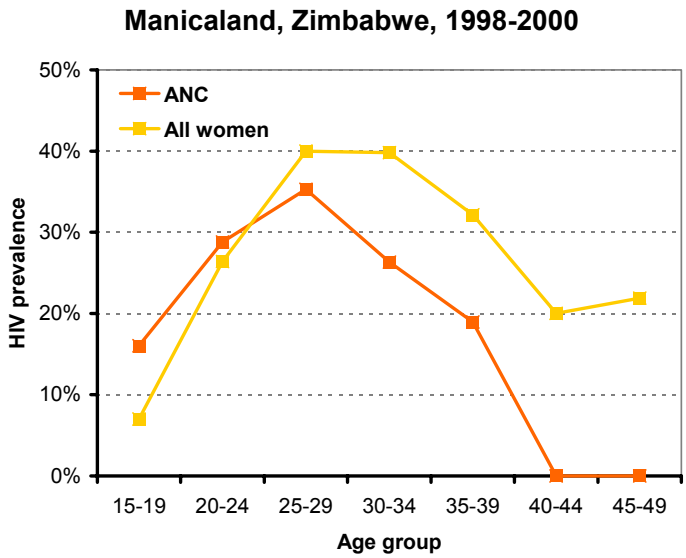


comparisons on 15-39, adjusted; & marks comparisons on 15-50, age standardised
£ comparions on 15-44; $ marks comparions 15+, age standardised;
† comparisons on 15-44, non-adjsuted; ‡ comparison of crude data
§ crude data, community 15-54, antenatal clinic data 15+

The extent to which pregnant women are representative of all women is affected by several factors. Women who are pregnant are sexually active and especially in the younger age groups (15-19) a large proportion of women are not or hardly sexually active. As a result HIV prevalence tends to be higher among pregnant women 15-19 than among all women 15-19 years. At older ages, women who are infertile or women who use contraceptives are less likely to become pregnant. Several studies have shown that HIV is associated with reduced fertility among HIV infected women with the average reduction typically being about 20%. For surveillance purposes it is important to know if the HIV-fertility association changes over time, but no such evidence has been reported yet. These biases have been reviewed in greater detail elsewhere (e.g. Zaba and Gregson, 1998).

Figure 3.3 shows the HIV prevalence among pregnant women and all women by age. Most studies have observed the cross-over effect in the youngest age groups. These data also imply that trying to derive estimates for all women from data for pregnant women by age-standardization is not appropriate as it would magnify the bias.

Figure 3.3
HIV prevalence by age group among antenatal women and women in the general population, Zimbabwe, 1998-2002



Estimating male HIV prevalence (steps 5-6)

Once we have the overall prevalence in the adult population 15-49 years, the male and female prevalence can be computed assuming that the female male ratio of HIV prevalence is 1.2 to 1 (step 4). For instance, if prevalence is 11% the estimate is 10% among men and 12% among women.

Estimating HIV prevalence among young people (15-24 years)

Prevalence among young people (15-24 years) is one of the leading indicators of progress towards international goals, such as those set in the UNGASS declaration on HIV/AIDS. Possible sources of data for HIV prevalence among young people are population-based surveys and surveillance systems.

UNGASS Declaration on HIV/AIDS
Impact Indicator: Reduction in HIV prevalence

The ultimate goal in the fight against HIV/AIDS is to eradicate HIV infection. As the highest rates of new HIV infections typically occur among young adults, more than 180 countries have committed themselves to achieving major reductions in HIV prevalence among young people—a 25% reduction in the most affected countries by 2005, and a 25% reduction globally by 2010.

Percentage of young people aged 15–24 who are HIV-infected

Purpose: To assess progress towards eradicating HIV infection
Applicability: Countries with generalized epidemics
Targets: 2005 – 25% reduction (most affected countries) 2010 – 50% reduction
Frequency: Biennial
Measurement: WHO guidelines for HIV sentinel surveillance
Method: This indicator is calculated using data from pregnant women attending antenatal clinics in HIV sentinel surveillance sites in the capital city, other urban areas and rural areas.
Numerator: Number of ANC attendees (aged 15–24) tested whose HIV test results are positive.
Denominator: Number of ANC attendees (15–24) tested for their HIV infection status.

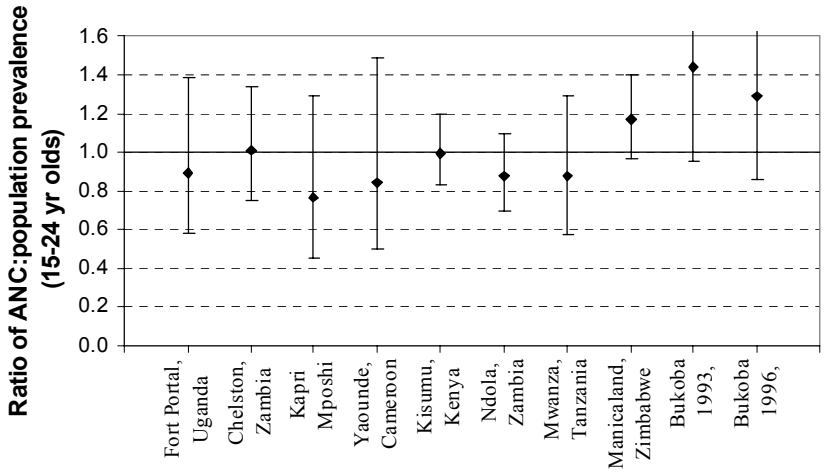
Source: UNAIDS, 2002

Population-based surveys can provide data on prevalence among young men and young women, broken down by five year age group and for the whole age range 15-24 years. The main challenges are to obtain representative sampling of all young people, sound testing procedures and good response rates.

Large scale population-based surveys, however, are costly and often conducted with large intervals (five years or more). Can antenatal surveillance data be used for national estimates of HIV prevalence among young people, as is done for 15-49 years of age? Usually about half the HIV infections among all pregnant women are in the age group of 15-24 years. Figure 3.4 examines the relationship between HIV prevalence among pregnant women 15-24 and young women, young men and both sexes combined in local community studies.

Figure 3.4

Comparison of HIV prevalence among ANC attendees and the general population: Localized population-based studies



Country estimates

For ***Burundi*** national prevalence among adults 15-49 years was estimated at 8.3%, based on data from Bujumbura and five semi-urban clinics.

For ***Mali***, the UNAIDS/WHO estimate of prevalence among adults 15-49 for end of 2001 was 1.7%. As there were few data from sentinel surveillance the estimates were based on the recently completed national household survey.

In 1999, HIV prevalence in ***Niger*** was estimated at 1.35%. This estimate was however based on very limited data and in 2001 no estimate was produced by UNAIDS/WHO.

For ***South Africa***, the UNAIDS/WHO estimates followed the same procedures as those used for Zambia with a few changes. First, there were data available for all years through 2000. The only major difference is that a greater adjustment factor was used for national prevalence to reflect the differential utilization rate of public antenatal clinics by racial and income groups in South Africa. National prevalence among pregnant women in antenatal care was 24.3%, but the national estimate of prevalence (adult 15-49) was 20.1%.

For ***Zambia***, the UNAIDS/WHO estimate of prevalence among adults 15-49 years for 2001 was 21.5% (UNAIDS, 2002). There were no national surveillance data available since 1998, although there were a few data points for urban areas from ad hoc studies. Using all the available data, separate curves were fit for major urban areas and outside major urban areas. These curves yielded a median prevalence of 28.4% in urban areas and 17.0% for rural. The weighted national prevalence was estimated at 21.5%. It was noted however that there were some misclassifications of clinics (urban versus rural), which have led to an overestimate of the rural prevalence especially.

For ***Zimbabwe***, the UNAIDS/WHO estimates followed the same procedures as those used for Zambia. Again, separate curves were fit for major urban and outside major urban areas, with a 20% reduction of rural prevalence to reflect the lack of truly rural sites. The most recent data available for Zimbabwe was the 2000 round of surveillance, which was used to estimate adult HIV prevalence at 33.7% for 2001.

4. POPULATION-BASED SURVEYS WITH HIV TESTING

- Population–based surveys differ in methodologies, sampling approaches, biological sample collection methods, HIV testing strategies, ways to deal with ethical issues and incentives for participation. These differences have to be taken into account when interpreting survey results.
- Non-response rates at the household level and at the individual level are major issues in interpreting the results. Refusal and absence are the main reasons and these are likely to have different associations with HIV prevalence.

Recently, several countries have conducted national population-based household surveys that include HIV testing and many more countries are planning to so in the near future. During the late eighties a few countries, such as Uganda, Burundi and Rwanda (Rwanda HIV Seroprevalence Study Group, 1989) carried out national household surveys. During the nineties, Rwanda was the only country to undertake a national survey and even this was done by testing residual blood from a 1997 malaria study. Recent technological developments, such as the use of blood-spotted filter paper or oral mucosal transudate for sample collection, have facilitated the collection of biological data in household surveys. A major reason for the interest in population-based estimates of HIV prevalence is concern about the accuracy of national estimates for adult female and male HIV prevalence generated by antenatal clinic-based surveillance systems.

Goals and content of AIDS surveys

HIV data collection in a national representative survey may have a number of objectives. The first objective is to obtain national and sub-national estimates of HIV prevalence. This includes age-specific patterns by sex, by residence (urban-rural) and major geographic or administrative region of the country. Furthermore, population-based surveys can provide data on HIV prevalence that can be used to calibrate and improve the sentinel surveillance system. Population-based health surveys are expensive and are usually carried out every 4-5 years. Population-based surveys, however, should be considered as another source of information to complete a national surveillance system and can provide key information that can be used to make national and sub-national estimates.

HIV data collection can be part of specific AIDS surveys or more general demographic health surveys. In almost all surveys data are collected on other aspects including risk behaviour, programme coverage and AIDS attitudes and knowledge. Information on other sexually transmitted infections (STIs) may also be sought. This may be through questions on recent and past history of symptoms and health seeking behaviour or through collection and testing of biological specimens. The box below summarizes the other kinds of information that can be collected in a survey on AIDS.

Content areas of an AIDS survey

- Knowledge on modes of transmission
- Sources of knowledge about HIV/AIDS
- Misconceptions about transmission (e.g. mosquitoes, witchcraft)
- Knowledge of ways to reduce risk of transmission (e.g. condom use, reduce number of partners, abstinence)
- Knowledge of symptoms of other STIs
- Attitudes towards HIV/AIDS, including stigma and discrimination
- Psychosocial determinants of risk behaviour (e.g. risk perception, self-efficacy)
- Prevalence of self-reported symptoms of STI (e.g. genital discharge, genital ulcer)
- Health seeking behaviour for STIs
- Circumcision status
- History of injections use

- Coverage of prevention of mother to child transmission programmes
- Coverage of voluntary counselling and testing programmes
- Exposure to media messages

- Sexual behaviour (marital status and cohabitation, number of partners, characteristics of partnerships, frequency of sex, condom use, sex worker contacts)
- Other risk behaviour (injecting drug use, men who have sex with men etc.)

- Presence of orphans in household
- Adult (and child) mortality in last year or longer period of time

- Care and support for chronically ill in household
- Care and support for orphans

- Test for active syphilis: RPR, Determine
- Antibody test for Herpes Simplex Virus type 2 (HSV-2)
- Antibody test for hepatitis B
- Polymerase Chain Reaction (PCR) test for HIV (for children under 18 months)

Ethical issues

All studies with human subjects need to take into account ethical considerations. Before blood or other samples are collected for HIV testing each participant should be informed on what he or she knows about HIV infection, how to avoid it and what the test of HIV results means. Respondents should be given informed consent forms that will allow survey personal to collect specimens. However informed consent requirements can cause selection bias. Some participants may decline to give consent to participate in the study or to give a specimen. These issues will be discussed further below.

There are several issues with national household surveys that include HIV data collection. First is the confidentiality of the HIV test results to protect respondents. Confidentiality implies that in surveys, whether linked or unlinked, there should be put in place mechanisms to ensure that all HIV positive and negative test results should be kept confidential. The second is the provision of HIV test results to survey participants. There is some experience of providing results from the samples provided for HIV testing for survey purposes. Generally, however, survey participants are given access to a parallel HIV voluntary counselling and testing service. The third main ethical concern is the follow up of the HIV infected person. With increased availability of ART,

the question arises as to whether the government or the survey implementing agency will have to take specific measures to facilitate the provision of treatment or of resources to those needing treatment.

For a more detailed discussion of these issues, see Macro manual or see MEASURE guide on biological and clinical data collection in population-based surveys.

Generalizing household survey findings: sample selection

Population-based surveys often use sampling frames that exclude some types of living arrangement. In HIV prevalence surveys, it is important to consider that many of the groups that may be at higher risk of HIV because of their living arrangements are not included. Such groups may include migrant workers who live in hostels, police or army personnel living in barracks, prisoners and refugee populations. Population groups with possibly lower risks of HIV, such as students in boarding schools, may also be excluded.

The effect of excluding such types of living arrangements on a national or sub-national estimate of HIV prevalence depends on the size of the excluded population and the extent to which their HIV prevalence differs from that in the general population.

Generalizing household survey findings: non-response

Non-response is an important issue in all population-based surveys. There are different issues to consider:

- Non-response at the household level
- Non-response at the individual level
- Reasons for non-response: absence and refusal

National population-based surveys usually apply a stratified two stage cluster design. Census enumeration areas (EAs) are used as the survey cluster and a survey with 5,000 – 10,000 interviews typically includes 250-500 clusters. The first step is to select the strata for the survey, such as provinces, then, within each province, further urban-rural stratification is done. So if there are five provinces, then there are 10 strata. In each stratum, EAs are selected systematically with probability proportional to the number of households in each EA. In each selected EA, a complete household listing operation is carried out and households are selected to achieve a self-weighting sampling fraction within each urban or rural area.

At a visit to a selected household, the following outcomes are common: completed, no household member at home or no competent respondent at home at the time of the visit, entire household absent for extended period, postponed, refused, dwelling vacant or address not a dwelling, dwelling destroyed, or dwelling not found. The household response rate is calculated as the proportion of all households selected for which household interviews were completed. If a household is not found, the household should not be replaced by another household in the same location.

At the individual level the result can be completed interview, respondent not at home, postponed, refused, partly completed, incapacitated and "other". The individual response rate is the proportion of all individuals identified in the enumerated households (as above) as meeting the individual interview eligibility criteria for whom individual interviews were successfully completed. Finally, an individual respondent may refuse to provide a biological sample.

The overall response rate is the product of the household and individual response rate. So if the household response rate is 90% and the individual response rate is 80%, the overall response rate is 90% * 80% = 72%. If 70% of the respondents who were interviewed agreed to give a sample, the overall response rate for giving a biological sample is 72% * 70% = 50%.

Household response may be related to HIV prevalence in several ways:

- Absence is likely to be a larger problem for small - especially single person - households, and adults living in single person households may have higher HIV prevalence
- Absence may be associated with movement of household members to another location because of illness or a recent death (Urassa et al, 2002)
- Household presence may be related to HIV/AIDS associated illness, especially in rural areas (the sick coming home). In that case the definition of eligibility matters. In DHS surveys, visitors are included. In other surveys, several months of residence are required before a person is considered eligible for the survey.

At the household visit, the head of the household is asked to consent to the household interview, which includes a listing of all household residents and may include a number of general questions about socio-economic conditions and also about care and support. In most surveys, the issue of collecting biological samples for HIV testing is not mentioned at this point.

Following the household interview, a list of all eligible individuals in the household is prepared. An eligible respondent may be absent or may refuse to participate in the survey. In most surveys consent is asked separately for the interview and for the biological data collection. The latter is usually done at the end of the interview.

Refusal may be associated with higher or lower risk of HIV infection compared with those who participate. Respondents may refuse because they already know their HIV status, or because they fear that they are HIV infected. In most studies, personal risk perception has been shown to be weakly or moderately strongly associated with HIV prevalence. For instance in the Zimbabwe Young Adult Survey 2001, HIV prevalence was 18% among women who did not perceive themselves at risk of HIV, 24%, 30% and 31% among those who considered themselves at low, medium and high risk respectively. Among men the corresponding HIV prevalence figures were 9, 13, 18 and 20% among those who consider themselves at no, low, medium and high risk of contracting HIV respectively. It is difficult to draw general conclusions on the strength of the association between refusal and HIV prevalence.

There is some evidence that absence is associated with increased HIV prevalence. For instance, people who travel more or families affected by labour migration have higher HIV prevalence than those who are not affected to the same extent by migration. In the context of household surveys short term mobility is particularly important. Traders, business men, people in search of work are more likely to make frequent short trips, and not be available during the time the survey team visits the cluster. The extent to which respondents who are away during daytime participate in the surveys partly depends on the quality of the survey team. If considerable efforts are made to make appointments and visit the household in the evenings or during weekends, response rates may improve.

It may also be that certain population groups have higher non-response rates. This may be more common among people with higher levels of education or who are better off and these people may also have different risks of HIV infection.

Summary of different considerations on non-response

HIV higher	HIV lower
Single person household	Young people in school
Travelling associated with higher HIV	Risk perception may lead to refusal but has little to do with actual HIV status
Absence due to HIV/AIDS morbidity or mortality	Higher non-response among more educated people
Refusal out of fear of being HIV positive which implies risk	
Refusal because knowledge of serostatus, which is more likely to be the case in HIV+	

Country practices: survey design and implementation

Burundi conducted a national HIV prevalence survey of all persons 12 years and over (CEFORMI, 2002). The survey sample design was based on three strata, urban (Bujumbura), semi-urban and rural, and in each stratum 30 clusters were selected with 35 persons per cluster, except in the rural stratum where the sample take was 115 persons. Venous blood was obtained and transported to the central laboratory in Bujumbura, where an ELISA test (Genscreen) was used. If positive, a rapid test (Determine) was used as confirmatory test. If both were positive, the results was considered positive. If the result was discrepant, Genscreen, three additional different rapid tests, and if needed Inno-Lia test were used to decide on the test results. Among men and women 15-54 years in Bujumbura HIV prevalence was 5.6% and 13.7% respectively, and prevalence in the semi urban areas was slightly higher. Rural prevalence however was just above 2% and since 91% of Burundi's population lives in rural areas, the national prevalence was 2.7% and 3.3% for men and women 15-54 years respectively.

In ***Mali*** a national DHS was carried out in 2001 and included HIV testing in one-third of the survey households (Cellule de Planification et de Statistique, Ministère de la Santé, Direction Nationale de la Statistique et de l'Informatique (DNSI) and ORC Macro. HIV testing in Mali: findings from the 2001 Mali Demographic and Health Survey. Calverton, Maryland, USA: CPS/MS, DNSI and ORC Macro. 2002). Capillary blood was taken for anaemia testing in the field. The first two drops were placed on a filter paper and tested in a central reference laboratory. At the laboratory two different ELISA tests were used for samples positive on the first test, a third ELISA test was used in case of discrepant results and all positive samples were confirmed by Western Blot. Respondents received their anaemia results on the spot and were given vouchers for free voluntary counselling and testing at a nearby health facility. If there was no such service in a nearby facility, the survey teams made sure that such services were made accessible. HIV prevalence was 1.7%, highest among urban women (2.5%) followed by rural women (1.9%), urban men (1.9%) and rural men (1.1%).

In 2002, the Ministry of Public Health in ***Niger*** conducted a national survey on HIV prevalence among the adult population (15-49 years), with financial support from the World Bank (Louboutin-Croc et al, 2002). A national sample with 40 urban and 80 rural clusters and 25 households in each cluster was drawn. The urban population, which constitutes 20% of the national population, was oversampled. Consent for the individual interview and a finger prick were obtained and six blood spots were put on a filter paper. No results were given to the respondent. In the laboratory test strategy III was used: Genscreen HIV1+2 was used as a first test. If positive, Vironostika HIV Uniform II plus O. In case of discordancy between the tests Immunocomb II BiSpot HIV 1&2 was used to decide on the result. HIV prevalence was overall 0.9%, 0.6% among men and 2.1% among women. Prevalence in the capital city was 1.8%.

Table 4.1
HIV prevalence among men and women 15-49 (%) by survey.

	N	Men			N	Women		
		Urban	Rural	All		Urban	Rural	All
Burundi	2,161	6.3	2.4	2.7	2,322	14.3	2.3	3.3
Mali	2,082	1.9	1.1	1.7	6,846	2.5	1.9	2.0
Niger	2,987	1.5	0.7	0.9	2,995	2.6	0.6	1.0
South Africa*	2,776			12.8	3,555			17.7
Zambia	1,734	19.2	8.9	12.9	2.073	26.3	12.4	17.8
Zimbabwe†	3833	11.8	9.3	10.3	4263	23.0	21.0	21.8
Zanzibar	1,537			0.4	2,425			1.3

* N is for all adults 15 and over, prevalence is for 15-49
†Zimbabwe prevalence is for 15-29

In ***Zambia*** a national Demographic and Health Survey (DHS) was carried out in 2001/2002. In one-third of the households all women 15-49 and men age 15-59 were asked to provide a blood sample for syphilis and HIV testing (Central Statistical Office, 2002). Venous blood samples were collected from eligible consenting women and men and tested for syphilis. A dried blood spot sample on a filter paper card was prepared from the venous blood sample, de-linked from all individual characteristics except age, sex and residence (urban-rural and province), and tested in a national reference laboratory. Two ELISA tests were used to identify HIV infection and all discordant cases were tested with Western Blot. Respondents received their syphilis test results the following day and were given vouchers for free voluntary counselling and testing at a nearby health facility. HIV prevalence was 17.8% and 12.9% among women and men 15-49 respectively. Urban HIV prevalence was more than twice as high as rural prevalence for both sexes.

In ***South Africa***, a national survey of people aged two years and over was conducted in 2002 (Shisana and Simbayi, 2002). The survey included a questionnaire and oral fluid samples were collected using the Orasure HIV-1 oral specimen collection device. Samples were tested in reference laboratories using a single Vironostika test. HIV prevalence among adults 15-49 years was 15.6%.

In ***Zimbabwe***, a national young adult survey (YAS) was conducted among people aged 15-29 years. Following the individual interview blood was collected by finger stick and put on filter paper. Blood samples were stored in zip lock bags at 2-8 degrees Celsius with controlled humidity and were tested at the National Microbiology Reference Laboratory within 10 days of collection. Two ELISA tests were used, Thermo Lab Systems and Welllcozyme HIV1+2 GacELISA. Tests were repeated on discordant results and repeat discordant results were tested with Western Blot. The individuals were given vouchers and a small transport fee to be able to visit the nearest facility with voluntary counselling and testing services.

Zanzibar conducted a national survey to determine the prevalence of HIV among people 10 years and older. Following household consent a brief questionnaire was administered to all eligible respondents and consent was obtained for a finger prick. Blood was tested for malaria (blood slide and microscopy) and anemia. Residual blood was taken for HIV testing, where two ELISA tests (Behring Enzygnost and a confirmatory HIV1&HIV2 plus and Vironostika Uniform II Plus O Ab) were performed. The respondents were given the results on malaria and anaemia. Common ailments were treated or referrals were given. The HIV testing was done anonymous and unlinked without consent. HIV prevalence was 0.2% and 0.9% among all male and female respondents 10 years and over respectively. Rates among men and women 15-49 years were about 0.4% and 1.3% for men and women respectively.

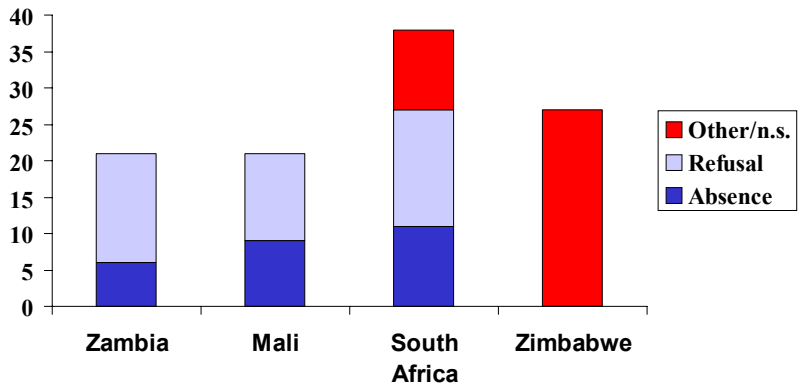
Country practices: response rates

Non-response is an important issue in all population-based surveys. Several survey reports do not provide complete data on the response rate. In Niger, only refusals, which were only 1.1% of all eligible respondents were reported. No information was given on the proportion of respondents that were absent or on household refusal rate. The Zanzibar survey did not provide response data. Numbers of male respondents compared to numbers of female respondents indicate that response rates for males were considerably lower. The total number of male respondents was 63% of the total number of female respondents. In Burundi, there was no information on response rates.

In most surveys three revisits are made before a listed participant is recorded as absent. In some surveys the reasons for absence are recorded. In the Burundi survey, response rates would be difficult to assess as the interviewers in a cluster continued until a certain number was reached. Some surveys replace individuals who are not found – this is not an advisable practice as it obscures non-response rates, and the sample is likely to become less representative for the general population.

The household response rate in the Mali and Zambia surveys was close to 100%, but in South Africa only 71% of households agreed to participate. Among those selected for the individual interview response rates ranged from 74% among all South African respondents age 15 and over to 96% among Zambian women (Figure 4.1 and Table 4.2). Response rates including HIV testing were 10-15% lower. The Zimbabwe Young Adult Survey had a household response rate of 95% and an individual response rate of about 85%.

Figure 4.1
Individual Non-Response Rate (%)



4809 young women listed, 652 not interviews, 546 not tested - 75%
4204 young men listed, 883 not interviewed, 371 not tested - 70%

Table 4.2
HIV prevalence (%) and response rates (%) by country and sex among respondents 15-49 years.

Country	Sex	N tested	HIV prevalence	Response rates		
				Household	Interviewed[1]	Testing[2]
Zambia	All	3,807	15.6	98.2		76.5
	Men	1,734	12.9	-	88.7	73.1
	Women	2,073	17.8	-	96.4	79.4
Mali	All	6,951	1.7	97.9		80.7
	Men	3,069	1.3	-	83.8	75.6
	Women	3,882	2.0	-	94.9	85.2
South Africa	All	6,080	15.6	71.1	73.7[3]	62.1[4]
	Men	2,585	12.8	-		58.4[4]
	Women	5,361	17.7	-		65.1[4]
Zimbabwe*	Men	3,833	10.3	95.2	82.7	91.2
	Women	4,280	21.8	95.5	88.1	89.0

[1]Among those who were eligible to be interviewed
[2] Among those who were eligible to be tested
[3] Among all respondents
[4] Among those aged 15 years and over
* Zimbabwe data is for 15-29

The high refusal rate at the household (or visiting point) level in South Africa may partly be associated with the process of obtaining consent. Households were asked if they wanted to participate in a survey that included oral fluid testing for HIV. Individuals were asked again to give written or verbal consent at the end of the individual interview. In the Mali and Zambia surveys, consent for testing was only asked at the end of the individual interview.

The main reasons for non-response were absence of the selected respondent and refusal to give a blood or oral fluid sample. In South Africa, non-response at the household level was largely due to refusal (16%) and absence (11%). In Zambia, the main reasons for individual non-response were refusal (15%) and absence (6%).

Absence and refusal may be associated with higher HIV prevalence than among those who agree to participate. Differential response rates by specific characteristics of the household may point in the same direction. For instance, in South Africa non-response rates due to absence was slightly higher in households in informal urban areas (14%), where HIV prevalence also tends to be higher. In Zambia and Mali, non-response rates were also highest among urban men in all surveys, who may have higher HIV prevalence. On the other hand, overall, female response rates tend to be higher than male response rates and women have higher HIV prevalence rates. In South Africa, households inhabited by whites had by far the lowest response rates.

Table 4.3 presents an example of an examination of non-response rates by reason, age, sex, and residence in the Zambia DHS 2001-2002. Male and female refusal rates were pretty much the same irrespective of rural or urban residence. There are up to two-fold differences in refusal rate by age group, ranging from 10.8% among urban women 15-19 to 19.7% among urban women 20-24, but no clear pattern is emerging. Absence was a less common reason for non-testing than refusal, and there are clear differences between the sexes. Urban men had a much higher absence rate than rural men (more than twice as high), urban women (four times higher), or rural women (nearly five times higher). Urban men 25-34 years were most likely to be absent.

Table 4.3
Percent distribution of de facto men and women eligible for HIV testing in Zambia DHS 2001/2002

	N	Tested	Refusal	Absent	Missing
Urban men					
15-19	151	68.9	15.9	9.9	5.3
20-24	153	71.2	14.4	11.8	2.6
25-29	140	62.1	15.7	17.9	4.3
30-34	133	63.2	16.5	15.8	4.5
35-49	181	71.1	17.1	13.2	4.4
All	758	67.6	16.0	13.6	4.2
Rural men					
	N	Tested	Refusal	Absent	Missing
15-19	387	70.3	18.1	6.2	5.4
20-24	229	78.2	15.3	4.8	1.7
25-29	259	78.0	13.5	5.0	3.5
30-34	195	77.4	12.8	6.7	3.1
35-49	411	80.5	11.2	5.6	2.7
All	1481	76.6	14.2	5.7	3.4
Urban women					
	N	Tested	Refusal	Absent	Missing
15-19	212	86.3	10.8	2.4	0.5
20-24	216	74.1	19.9	3.7	2.3
25-29	159	82.4	13.8	2.5	1.3
30-34	115	77.4	16.5	5.2	0.9
35-49	171	76.6	17.0	3.5	2.9
All	873	79.5	15.6	3.3	1.6
Rural women					
	N	Tested	Refusal	Absent	Missing
15-19	437	73.7	19.7	3.4	3.2
20-24	359	82.5	12.5	3.9	1.1
25-29	304	77.6	18.4	2.6	1.3
30-34	231	81.0	14.3	3.0	1.7
35-49	485	82.3	13.4	1.9	2.5
All	1816	79.3	15.7	2.9	2.1

Guidelines for presenting response rates in surveys

Every household survey should present the following data on non-response:

- Household response rate
- Individual response rate (for questionnaire)
- Individual response rate for taking a specimen and testing for HIV
- Response rates should be broken down by age and sex
- Response rates should be presented by reason for non-response, notably refusal and absence

HIV antibody testing strategies

The recommended testing procedure for the purpose of HIV surveillance primarily depends on the expected level of HIV prevalence (WHO/UNAIDS, ref). One ELISA test is recommended if HIV prevalence exceeds 10%, two tests if prevalence is below 10%. In antenatal settings, venous

blood is typically collected and serum is tested for HIV antibodies. Accuracy of HIV testing in surveillance systems critically depends on correct specimen collection, processing and transport, and HIV testing according to the protocol. Quality control, both internal and external, is a critical element to judge the quality of the HIV surveillance results, and is part of the South African, Zimbabwe and Zambian surveillance systems.

The three surveys used different biological specimens (and corresponding specimen collection strategies), and HIV antibody testing strategies. The Mali, Zambia and Zimbabwe surveys used dried blood spots on filter paper. In Zambia, venous blood was drawn, as syphilis testing was also part of the survey, and a dried blood spot prepared from the venous blood, while in Mali capillary blood was collected from a finger prick. In South Africa, oral fluid was collected with a special collection device. Advantages and disadvantages of the different specimens include acceptance rates of the respondents, logistics, laboratory procedures and test accuracy. For example, antibody levels are higher in blood or serum compared to oral fluid. Also, as discussed above, response rates may be influenced by the type of sample that is requested, where theoretically participants may be put off by a request for blood, while collection of oral fluid may be more acceptable, although this is not borne out by the observed participation rates in these surveys.

Both Mali and Zambia have used more stringent HIV testing protocols than recommended by UNAIDS/WHO, including confirmation with Western Blot. This predominantly increases costs of testing but should not affect the estimates though there is higher specificity. The HIV prevalence estimate from the South Africa survey would have been more precise with additional HIV testing. The HIV prevalence in some sub-populations was well below 10% and a two-test testing strategy would have been more appropriate, especially in younger populations (2-14 years, not discussed here). In the adult population, however, sub-optimal specificity of the single HIV test used for saliva samples may only have led to a small overestimation of prevalence.

5. RECONCILING SURVEY RESULTS AND SURVEILLANCE-BASED ESTIMATES

The following steps should be undertaken to reconcile HIV prevalence results from population-based surveys and antenatal clinic-based surveillance

1. Assess the level of non-response in the survey data by selected key variables that have a strong association with HIV prevalence: by sex and age groups and if possible by urban rural residence
2. Analyze and adjust for the effect of survey non-response bias on the prevalence estimate: by assuming that non-responders have the same level of prevalence as survey participants or if there are good reasons to assume that the relative risk of HIV infection is higher among non-respondents adjust using increased risks of infection
3. Compare HIV prevalence among pregnant women in the survey and at the ANCs
4. Compare HIV prevalence rates between urban survey areas and urban ANC data
5. Compare HIV prevalence between rural ANCs in the surveillance system and among both sexes combined for nearby clusters of the population-based survey
6. Compare the overall rural HIV prevalence in the survey and ANC surveillance system.
7. Compare the rankings of HIV prevalence by geographic areas (e.g. provinces or regions) for the survey and ANC data.

It is clear that there are biases in both surveys and sentinel surveillance systems. National population-based surveys capture a much wider representation of the general population than antenatal clinics, including men and non-pregnant women. Also, survey data are more geographically representative of the country, although extensive sentinel surveillance systems such as in South Africa also allow for more robust geographical breakdowns. Survey-based estimates however have substantial uncertainty due to non-response associated with refusal to participate and absence from the household. In most instances, one would expect estimates derived from surveys to be lower than true population prevalence, but the magnitude of this bias is likely to vary greatly between countries. Analysis of the basic characteristics of non-responders, if available, can be used to adjust the estimates, but can only provide a partial solution.

Examining the data: assessment of the level of potential bias in the survey data.

The first step is to assess the level of non-response in the survey data by selected key variables that have a strong association with HIV prevalence. As a minimum, it should include a breakdown by age (15-19, 20-24, 25-34, 35-49 years) and sex and, if the sample size allows, also by urban-rural residence (see Table 4.3 for an example). If possible, a third stratum – semi urban – should be added. Such analyses can for instance show the non-response rate among urban men 25-34 years. The information on age, sex and location of residence would be available from a listing of household members, which is done prior to individual interviews, for those who refused an interview. There is more information to examine non-response if the reason for non-response is refusal to give a blood or other specimen and this occurs after the individual interview. In that case one may, for example, look at response rates by "ever had sex".

Adjusting for non-response bias

The simplest way of adjusting for non-response bias is to assume that those who did not give a specimen for testing have the same prevalence as participants of the same sex in the same age group and with the same residence. This non-response bias adjustment is shown in Table 5.1. It becomes important if there are large differences in non-response between categories with very different prevalence rates.

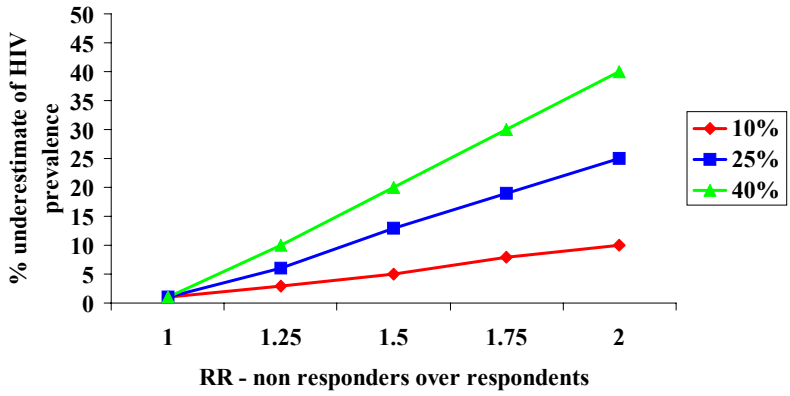
One may also assume that those who do not respond have higher (or lower) prevalence than those who do attend. The non-responders may have twice as high HIV prevalence as responders. Figure 5.1 shows the effect of 10, 25, and 40% non-response on the prevalence at different levels of HIV prevalence by different assumptions about the extent to which the relative risk of HIV among non-responders is increased (using 1.25, 1.5, and 2 times as high). Overall, the effect on prevalence becomes large at non-response rates over 25%, and with relative risks of 1.5 or higher. At non-response rates under 25% or lower, the effect of increased HIV prevalence among those who are not participating in the survey only becomes substantial if the relative risk is exceeding 1.5 (i.e. 1.5 times higher HIV prevalence as among those who participate). This may be possible, but there have to be convincing reasons to assume such a large increase in risk.

Table 5.1
Adjusting for differential non-response rates

	N	Response Rate	HIV Prevalence	Adjusted
15-19	40	100%	2%	
20-24	33	90%	9%	
25-29	27	74%	25%	
All	100	90%	9.4%	10.5%

Figure 5.1 Effect of non-response rate on estimate of HIV prevalence by different levels of relative risk among non-responders

Figure 5.1
Effect of RR for non-responders by level of non-response: relative increase in prevalence



Estimates-based on unlinked anonymous sentinel surveillance data have the inherent advantage that bias due to refusal to be tested is eliminated. This may change in the near future with the introduction of prevention of mother to child transmission of HIV in antenatal settings and surveillance systems will have to change. The extrapolation of estimates from pregnant women to the adult population is based on a set assumption that may not apply equally well to all countries and at all times in the course of the epidemic. In addition, the major current weakness of estimates using sentinel surveillance data is related to the biased sample of pregnant women captured by the surveillance system. The degree of coverage provided by HIV surveillance systems varies dramatically across countries and therefore the quality of estimates of prevalence of HIV/AIDS also varies.

Comparing survey and surveillance data

There are several ways in which direct comparisons between the ANC surveillance data and surveys results can inform the estimates:

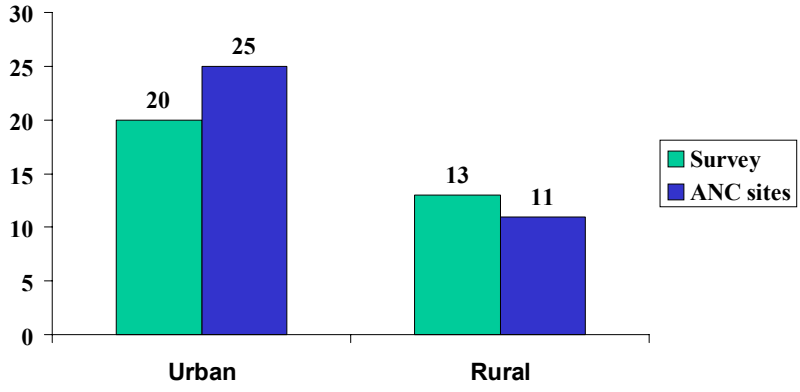
- **Comparison of the prevalence among pregnant women in the survey with antenatal clinic prevalence** – this tells us something about the extent to which pregnant women in the antenatal clinic of the surveillance system are representative of all pregnant women. (example)

- **Comparison of the urban HIV prevalence rates between survey and urban ANC data** – if the antenatal surveillance system covers the urban population well, the overall prevalence 15-49 years in the survey should be close to the antenatal data.

- **Comparison of HIV prevalence between rural antenatal clinics in the surveillance system and data for both sexes combined for nearby clusters of the population-based survey**. These should be close as well if numbers are sufficiently large (to reduce sampling error).

Figure 5.2 gives an example of a comparison between HIV prevalence in the same clusters. In both urban and rural areas the prevalence figures were fairly close. Note that sampling error can easily explain the differences. The rural survey prevalence is based on only 7 clusters (77 women).

Figure 5.2
Comparison of HIV prevalence in DHS survey and antenatal clinics in the same clusters, Zambia, 2001/2002



- **Comparison between the overall rural HIV prevalence in the survey and surveillance system**. One would expect the rural prevalence in the survey to be about 20% lower (see Chapter 3) than the rural prevalence from the antenatal clinic data. Although this figure of 20% is arbitrary and the urban rural gradient may vary considerably from country to country. This is because more remote and less densely populated rural areas are usually not covered by the antenatal clinics of the surveillance system, and because such areas are likely to have lower HIV prevalence. If there are larger differences between the two rural estimates, one will have to change the adjustment factor in the estimation procedure.

  If possible one should divide the population into three strata, major urban, semi urban (smaller towns, trading centres etc.) and truly rural. This enables a better assessment of the gradient in HIV prevalence from major urban to remote rural populations. The problem with using the three strata is that it is often difficult to obtain data on the proportion of the population that lives in semi-urban areas.

- **Comparison of ranking of geographic areas (e.g. provinces or regions)** if possible. If there is little consistency between the two this is a source of major concern. If the antenatal clinic data are based on multiple years and show a consistent level or consistent trend, then the discrepancy should prompt an in-depth investigation of the accuracy of the population-based estimates by geographic region as there may have been serious problems in some or all.

Conclusion

For all estimates, whether based on a national survey or on sentinel surveillance data there is a need to critically appraise the data. A single method or data source generally will not provide the best estimate of HIV prevalence. The value of antenatal clinic-based surveillance lies primarily in the assessment of trends, and surveys, often conducted at 4-5 year intervals, may help improve our efforts to produce estimates of the level of HIV prevalence-based on antenatal clinic data. High quality population-based surveys can improve the assumptions that are used to estimate national levels of prevalence. Example would include assumptions related to the rural adjustment and the computation of male prevalence. Furthermore, results of population-based surveys could clearly point to improvements needed in national HIV surveillance systems.

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