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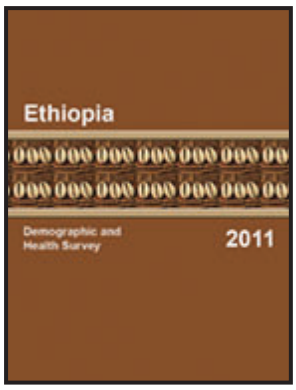
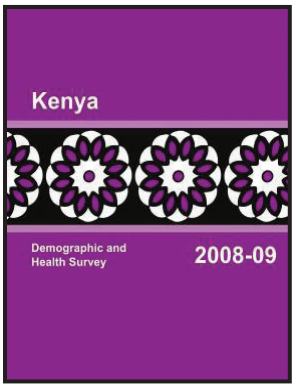
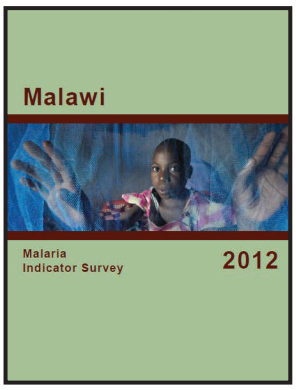
# MODULE 6

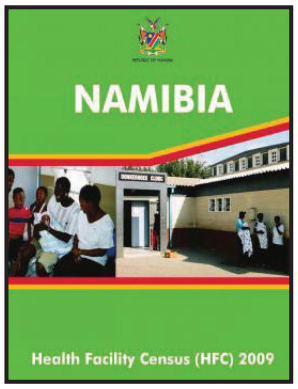
# Understanding and Using the Demographic and Health Surveys

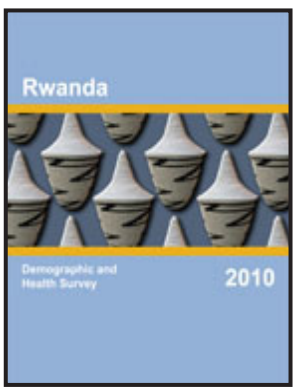
## DHS Curriculum
## Facilitator's Guide
## March 2014

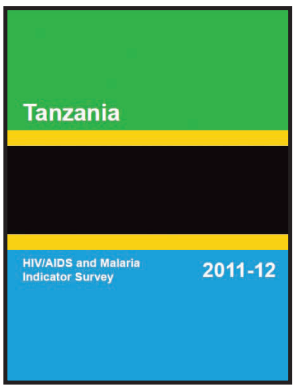


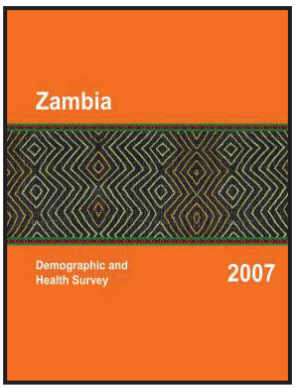







**About the DHS Curriculum Facilitator's Guide**

The following persons (in alphabetical order) have contributed to developing, reviewing, and editing *Understanding and Using the Demographic and Health Surveys – DHS Curriculum Facilitator's Guide*: Sarah Balian, Thada Bornstein, Sarah Bradley, Anne Cross, Joy Fishel, Lia Florey, Debbie Gachuhi, Hannah Guedenet, Kiersten Johnson, Shane Khan, Laurie Liskin, Erica Nybro, Cameron Taylor, and Sally Zweimueller

The DHS Curriculum Facilitator's Guide is a comprehensive package of ready-made training materials about understanding and using Demographic and Health Survey reports. The curriculum is designed for use in African universities and with public health program staff. Over 25 hours of instruction are divided into eight stand-alone modules designed to be a course on its own or customized and integrated into existing curricula. Each module is complete with instructor guides, Power Point slides, exercises, handouts, pre and post tests and answer keys. The DHS Curriculum Facilitator's Guide is available in both print and electronic versions.

Questions and comments regarding the DHS Curriculum can be sent to curriculum@dhsprogram.com

**About The DHS Program**

The DHS Program assists countries worldwide in the collection and use of data to monitor and evaluate population, health, and nutrition programs. Funded by the U.S. Agency for International Development (USAID) under the terms of Contract No. GPO-C-00-08-00008-00, The DHS Program is implemented by ICF Macro in Rockville, Maryland. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development.

The main objectives of The DHS Program are:

1) to provide decision makers in survey countries with information useful for informed policy choices
2) to expand the international population and health database
3) to advance survey methodology
4) to develop in participating countries the skills and resources necessary to conduct quality demographic and health surveys

Information about The DHS Program or the status of The DHS Program surveys is available on the Internet at http://www.dhsprogram.com or by contacting:

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# Module 6: Collecting Data on HIV/AIDS in National Surveys

## PREPARATION

### Review Instructor Guide

### Equipment, Materials, Supplies

- LCD projector and screen
- Flipchart or writing board
- Markers
- PowerPoint presentation

### Handouts

Make copies for each student of:

- Handout 6.1, *HIV Testing in National Population-based Surveys: Experience from the Demographic and Health Surveys*, by V. Mishra et al. Bulletin of the World Health Organization 84(7), July 2006.
- Handout 6.2, *Comparing Sentinel Surveillance Data and Population-based Surveys*
- Handout 6.3, Map of *National HIV Prevalence*
- Handout 6.4, *Results of Recent Population-based Surveys* (UNAIDS 2007 AIDS Epidemic Update)
- Handout 6.5, *UNAIDS Global Facts and Figures 2009*

### Room Arrangements

Participants should be seated at tables in groups of four to seven, if possible

**PURPOSE**

This module explains how the DHS estimates HIV prevalence, compares DHS estimates with HIV estimates from other sources, and discusses DHS results on HIV from six countries in sub-Saharan Africa.

**OBJECTIVES**

By the end of this module, participants should be able to:

- Discuss the type of data The DHS Program collects
- Describe how The DHS Program estimates HIV prevalence
- Compare The DHS Program HIV prevalence estimates to other HIV prevalence estimates
- Discuss the latest The DHS Program HIV knowledge, behavior, and prevalence results in six countries
- Explain how to correctly interpret trends in HIV prevalence

**TIME**

6.5 hours (including optional sessions)

**MODULE OVERVIEW**

| | | |
|---|---|---|
| Session 1 | Key HIV-related Data collected by The DHS Program | 1 hour |
| Session 2 | The DHS Program Estimates of HIV Prevalence | 2 hours |
| Session 3 | Comparing DHS and Other Estimates of HIV Prevalence | 1 hour |
| Session 4 | HIV Knowledge and Prevalence: Results from Six Countries (Optional) | 1.5 hours |
| Session 5 | Measuring Trends in HIV Prevalence (Optional) | 1 hour |

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|---|---|
| **Session 1**<br>1 hour | **Key HIV-related Data Collected by The DHS Program** |
| **Session Objective** | Discuss the types of HIV-related data the DHS collects |
| **STEP 1** | PRESENT **Slides 1 and 2**.<br>WELCOME participants, REVIEW the objectives for this module, and PROVIDE an overview of all four sessions. Point out the objectives for the first session.<br>Present **Slide 3**.<br>To introduce this session, TELL participants that The DHS Program collects a lot of information on HIV knowledge, attitudes, behavior, and, sometimes, HIV prevalence. Data are usually collected from both women and men age 15–49. Several countries have collected HIV prevalence data from children. For example, the 2011 Uganda AIS collected prevalence data from children, birth to age four, and the 2009 Mozambique AIS, from birth to age 11. A number of countries are now collecting prevalence data on men up to age 59 or even 64<br>Many of the questions on HIV knowledge and behavior were added to the DHS in response to requests from USAID and leading international organizations, such as UNAIDS (the Joint United Nations Programme on HIV/AIDS). These organizations asked for the information in order to help plan, monitor, and evaluate national programs to fight HIV/AIDS. Questions that have appeared in previous DHS surveys may not appear in future ones. With every new phase of The DHS Program, revisions are made to the questionnaire. Most recently, HIV-related questions on orphans and vulnerable children, care for sick persons, and knowledge of abstinence as a prevention method have been removed from the questionnaire. Take, for example, the question on abstinence. It was included in the DHS because many behavior change programs focus on abstinence. However, the global community has never agreed upon knowledge of abstinence as a standard indicator. The question was also found to be confusing for respondents: they did not understand what the question was asking.<br>TELL participants that we will now look at some of the standard HIV indicators that are included in The DHS Program. |
| **STEP 2** | PRESENT **Slide 4**.<br>EXPLAIN that questions regarding HIV knowledge in the DHS and AIS cover the basic awareness of HIV/AIDS, the |

two major prevention methods, and various misconceptions about HIV transmission. Data from the knowledge questions are always presented by background characteristics, such as age, sex, residence, and education. This is done to help HIV prevention projects target their messages better.

In most African countries, over 80% of women and men have heard of AIDS. Using trend data, the DHS has shown how health communication programs and the media have increased awareness of HIV and AIDS in many African countries.

PRESENT **Slide 5**.

EXPLAIN that comprehensive knowledge of HIV is an example of a combined indicator—one that includes multiple parts. This indicator is calculated from answers to five questions. Only if respondents answer all five questions correctly are they considered to have comprehensive knowledge of HIV. DHS reports present data on the knowledge of each indicator separately and for the combined comprehensive knowledge indicator.

EXPLAIN that this indicator is not the same for every country. The two most common misconceptions are different depending on local beliefs in each country. In some countries many people believe that HIV is transmitted by mosquitoes but not by supernatural means. In other countries the opposite is true. These differences are taken into account when calculating this indicator for different countries.

PRESENT **Slide 6**.

EXPLAIN that in almost every country, people are more likely to know that HIV can be transmitted by breastfeeding than they are to know that there are drugs that can reduce the risk of transmission via breast milk and childbirth. These data are very important for people setting up PMTCT projects.

PRESENT **Slide 7**.

EXPLAIN that measuring stigma in a quantitative survey like the DHS is not easy. The DHS uses four questions that probe attitudes toward people living with HIV/AIDS to assess stigma. Of these four, in most countries people are most likely to agree that they would care for a family

member with HIV in their homes.

In some countries, the percent of women and men who express positive attitudes on all four indicators is very low. In Zimbabwe, for example, where 18% of women and men age 15–49 are HIV-positive, the 2005–2006 DHS found that only 17% of women and 11% of men agreed with all four statements.

PRESENT **Slide 8**.

EXPLAIN that these indicators are designed to identify behaviors that increase or decrease the risk of HIV transmission, including sex with multiple partners, and condom use. TELL participants that UNAIDS has recently changed the definition of higher-risk sex to having sex with more than one partner in the previous 12 months. Previous DHS surveys define higher-risk sex as sex with a person who is not a spouse or who does not live with the respondent. New interest has emerged in concurrency; that is having 2 sexual partners in the same time period. Most surveys carried out since 2010 present the prevalence of concurrent sexual partnership among both women and men.

It is important to remember that people may not always be honest about their own sexual activities, but that the DHS ensures confidentiality so that respondents can feel safe being honest.

PRESENT **Slide 9**.

EXPLAIN that these questions are designed to get information about how many people in a country have ever been tested for HIV. This information helps program planners evaluate the success of their testing programs on a national and regional basis.

It is important to note that those who have been tested and received the results of their HIV test do NOT necessarily know their current status. Someone who tested negative a year ago may have become infected since the time of their last test. This indicator is often used as a proxy for the percentage of people who know their status, but this should be interpreted with caution.

PRESENT **Slide 10**.

EXPLAIN that these indicators are designed to measure behaviors among young people age 15–24 that may put them at greater risk for HIV.

PRESENT **Slide 11**.

EXPLAIN that the great advantage of testing for HIV infection in the DHS is that it is possible to identify the demographic characteristics of HIV-positive respondents. This helps identify patterns of behavior that may be associated with HIV.

For example, the DHS clearly shows that HIV is more common in urban than in rural areas and more common among women than among men. However, not all DHS surveys have shown an association between male circumcision and HIV infection, as has been found in other studies.

One important risk factor for HIV transmission is when marital partners or cohabiting couples do not share the same HIV status. If one member of a couple is infected with HIV and the other member is not, the couple is called "discordant."

**STEP 3**

End this session by ASKING participants if they have any questions about information on HIV/AIDS collected in DHS surveys. ENCOURAGE participants to read through the HIV chapters in a DHS final report in their free time, and REMIND them that the questionnaire in the appendix of each survey will provide information on how the questions are asked. DISTRIBUTE **Handout 6.5**, *UNAIDS Global Facts and Figures 2009* for participants to review in their free time.

| | |
|---|---|
| **Session 2**<br>2 hours | **The DHS Program Estimates of HIV Prevalence** |
| **Session Objective** | Describe how the DHS estimates HIV prevalence |
| **STEP 1** | |
| | PRESENT **Slide 12**. |
| | TELL participants that getting accurate estimates of HIV prevalence and trends over time has been one of the greatest challenges in controlling the epidemic. |
| | This session will discuss several different approaches to estimating the prevalence of HIV. Thanks to the DHS, **population-based estimates** are now considered the most accurate approach by all international agencies. |
| | DHS is now starting to repeat HIV testing in some countries. The next challenge is to consider how to interpret trends based on population-based data. |
| | PRESENT **Slide 13**. |
| | EXPLAIN that the first time the DHS included HIV testing was in 2001 in Mali. Since that time, the DHS has conducted HIV testing in more than 30 countries, including Burkina Faso, Cameroon, Côte d'Ivoire, Ethiopia, Kenya, Rwanda, Tanzania, Uganda, and Zambia. |
| | As of March 2014, DHS has done a second round of HIV testing in 19 countries: Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Dominican Republic, Ethiopia, Guinea, Haiti, Kenya, Lesotho, Malawi, Mali, Niger, Rwanda, Senegal, Tanzania, Uganda, Zambia, and Zimbabwe. |
| | In 2014, surveys with HIV testing will be starting or underway in the following countries: Democratic Republic of Congo, Dominican Republic, Gambia, Ghana, India, Liberia, Mali, Namibia, Sierra Leone, Togo, and Zambia. |
| | TELL participants to read **Handout 6.4**, *Results of Recent Population-based Surveys*, to learn more about how estimates from the DHS have influenced and changed other international estimates of HIV prevalence. |
| **EXERCISE** | (NOTE to the instructor: The instructions below divide participants into small groups for this exercise. However, if the participants have limited knowledge of HIV/AIDS, it may be better to keep the participants together and lead the discussion yourself. In either case, this exercise should |

take about 30–45 minutes.)

PRESENT **Slide 14**.

DIVIDE the participants groups of 3-4 to discuss the two questions on the slide. Allow 20–30 minutes for this, and then BRING everyone together. One question at a time, ASK several individuals to share their answers with the rest of the participants.

*Question 1: What source of data have most countries relied on to estimate levels of HIV infection?*

Answer: Sentinel surveillance sites located in the country

DEFINE sentinel surveillance: Sentinel surveillance refers to the systematic and continuous monitoring of HIV prevalence among specific groups of people who attend specific health care facilities. In most countries, sentinel surveillance for HIV has been carried out in just one group of people: pregnant women who receive antenatal care. Since sentinel surveillance involves only people who come to health care facilities, it is facility-based research.

EXPLAIN the following points:

There are two main reasons for routinely testing pregnant women during ANC visits as a way to measure national HIV prevalence:

- Pregnant women are thought to be fairly representative of the general adult female population.
- Many pregnant women come to antenatal care clinics (ANC) at least once during their pregnancy and thus can easily be tested.

Pregnant women are typically tested for syphilis during their ANC visits. The extra blood from this test is then used to test for HIV. The pregnant women are not given the results of their HIV tests because by design the testing is anonymous and confidential.

Some countries also anonymously test blood donors to estimate HIV prevalence. Researchers do not test nearly as many blood donors as pregnant women. Researchers also do not test blood donors as frequently as they test pregnant women. This is because blood donors are a self-selected group and may include people who donate blood for money or for a family member who is sick. Thus, they are not representative of the general population.

*Question 2: What other sources of data are available on the prevalence of HIV and AIDS?*

Possible answers include:

- Local surveys

- Community mapping
- Voluntary counseling and testing (VCT) statistics
- Prevention of mother-to-child transmission (PMTCT) service statistics

EXPLAIN that these sources differ from population-based testing in two ways: they involve a different size sample, and some may be biased because they are a self-selected sample.

Present **Slide 15**

(Note to the instructor: If participants do not know the difference between incidence and prevalence you can conduct the following visual demonstration:

Tell the class that they represent a population. Ask someone to count how many people are present in class that day. Choose approximately 10% of the class and ask them to stand up. Tell the class to imagine that the people standing are HIV+. Ask someone to count how many people are standing. Tell the class that you are going to calculate HIV prevalence for this example. You will divide the number of people standing (who represent HIV+ individuals) by the total number of people in the class (who represent the population). This number represents the HIV prevalence within the population.

To demonstrate HIV incidence. Ask half of the people who are standing (who represent HIV+ individuals) to choose one of the people seated next to them. Tell these individuals to stand up as well. Tell the class to imagine that the people who have just stood up had unprotected sex with the people who chose them and they are newly infected with HIV within the past year. Tell everyone to sit down except for the people newly infected with HIV. Ask the class to count how many people are currently standing. In order to determine HIV incidence over the past year, divide the number of people standing by the total number of people in the classroom. Explain to the class that incidence is always for a given time period, most often over the course of a year.

Now have all those who were originally and newly infected with HIV stand up. Recalculate HIV prevalence (the total number standing divided by the total number in the class). HIV prevalence increased with the new cases.

Ask the class what will happen if 3 of those standing die? (answer: HIV prevalence will go down).

Ask the class what will happen if all of those standing go on ARVs and live long lives? (answer: if new people continue to be infected, HIV prevalence will increase because none of the HIV-positive people are dying and dropping out of

the population. This is why HIV prevalence may increase in countries where there are good ART programs, even if fewer new cases of HIV occur.)

The ultimate goal is to reduce incidence (i.e. new cases of HIV spreading) and to support those currently HIV-positive to live long, healthy lives. )

*Question 3: What is the difference between HIV prevalence and HIV incidence? How are they calculated?*

Answer: HIV prevalence measures the percentage of people in a population who are infected with HIV; it includes both new and ongoing cases of HIV infection.

In contrast, HIV incidence measures only the number of new HIV infections in the population during a certain time period, usually one year.

WRITE the following formulas on the flipchart, and EXPLAIN how to calculate HIV prevalence and incidence.

*For HIV prevalence:*

$$\frac{\text{Number of persons age 15-49 infected with HIV}}{\text{Total number of persons age 15-49 in the population}}$$

*For HIV incidence:*

$$\frac{\text{Number of new HIV infections in persons age 15-49 during one year}}{\text{Total number of persons age 15-49 at risk during that year}}$$

(Note to instructor: In each formula, the horizontal line indicates "divided by.")

TELL participants that the DHS measures HIV prevalence, not HIV incidence.

**STEP 2**

PRESENT **Slide 16**.

TELL participants that **Slides 17–21** discuss how HIV testing is conducted in the DHS and AIS.

EXPLAIN the following process for collecting blood samples:

After getting their informed consent, the interviewer asks both men and women to provide some blood. The blood is collected by pricking the finger with a clean and sterile lancet, which is a sharp medical instrument. The finger is first cleaned with alcohol and then pricked. The first drop of blood is wiped away. Then the health worker collects five drops of blood, letting them drip onto filter paper in specially designated spots.

The blood sample is then sent to a lab. The blood spot does not have a name on it, so the DHS cannot identify by name the person from whom the blood was collected. However,

the sample does have a bar code that can be read digitally by a scanner. Each bar code is unique to an individual. The bar code allows the HIV test result to be linked with the DHS questionnaire from the same individual. However, it prevents anyone from identifying the individual tested, because the names of DHS respondents are not recorded in the databases.

Respondents always give informed consent for the HIV test. The interviewer reads the following statement to the respondent:

"As part of this survey, we are also studying HIV among women and men. As you know, HIV is the virus that causes AIDS. We are trying to find out how big the AIDS problem is in [name of country], so we are asking the people we interview to give a few drops of blood from a finger. The things we use for taking the blood are completely clean and safe. The blood will be sent to a laboratory for testing. No names will be attached. Do you have any questions? Will you accept the test?"

If the respondent agrees, then the interviewer signs his or her own name certifying that the respondent has agreed. If the respondent is unmarried and between the ages of 15 and 17, a parent or guardian is required to give consent. If the respondent does not agree, the interview is ended.

PRESENT **Slide 17**.

EXPLAIN that this is a picture of a woman giving blood during the survey. You can see that her finger has already been pricked and five drops are being placed onto the five circles on the filter paper. A bar code label unique to the respondent is attached to the filter paper, but information that could potentially identify an individual (such has his/her name) is not.

Infection control procedures are carefully followed. Notice that the interviewer is wearing plastic gloves to protect herself and the survey respondent. Interviewers receive extensive training to do this testing.

PRESENT **Slide 18**.

EXPLAIN that, as we saw, blood is collected and stored on special filter paper. This paper is placed in a drying box like the one pictured here for 24 hours. After that, it is transferred to an airtight bag with a desiccant, or drying agent, which preserves the samples until they can be taken to the laboratory.

Point out that the drying box is sitting on top of a sheet of bar code labels. These are used to make sure that samples

remain anonymous.

Samples are usually sent to the lab every week or two during the field work.

PRESENT **Slide 19**.

EXPLAIN that after the blood is collected, it is sent to a central laboratory where it is tested for HIV. Each sample is tested with a special biochemical test called ELISA, which stands for enzyme-linked immunosorbent assay. ELISA tests are considered by experts to be a highly accurate method of testing for HIV antibodies. All (100%) of the samples that test positive for HIV and 10% of the samples that do not are retested with a second type of ELISA test. If the first and second tests are discordant, that is, if they disagree, the samples are retested with both types of ELISA tests.

If the results are still discordant after the second round of ELISA testing, the samples are tested using a Western Blot test, and the result from the Western Blot is considered final. The Western Blot test is more accurate then the ELISA, but it also more expensive and takes more time. It is not practical to test all of the samples with the Western Blot.

To ensure the highest standard of testing, the DHS selects about 5% of the total sample and sends it to another lab, one that is not associated with the survey, for testing. These samples are tested, and the results are checked against the results of the main laboratory.

This protocol outlines the steps generally followed. However, there are variations in some countries. For example, not all countries have two highly qualified laboratories to do outside quality control. In these instances quality control is done in the same laboratory but by different tests and different technicians. In every country, the DHS follows internationally accepted guidelines for ensuring that the data are valid.

TELL participants that testing is explained in more detail in **Handout 6.1**, which will be distributed at the end of the session.

PRESENT **Slide 20**.

EXPLAIN that when the results of the HIV tests are finalized, these data are merged with the data from the individual interviews. When test results are merged with data from the individual interviews, all information that

could potentially identify a respondent has been removed, so there is no way for a respondent to be linked with his/her HIV test results. This produces a dataset that links individual characteristics to HIV prevalence. In other words, this makes it possible to link HIV prevalence with an individual's education, residence, income, and other characteristics.

PRESENT **Slide 21**.

EXPLAIN that each country has an ethical review board that must approve all procedures for HIV testing in the DHS. The DHS submits forms describing the testing procedures to this review board. The board may make queries and suggestions before it approves the testing. The procedures are also approved by the review boards of all the implementing partners.

As explained earlier, each respondent indicates their willingness to participate and be tested through an informed consent process. Each respondent's confidentiality is ensured through anonymous testing.

The DHS takes special care to make sure that the workers who collect the blood samples are not injured or exposed to injury. The lancet used to prick the finger, for example, contains a blade that is small and retractable. After a finger is pricked, the blade retracts into the lancet and cannot be removed. If venous blood is collected (which requires the use of needles), all medical tools are disposed of in sharps containers, following strict infection control procedures. Workers use alcohol to clean the fingers of respondents and wear gloves to protect themselves while collecting blood.

**EXERCISE**

PRESENT **Slide 22**.

DIVIDE participants into two groups to debate the following question:

Should respondents be told their HIV status during the survey? Consider the following issues in your decision: respondent confidentiality, access to health care, logistics, cost, and national policies.

APPOINT one group to be "pro," that is, to argue for returning test results, and the other group to be "con," that is, to argue against returning test results.

(An alternative way to conduct this exercise is to have the two groups list reasons for and against returning test results and then compare their lists.)

TELL the groups they have 20 minutes to prepare their

response and 5 minutes to present their arguments. Each group should appoint a recorder to take notes, a timekeeper, and a spokesperson who will present the group's arguments to the rest of the participants.

Below are some points that may come up during the discussion:

PRO:

• In remote areas, people may not have another opportunity to learn their HIV status.

• People have a right to be informed about a life-threatening condition even if they cannot get treatment.

• People with access to treatment can start ARVs (antiretrovirals) and save their lives.

• Learning their status may prompt people to start practicing safer behavior.

• Returning HIV test results is an opportunity to make a difference in peoples' lives.

• People should be given the option of receiving or not receiving their results, so that they can make their own decisions.

CON:

•HIV testing is no longer confidential if field workers know results.

Confidentiality is a concern: if the counselor stays in a house a long time, neighbors may assume someone living there is HIV-positive.

• A respondent who receives his or her results at home may be pressured by other family members into revealing the test results. For example, there could be serious repercussions for a married couple who learns that one partner is HIV+, while the other is not.

• Some people do not want to know their status.

• Some people may feel pressured into getting their results when they do not want them.

• Respondents may not volunteer to give blood for testing if they know they will be told the results.

• If not using rapid tests, interviewers would have to come back to the household, which is very time-consuming and expensive.

• Interviewers are not trained counselors; they either would have to be trained to do so, which would incur additional time and cost, or counselors would need to join the interview teams.

• Providing counseling to both HIV-positive and HIV-

negative individuals can be very time-consuming and increase the time allocated for field work.

Other related points:

• There may be ethical concerns about testing when there is no access to treatment for people found to be HIV-positive or to prevention methods for people found to be HIV-negative. Is it ethical to tell someone that they have HIV if you cannot provide treatment?

• Sentinel surveillance protocols at ANC facilities do not even tell women that their blood is being tested for HIV and also do not give them the results.

• Research on people who have been tested and learned their test results does not conclusively show that there has been behavior change. Results are very mixed. Many people do not change their behavior.

**STEP 3**

PRESENT **Slide 23**.

SUMMARIZE the discussion. TELL participants that The DHS Program works with each country to develop a policy for returning results. Therefore, the policy of returning test results varies from country to country.

PRESENT **Slide 24**.

EXPLAIN that in a number of countries, the standard protocol has been modified at the request of the national government or other agencies working in the country. This table lists various approaches taken in different DHS surveys.

TELL participants about yet another approach that was used in a survey conducted in Kenya in 2007, in which The DHS Program was not involved. Respondents were given a piece of paper with a bar code. The HIV test results, labeled with the same bar code, were sent from the central laboratory to the VCT site closest to the respondent several months after the survey was completed. The respondent was told that he or she could take the bar code to that facility, where a provider would match it with the information from the central laboratory and give the respondent the results, along with appropriate counseling.

PRESENT **Slide 25**.

EXPLAIN that each approach to following up survey respondents who have been tested for HIV raises both practical and ethical issues. The columns in this table

present four of the most common approaches to follow-up. The rows show which challenges are associated with each approach.

The last row concerns complexity and cost. Considerable resources, including experienced personnel and reliable logistics, are needed to implement testing and to ensure that good quality services will be provided to respondents. Most countries do not have this level of resources.

PRESENT **Slide 26**.

TELL participants that the DHS standard protocol, which has been used in the most countries, is to tell the respondent during the informed consent procedure that she or he will not get test results back.

The respondent is given educational materials about HIV and a referral for free testing at the nearest facility.

PRESENT **Slide 27**.

TELL group that there is no absolutely right way. Country and individual situations differ. However, the DHS protocol, which calls for individual informed consent and providing respondents with vouchers to VCT clinics is in compliance with international guidelines, that is protocol approved by WHO and UNAIDS.

ASK the group for a few volunteers to answer the following question: Based on what you have learned, would you now change your opinion about returning HIV test results to respondents from the one you held during the earlier debate? Why or why not?

**STEP 4**

End this session by ASKING participants if they have any questions. DISTRIBUTE **Handout 6.1**, *HIV Testing in National Population-based Surveys: Experience from the Demographic and Health Surveys.* This provides more detailed information on HIV testing in the DHS. TELL participants that they can read it in their free time.

| | |
|---|---|
| **Session 3**<br>1 hour | **Comparing DHS and Other Estimates of HIV Prevalence** |
| **Session Objective** | Compare DHS estimates to other estimates of HIV prevalence |
| **STEP 1** | PRESENT **Slide 28**.<br>TELL participants that this session will focus on the differences between estimates of HIV prevalence produced by the DHS and estimates based on sentinel surveillance. Remind participants there are several sources of data on HIV, including population-based and sentinel surveillance data. |
| **EXERCISE** | (NOTE to the instructor: There are two ways to conduct this activity using **Handout 6.2**, *Comparing Sentinel Surveillance Data and Population-based Surveys.* If participants' knowledge is limited, you may lead the discussion as an activity for the entire group. If the participants are more advanced, you may have participants work in pairs or small groups to complete the exercise. See below for the two sets of instructions.)<br>*Discussion approach:*<br>DISTRIBUTE **Handout 6.2**. TELL participants to look at the table. DISCUSS with participants how to best fill in the cells in the table, beginning with the columns that participants are more familiar with.<br>*Small group exercise approach:*<br>DISTRIBUTE **Handout 6.2**. DIVIDE participants into small groups or pairs. ASK them to complete the table to the best of their knowledge. TELL each group to select a recorder to take notes and a spokesperson to present the group's conclusions to the rest of the participants. Allow about 15 minutes for this. BRING everyone together, and ASK different groups to share their responses with the rest of the participants.<br>PRESENT **Slide 29**.<br>EXPLAIN that a question may arise as to which data we should use to estimate HIV prevalence. The answer is that we need to use both population-based and sentinel surveillance data. Population-based surveys provide the most accurate estimate of national HIV prevalence. However, they are time-consuming and expensive. It is not possible to carry them out on a regular basis. It also is |

not practical because prevalence does not change quickly enough to justify more frequent surveys.

TELL participants that sentinel surveillance estimates are easier and less expensive to carry out. They can be conducted every year or every two years. However, they do not represent all people in the country as well as population-based surveys. For example, most sentinel surveillance estimates are based only on women who go for ANC, predominantly urban women. Men are left out. Furthermore, only pregnant women go for ANC, which means that they have had unprotected sex, which potentially put them at risk of contracting HIV.

Most experts now agree that a combination of both types of data is the best solution. Less expensive sentinel surveillance among pregnant women and blood donors can be used to track the status of the epidemic and show trends over time. The results of population-based surveys, conducted every four to five years, can serve as a means of adjusting the accuracy of the sentinel surveillance estimates.

**STEP 2**

EXPLAIN that sentinel surveillance results from ANC sites are often very similar to the results produced by population-based surveys for the pregnant women included in the survey sample. We are going to look at an example from Ethiopia, which illustrates how important it is to compare "like with like"—that is pregnant women from sentinel surveillance and pregnant women from population-based surveys. TELL participants that the DHS project does this type of analysis in many countries.

PRESENT **Slide 30**.

TELL participants that now we are going to compare the DHS HIV prevalence estimates to those from ANC sentinel surveillance in Ethiopia. This slide presents results from the 2005 Ethiopia DHS.
In Ethiopia, the 2005 DHS found that the HIV prevalence was:

- 1.9% among women,
- 0.9% among men, and
- 1.4% among all adults.

This pattern, in which women have a higher prevalence than men, is found in most African countries.

PRESENT **Slide 31**.

SHOW participants that the prevalence of HIV in Ethiopia is much higher among women than men in urban areas. In rural areas, women and men have similar levels of HIV.

PRESENT **Slide 32.**

SHOW participants that HIV prevalence increases for both women and men as education increases.

PRESENT **Slide 33**.

EXPLAIN that this table compares the EDHS 2005 estimates of HIV prevalence with estimates based on ANC sentinel surveillance for the same year. In the vast majority of regions, the ANC estimates are higher than the EDHS estimates.

For example, the 2005 EDHS estimated HIV prevalence in Addis Ababa at 4.7%, while the ANC estimated prevalence in Addis Ababa at 11.7%—more than twice as high.

PRESENT **Slide 34**.

EXPLAIN that the EDHS also provides data on the use of antenatal care. This figure shows that urban women were more than twice as likely as rural women to receive ANC in 2005. Since we know that HIV prevalence is higher in urban areas, we should expect that HIV testing done among mostly urban women would result in a higher HIV prevalence as well. Testing primarily among women in antenatal care tends to skew ANC estimates of HIV prevalence upward, since the prevalence of HIV in Ethiopia is far higher among urban than rural women.

PRESENT **Slide 35**.

TELL participants that this slide is similar to the previous one. The figure shows that more educated women use ANC more heavily than less educated women. This may also bias ANC estimates of HIV prevalence since, as we saw before, HIV prevalence increases with education in Ethiopia.

PRESENT **Slide 36**.

EXPLAIN that this figure compares three different estimates of HIV prevalence among women in Ethiopia. The first two come from DHS data, while the third comes from ANC sentinel surveillance data.

The figure shows that the DHS estimate for pregnant women who received ANC (shown in the first bar) is comparable to the sentinel surveillance ANC estimate (shown in the third bar). Both estimated HIV prevalence in

| | |
|---|---|
| | this population group at 3.5%. The DHS estimated HIV prevalence to be considerably lower among women who did not receive ANC or were not pregnant (shown in the second bar); these women, by definition, were not included in the ANC sentinel surveillance data.<br><br>EMPHASIZE that this is a very important point. When we compare similar populations or samples—pregnant women with pregnant women—the results are similar, regardless of the source of data. It is very important to consider the nature of the population being studied when you compare different sources of data. |
| **STEP 3** | End this session by ASKING participants if they have any questions about the difference between ANC and DHS estimates of HIV prevalence. |

| | |
|---|---|
| **Session 4**<br>1.5 hours | **HIV Knowledge and Prevalence: Results from Six Countries (Optional Session)** |
| **Session Objective** | Discuss the latest DHS HIV results from Ethiopia, Kenya, Malawi, Rwanda, Tanzania, and Zimbabwe |
| **STEP 1** | (NOTE to instructor: As you present **Slides 37–52,** which compare results on HIV knowledge, attitudes, behavior, and infection from six African countries, ASK participants for their thoughts on what each slide shows before you share the notes.<br><br>Alternatively, you may show a presentation of the HIV results from your own country instead of these slides. Check the Curriculum CD to see whether such a presentation is available for your country.)<br><br>PRESENT **Slide 37**.<br><br>TELL participants that as we go through these slides on HIV knowledge and prevalence, they should look for common patterns and consider the implications of these patterns for prevention and treatment interventions.<br><br>PRESENT **Slide 38**.<br><br>EXPLAIN that most people in Africa have heard of AIDS. When the DHS asked this question in surveys in the 1980s and early 1990s, the responses were very different. While older women and men, particularly those in rural areas and with less education, remain somewhat less likely to have heard about AIDS than other members of the population, the vast majority of people know about the disease.<br><br>PRESENT **Slide 39**.<br><br>EXPLAIN that knowledge of prevention methods is quite high. However, this figure includes some disturbing findings. First, fewer women know about condoms than other prevention methods. Secondly, Ethiopian women are much less knowledgeable than other African women: less than two-thirds of Ethiopian women know how to prevent HIV infection.<br><br>PRESENT **Slide 40**.<br><br>EXPLAIN that one of the major factors in the transmission of HIV is that infected people look and feel healthy, sometimes for years. By now, many women and men know this fact. Among men, for example, the percent of men who know that you can't tell by looking whether someone is infected with HIV ranges from a low 78% in Ethiopia to a high of 93% in Malawi. Still, people continue to have |

unprotected sex. This is a dilemma for health educators and others trying to stop transmission of the virus.

PRESENT **Slide 41**.

EXPLAIN that many more women know that it is possible to transmit HIV via breastfeeding than know that mother-to-child transmission can be prevented. This difference will decline in time as more PMTCT programs are rolled out in African countries. The results from Ethiopia are cause for concern, however, because less than half of women know that maternal-to-child transmission can be prevented.

PRESENT **Slide 42**.

EXPLAIN that EXPLAIN that more men and women are getting tested for HIV in many countries as VCT programs are scaled up. More than half of women in Kenya, Malawi, Rwanda, and Tanzania have been tested and received the results. Remember that prior testing and knowing the results of the prior test does not necessarily mean that respondents know their current status. Some may have been infected with HIV since their last test.

PRESENT **Slide 43**.

Concurrent sexual partnerships, that is, partnerships that overlap in time, have received increasing attention as a potential driver of the HIV epidemic. In response, The DHS Program began measuring concurrency starting in about 2010 in most countries. Concurrency can be measured by point prevalence, that is the proportion of women and men age 15-49 with more than one ongoing sexual partnership at six months before the interview. Cumulative prevalence of concurrent partnerships is defined as the proportion of women and men age 15-49 with overlapping sexual partnerships at any point in the past year. This slide shows the percentage of women and men who have had concurrent sexual partnerships at any time in the last 12 months or cumulative prevalence. The percentage of women with concurrent partnerships is very low; among men concurrency ranges from 2.8% in Ethiopia to 15.7% in Tanzania. Interpreting these findings is difficult. Men and women do not always tell the truth about the sexual behavior, they also may not remember dates correctly, and for men, concurrency is linked with the practice of polygyny. For these reasons and because the sample size of men and women with concurrent partnerships is so small, the DHS surveys cannot show a relationship between concurrency and HIV prevalence.

Present Slide 44

EXPLAIN that this map shows which countries have carried out a DHS that included HIV testing. DISTRIBUTE **Handout 6.3**, map of *National HIV Prevalence* These include countries in Latin America and Asia, as well as in Africa. Note that the countries in southern Africa have the highest prevalence rates.

PRESENT **Slide 45**.

EXPLAIN that this figure shows the DHS estimates of HIV prevalence for all six countries. Prevalence is lowest in Ethiopia and highest in Zimbabwe.

PRESENT **Slide 46**.

EXPLAIN that in most countries women are much more likely than men to be infected with HIV. This is mostly due to biology: women are more susceptible to infection because there is more vulnerable skin exposed to sexual fluids in women than in men and because semen reaches the cervix where many sexually transmitted infections (STIs) arise. Due to this susceptibility, women are also more likely to have STIs and they, in turn, increase a woman's chance of being infected with HIV. The higher rate of infection in women also stems from gender differences: women are less likely to be able to insist on safer sex than men.

PRESENT **Slide 47**.

EXPLAIN that this figure shows differences in HIV prevalence by urban-rural residence. As noted earlier, the DHS has found that HIV prevalence is commonly higher in urban areas than in rural areas. Recall that higher HIV prevalence in urban areas is one of the reasons that HIV prevalence estimates from ANC sentinel surveillance are typically higher than HIV prevalence estimates from national surveys. Women who live in urban areas are more likely to get ANC than rural women, which can skew HIV prevalence estimates.

PRESENT **Slide 48.**

EXPLAIN that prevalence patterns by age are similar in most countries. This figure shows that infection rates generally rise fairly quickly in younger women and peak among 30-year-olds.

PRESENT **Slide 49.**

EXPLAIN that prevalence patterns by age among men are similar in most countries. This figure shows that infection rates rise later than they do in women and peak HIV prevalence among men generally occurs between age 35 and 44. In Zimbabwe, however, prevalence among men peaks in the 40-44 age group and then starts to drop off.

PRESENT **Slide 50**.

EXPLAIN that in Kenya and Zimbabwe HIV prevalence is lowest among the most educated. [Note to moderator: the percentages in these charts have been rounded, but the chart reflects the actual percentage. Thus, the bars for Ethiopia are slightly different heights although both equal 1.]

PRESENT **Slide 51**.

EXPLAIN that this figure shows that wealth is linked to HIV infection in several countries. As household wealth increases, HIV prevalence generally increases. However, this pattern is changing over time. In Zimbabwe, for example, there is no consistent pattern between wealth and HIV prevalence.

PRESENT **Slide 52**.

EXPLAIN that this figure clearly shows the impact of sexual exposure on HIV infection. HIV prevalence is considerably higher among women who have ever been married than among women who have never married. The high rates of infection among widowed women may reflect the death of their partners from HIV.

**STEP 2**

ASK participants if there was any information that was new to them or that they found surprising.

DISTIRBUTE **Handout 6.4**, *Results of Recent Population-Based Surveys*, for more information on how DHS surveys have impacted global estimates of HIV prevalence. End this session by ASKING participants if they have any questions about DHS estimates of HIV prevalence.

| | |
|---|---|
| **Session 5**<br>1 hour | **Measuring Trends in HIV Prevalence (Optional Session)** |
| **Session Objective** | Explain how to correctly interpret trends in HIV prevalence |
| **STEP 1** | PRESENT **Slide 53**.<br>TELL participants that in order to be able to analyze trends in HIV prevalence, it is important to understand some statistical concepts such as confidence intervals and statistical significance.<br><br>PRESENT **Slide 54**.<br>EXPLAIN that as more surveys that include HIV testing are conducted, there is more HIV prevalence data to consider. People are eager to say that HIV prevalence has changed, to show that a program is working or to request more funding. However, caution must be taken when determining whether or not HIV prevalence has actually changed.<br><br>PRESENT **Slide 55**.<br>EXPLAIN that DHS data are from samples—we don't |

interview everyone in a country. If everyone was interviewed, it would be a census, rather than a survey. If the DHS were a census, there would be no uncertainty around our statistics.

Because DHS uses a sample of people to make estimates about an entire population, it's important to remember that DHS statistics represent the "best estimate" of a statistic (such as HIV prevalence), but it is not necessarily "the truth" for the entire population.

PRESENT **Slide 56**

EXPLAIN that all survey statistics, from DHS or any other source, are estimates. Since surveys choose a sample of individuals, rather than interviewing the entire population, the numbers are not exact values.

Every estimate is subject to a certain degree of uncertainty. The numbers shown in a table are the middle of the range of possible values that reflect the degree of uncertainty of the estimate. This range of possible values is called the confidence interval. Researchers are confident that the truth lies within this range 95% of the time.

[Note to facilitator: The DHS project calculates a slightly wider confidence interval of 95.44% to account for the multi-stage sample design and the complexity of some of the indicators. The difference between the standard 95% confidence interval and those calculated in the DHS is not large enough to be meaningful.]

PRESENT **Slide 57**.

(Note to the instructor: This slide contains animation). EXPLAIN that the 2003-04 Tanzania HIV/AIDS indicator survey reported that the HIV prevalence among women and men age 15-49 on the mainland was 7.0%.

Click to cue the animation.
However, the confidence interval ranges from 6.3% to 7.8%. Researchers are confident that the true HIV prevalence among women and men age 15-49 on the mainland is between 6.3 and 7.8.

PRESENT **Slide 58**.

EXPLAIN that the prevalence estimates for women and men are also subject to error and have confidence intervals surrounding the estimate. To find out the confidence interval we can consult the appendix tables in the DHS.

PRESENT **Slide 59.**

(Note to the instructor: This slide contains animation).

TELL participants that in order to locate the confidence intervals in a report, they must find the Appendix on Estimates of Sampling Errors.

First locate the table which pertains to the sample population of interest. Here we are looking at the sampling errors for women. Click to cue the animation.

Second, find the indicator in the first column, in this case HIV prevalence.

Click to cue the animation.

Third, find the columns R-2SE and R+2SE.

Click to cue the animation.

The R-2SE column shows the lower end of the confidence interval. In this case it is 6.8%. The R+2SE column shows the upper end of the confidence interval. In this case it is 8.6%. Thus, the confidence interval for HIV prevalence among women age 15-49 on the mainland in the 2003-04 Tanzania HIV/AIDS Indicator Survey is 6.8% to 8.6%. Researchers are confident that the true HIV prevalence among women age 15-49 on the mainland is between 6.8% and 8.6%

PRESENT **Slide 56**.

TELL participants that in statistics, a conclusion that is unlikely to have occurred simply by chance is called statistically significant.

If a measure is statistically significant, researchers are confident that the difference between two figures is actually real, and not just a result of chance.

In order to determine if HIV prevalence has really changed, statistical tests need to be performed to determine if the difference in HIV prevalence estimates is statistically significant.

PRESENT **Slide 61**.

TELL participants that when looking at estimates of HIV prevalence from different years, statistical significance must be determined in order to be able to say that HIV prevalence has really changed.

In Tanzania in 2003-04, the HIV/AIDS Indicator Survey reported that HIV prevalence was 7.0% among Tanzanians age 15-49 on the Mainland. But the confidence interval for this figure is 6.3%-7.8%, meaning that researchers are confident that the true national prevalence rate in Tanzania is within this range.

HIV testing was repeated in the 2007-2008 Tanzania HIV and Malaria Indicator Survey. At this time, the national HIV prevalence rate was reported as 5.8 % for 15-49 year olds. This seems much lower, and many people rushed to celebrate a huge victory. But in 2007-2008, the confidence interval was 5.3% to 6.4%.

Note that the two ranges overlap, but just slightly, which requires additional statistical analysis. The statistical test concluded that the decrease in overall HIV prevalence between the two surveys is indeed statistically significant. This means that researchers are confident that the total HIV prevalence for 15-49 years really did decrease between 2003-04 and 2007-08.

Now look at the bars for men age 15-49. In 2003-04 the HIV prevalence among men was 6.3%. The confidence interval was 5.4% and 7.1%. In 2007-08, the HIV prevalence among men was 4.7%. The confidence interval was 3.9% to 5.4%. Again the two ranges barely overlap, which require additional statistical analysis.

The statistical test concluded that decrease among men is also statistically significant. This means that researchers are confident HIV prevalence among men age 15-49 really did decrease between 2003-04 and 2007-08.

Finally, look at the bars for women age 15-49. In 2003-04 the HIV prevalence among women was 7.7%. The confidence interval was 6.8% and 8.6%. In 2007-08, the HIV prevalence among women was 6.8%. The confidence interval was 6.0% to 7.6%. However, we cannot say with confidence that HIV prevalence among women in Tanzania decreased during this time period, as the two confidence intervals overlap quite a bit.

PRESENT **Slide 62**.

TELL participants that apparent decreases in HIV prevalence estimates for different years, we cannot be certain that HIV prevalence has really changed unless statistical tests determine that the changes are statistically significant.

Thus it is important to be very careful when drawing conclusions about trends in HIV prevalence. Statistically significant decreases have been seen only in Tanzania (among men and the total prevalence) and among the total population in the Dominican Republic. Changes in HIV prevalence in Kenya, Mali, and Zambia are not statistically significant; we cannot be certain that the true HIV prevalence in these 3 countries has changed between surveys.

ASK participants if there was any information that was new

to them or that they found surprising.

End this session by ASKING participants if they have any questions about DHS estimates of HIV prevalence.

**STEP 2**

# Module 6

Collecting Data on HIV / AIDS in National Surveys

## Objectives for Module 6

By the end of this module, participants should be able to:

- Discuss the type of data The DHS Program collects
- Describe how The DHS Program estimates HIV prevalence
- Compare The DHS Program HIV prevalence estimates to other HIV prevalence estimates
- Discuss The DHS Program's latest HIV knowledge, behavior, and prevalence results in six countries
- Explain how to correctly interpret trends in HIV prevalence



# Module 6 Session 1

Key HIV-related Data Collected by The DHS Program

## HIV Knowledge: Awareness and Prevention

- Basic awareness of HIV/AIDS: "Have you ever heard of HIV or AIDS?"
- Asks about two HIV prevention methods:
  - Using condoms
  - Limiting sex to one partner

Data are categorized by age, sex, residence, education, etc.



## Comprehensive Knowledge of HIV

- The DHS defines comprehensive knowledge as:
  - Knowing that condom use and limiting sex to one uninfected partner can prevent HIV transmission;
  - Knowing that a healthy looking person can have HIV; and
  - Correctly rejecting two local misconceptions about HIV transmission or prevention.
- Common myths and misconceptions include beliefs that HIV can be transmitted by mosquito bites, supernatural means, or sharing food with an infected person.



## HIV Knowledge: PMTCT

- The DHS includes two questions about the prevention of mother-to-child transmission (PMTCT):
  - Whether HIV can be transmitted by breastfeeding
  - Whether the risk of mother-to-child transmission can be reduced by the mother taking special drugs during pregnancy

## Attitudes Towards People Living with HIV / AIDS

The DHS uses four indicators to assess stigma:

- Are you willing to care for a family member with HIV in you home?
- Would you buy fresh vegetables from a shopkeeper with HIV?
- Should a female teacher with HIV who is not sick be allowed to continue teaching?
- Would you keep it secret that a family member is HIV-positive?

Module 6, Slide 7

## Behavior: Sexual Intercourse

- More than 1 sexual partner in the past 12 months
- Condom use at last intercourse
- Payment for sexual intercourse in last 12 months (men only)
- Concurrent sexual partners (2 overlapping sexual partners in the last 12 months)

Module 6, Slide 8

## Behavior: HIV Testing

- Know where to get a HIV test
- Have ever been tested
- Have ever been tested and received results
- Have been tested and did not receive results
- Have been tested and received results in the past 12 months

Module 6, Slide 9

## Behavior: Youth

- Had sex before age 15, or before age 18
- Used a condom at first intercourse
- Used a condom at most recent intercourse
- Has had sex with more than 1 partner in the last 12 months

Module 6, Slide 10

## HIV Prevalence

- HIV prevalence by background characteristics:
  - Age
  - Sex
  - Education
  - Marital Status
  - Wealth
  - Sexual behavior
  - Male circumcision
- Couples: HIV status of partners

Module 6, Slide 11

# Module 6
# Session 2

The DHS Program Estimates of HIV Prevalence

## HIV Testing in the DHS and AIS

- Benin*
- Burkina Faso*
- Burundi
- Cambodia
- Cameroon*
- Cape Verde
- Central African Republic
- Chad (ongoing)
- Congo (Brazzaville)
- Cote d'Ivoire*
- Democratic Republic of Congo*
- Dominican Republic*
- Equatorial Guinea
- Ethiopia*
- Gabon
- Gambia
- Ghana
- Guinea*
- Haiti*
- India*
- Kenya*
- Lesotho*
- Liberia*
- Malawi*
- Mali*
- Mozambique
- Namibia (ongoing)
- Niger*
- Rwanda*
- Sao Tome e Principe
- Senegal*
- Sierra Leone*
- Swaziland
- Tanzania*
- Togo (ongoing)
- Uganda*
- Vietnam
- Zambia*
- Zimbabwe*

*Testing in more than one survey



## Key Questions on HIV Estimates

1. What source of data have most countries relied on to estimate levels of HIV infection?
2. What other sources of data are available on the prevalence of HIV and AIDS?



## Key Questions on HIV Estimates

- What is the difference between HIV prevalence and HIV incidence? How are they calculated?



## HIV Testing in the DHS and AIS

- Men and women are asked to voluntarily provide drops of blood via a finger prick.
- Dried blood spots are saved on a special specimen collection card.
- An anonymous linked barcode allows for HIV tests to be linked with socio-demographic data from The DHS Program questionnaire without identifying the individual.



## Collecting Blood for HIV Tests



## Drying Box with Blood Samples

## Laboratory Testing for HIV

- Dried blood spots are sent to a national laboratory for testing.
- Blood spots are tested for HIV with ELISA tests.
- To make sure HIV test results are accurate:
  - ALL positive results and 10% of negative results are tested with a different type of ELISA test.
  - Discordant results—positive on one and negative on the other test—are retested with two types of ELISA tests.
  - Results that are still discordant in the second round are tested with the Western Blot test for a final result.
  - About 5% of blood samples are tested at a different laboratory to ensure consistent results.



## Merging Test Results & Demographic Data

After the HIV test results are finalized, they are merged with data from interviews. This permits analysis of HIV prevalence by:

- Age
- Sex
- Residence
- Education
- Ethnicity
- Wealth
- Other background characteristics



## Addressing Ethical Issues

- All HIV testing procedures are reviewed by the country's ethical review board and by review boards at all implementing partners.
- Survey respondents always give informed consent for HIV testing.
- Every effort is made to safeguard respondents' confidentiality.
- Safe procedures are used to collect and test blood to prevent accidental infection.



## Returning the Results of HIV Tests: A Debate

Should respondents be told their HIV status during the survey? Consider the following issues in your decision:

- Respondent confidentiality
- Access to health care
- Logistics
- Cost
- National policies



## Follow-up After HIV Testing

- The DHS Program follows the policies and requests of the country regarding the return of HIV test results to respondents.
- Different methods are used to follow up with respondents after HIV testing, depending on the country.



## Country Approaches to Following Up HIV Testing in The DHS Program

| Approach to providing VCT | Survey |
|---|---|
| VCT sites set up in response to the DHS | Mali 2001 |
| Existing VCT sites equipped and/or updated | Ethiopia 2005<br>Uganda 2004-05 |
| Respondents reimbursed for travel cost to a VCT site | Malawi 2004<br>Cambodia 2005 |
| Mobile VCT units follow the survey teams during fieldwork | Kenya 2003 |
| Temporary VCT sites established during the survey at fixed locations | Uganda 2004-05<br>DRC 2007 |

## Ethical and Practical Challenges

| | Referral to existing VCT sites | Mobile VCT | Returning results at health facilities | Returning results at Home |
|---|---|---|---|---|
| Availability and accessibility | X | | X | |
| Follow-up and treatment | X | X | X | X |
| Privacy (potential harm) | | | | X |
| Household pressure | | | | X |
| Confidentiality | | | X | X |
| Right result to right respondent | | | X | |
| Timing | | | X | |
| Availability of counselors | | X | | X |
| Complex and costly | | X | | X |

Module 6, Slide 25

## The DHS Program's Standard Protocol for Follow-up

- Respondents are told that they will not get their test results back.
- Respondents and family members are referred to the nearest testing facility for free testing and counseling.
- All respondents are given educational materials on HIV prevention.

Module 6, Slide 26

## Conclusions Regarding Follow-up

- There is no single, absolutely right answer to how to handle HIV test results in population-based surveys.
- All approaches raise some ethical issues.
- Country settings differ widely; no one approach fits all.
- The DHS Program protocol is in compliance with internationally approved guidelines.

Module 6, Slide 27

# Module 6
# Session 3

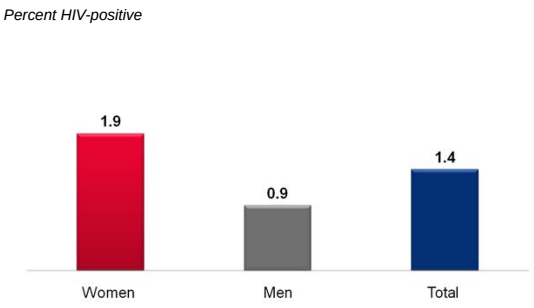
Comparing DHS and Other Estimates of HIV Prevalence

## Population-based Surveys Versus Sentinel Surveillance

| | Sentinel Surveillance at ANC Sites | Population-based Surveys (DHS / AIS) |
|---|---|---|
| Population studied | Pregnant women attending antenatal clinics | Representative sample of men and women |
| Frequency | Usually every two years | Every four to five years |
| Location | Antenatal clinics | Country-wide, in rural and urban areas |
| Strengths | • Available every two years<br>• Part of the health system and used to guide national decision-making.<br>• Can be more sustainable when built into systems<br>• People are familiar with and use sentinel surveillance data<br>• Less expensive | • Representative of the national picture<br>• Provides data at the regional level<br>• Provides clear understanding of urban versus rural HIV prevalence<br>• Tests both men and women<br>• Provides more information on links between prevalence and poverty, education, etc. |
| Weaknesses | • Not representative of national picture<br>• Excludes men in most countries<br>• Covers a relatively small number of health facilities that often are not representative of the whole country<br>• May cover only select regions | • Costly and labor-intensive<br>• Takes a long time to conduct<br>• Cannot be done every year<br>• Not everyone is at home or agrees to be tested |

Module 6, Slide 29

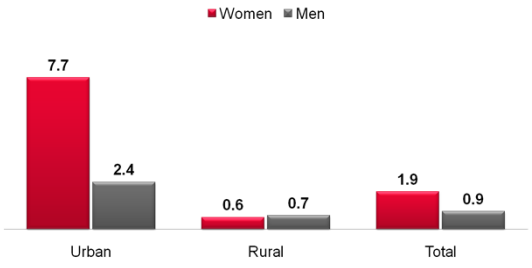
## HIV Prevalence, Ethiopia DHS 2005




Module 6, Slide 30

## HIV Prevalence by Residence, Ethiopia DHS 2005

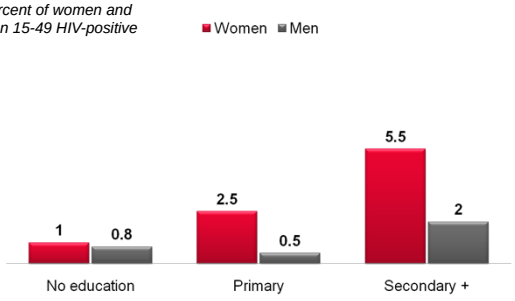
*Percent of women and men 15-49 HIV-positive*




Module 6, Slide 31

## HIV Prevalence by Education, Ethiopia DHS 2005

*Percent of women and men 15-49 HIV-positive*




Module 6, Slide 32

## HIV Prevalence in Ethiopia from the EDHS and ANC Sentinel Surveillance

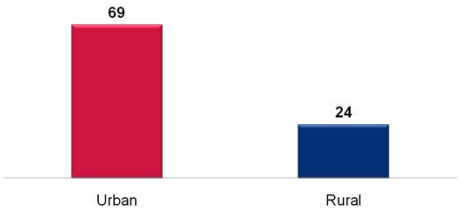
| | 2005 EDHS | | 2005 ANC Round | |
|---|---|---|---|---|
| **Region** | **HIV prevalence** | **Unweighted number of adults tested** | **HIV prevalence** | **# of pregnant women tested** |
| Tigray | 2.1 | 1,038 | 4.2 | 3,111 |
| Affar | 2.9 | 528 | 3.1 | 763 |
| Amhara | 1.7 | 1,635 | 4.5 | 6,961 |
| Oromiya | 1.4 | 1,924 | 2.4 | 7,185 |
| Somali | 0.7 | 451 | 1.2 | 607 |
| Ben-Gumuz | 0.5 | 721 | 2.8 | 1,615 |
| SNNP | 0.2 | 1,819 | 2.3 | 4,119 |
| Gambela | 6.0 | 638 | 4.0 | 506 |
| Harari | 3.5 | 625 | 5.2 | 569 |
| Addis Ababa | **4.7** | 1,192 | **11.7** | 1,939 |
| Dire Dawa | 3.2 | 478 | 6.8 | 872 |
| | | | | |
| Total | 1.4 | 11,050 | 3.5 | 28,247 |

Source of ANC data: HAPCO

Module 6, Slide 33

## ANC by Residence, EDHS 2005

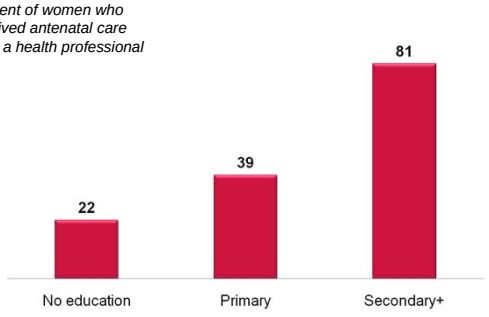
*Percent of women who received antenatal care from a health professional*




Module 6, Slide 34

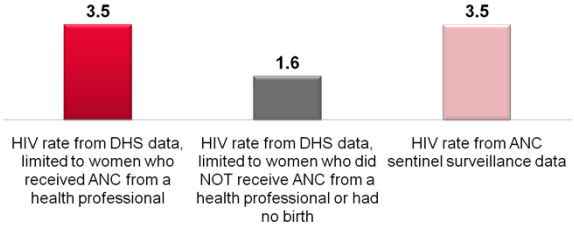
## ANC by Education, EDHS 2005

*Percent of women who received antenatal care from a health professional*




Module 6, Slide 35

## HIV Prevalence: DHS and ANC Compared, Ethiopia 2005

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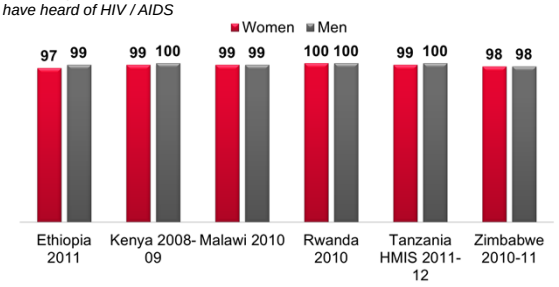
# Module 6
# Session 4

HIV Knowledge and Prevalence:
Results from Six Countries

Ethiopia • Kenya • Malawi • Rwanda
Tanzania • Zimbabwe

## HIV Knowledge: Awareness of HIV / AIDS

*Percent of men and women age 15-49 who have heard of HIV / AIDS*

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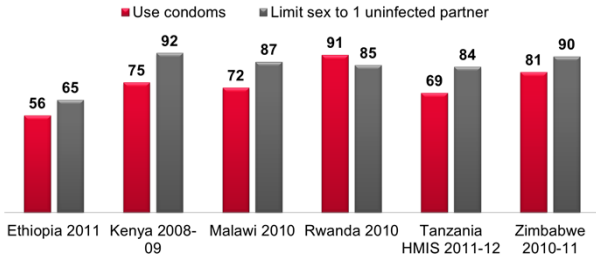
## HIV Knowledge: Prevention Methods

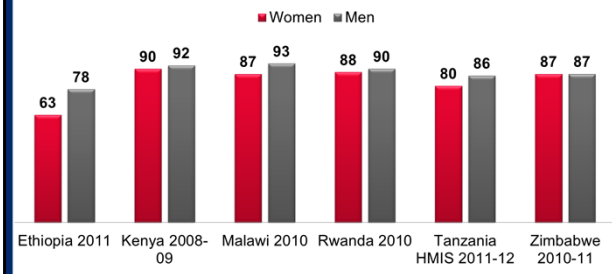
*Percent of **women** age 15-49 who know the following ways to reduce risk of getting HIV / AIDS:*




Module 6, Slide 39

## HIV Knowledge: A Healthy-Looking Person Can Have HIV

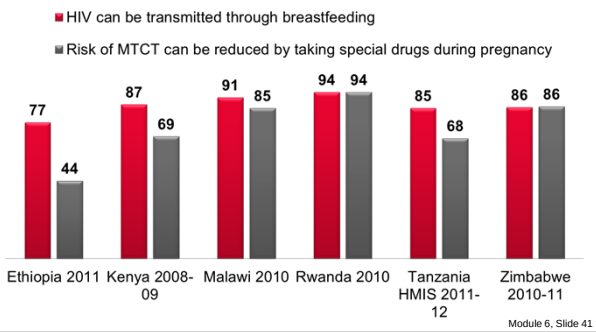
*Percent of women and men age 15-49 who know that a healthy-looking person can have HIV*




Module 6, Slide 40

## Women's Knowledge of PMTCT

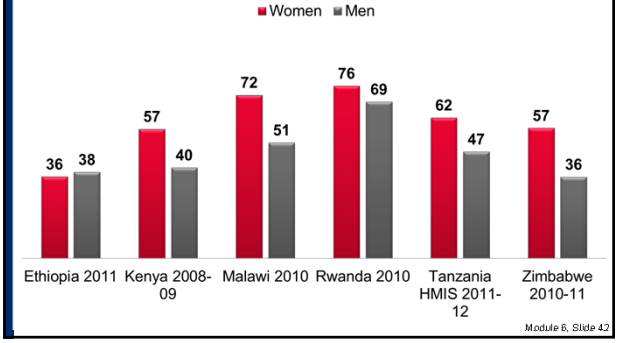
*Percent of **women** age 15-49 who know that:*




Module 6, Slide 41

## Prior HIV Testing

*Percent of women and men age 15-49 who have ever taken an HIV test and were informed of the results*

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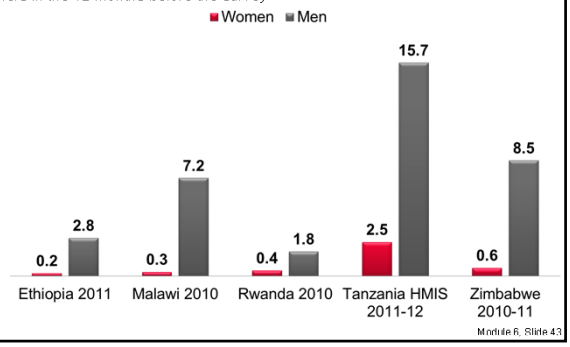
## Cumulative Prevalence of Concurrent Sexual Partners

*Percentage of all women and men age 15-49 who had any concurrent sexual partners in the 12 months before the survey*

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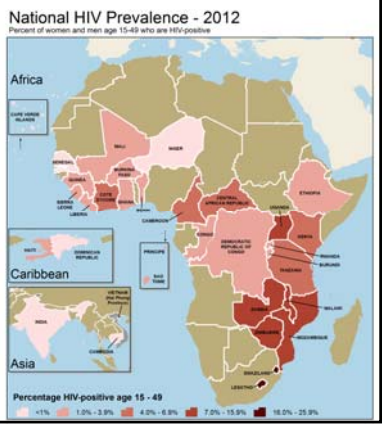
## HIV Prevalence in DHS Surveys

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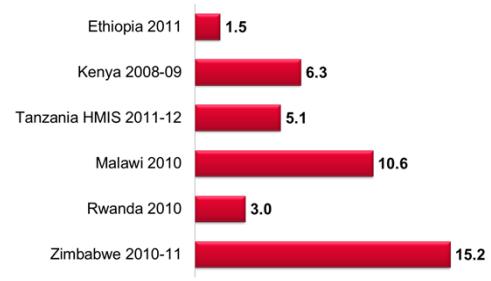
## HIV Prevalence




*Percent of women and men age 15-49 who are HIV-positive*

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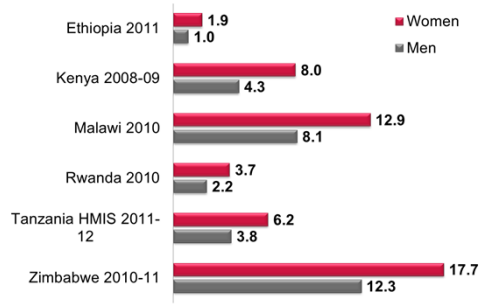
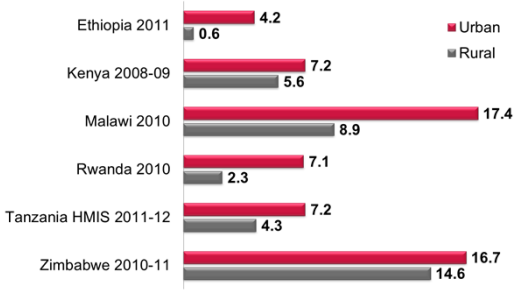
## HIV Prevalence by Sex




*Percent of women and men age 15-49 who are HIV-positive*

Module 6, Slide 46

## HIV Prevalence by Urban-Rural Residence

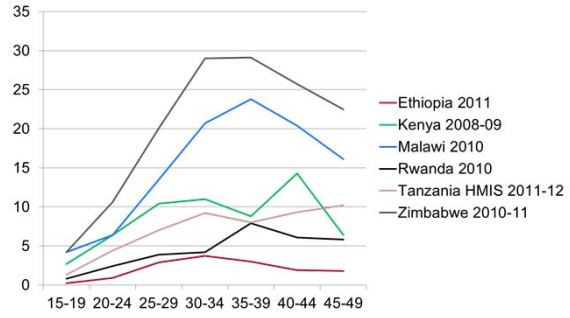



*Percent of women and men age 15-49 who are HIV-positive*

Module 6, Slide 47

## HIV Prevalence by Age, Women

*Percent of women who are HIV-positive*

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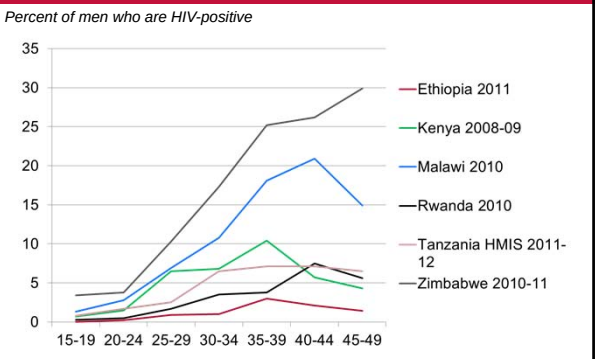
## HIV Prevalence by Age, Men

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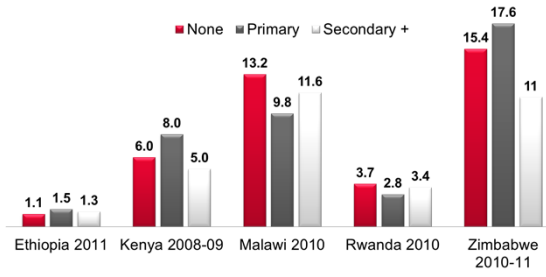
## HIV Prevalence by Education

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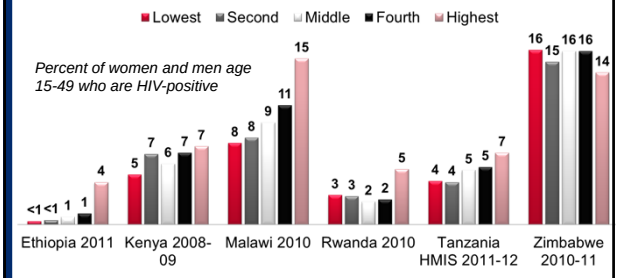
## HIV Prevalence by Wealth Quintile

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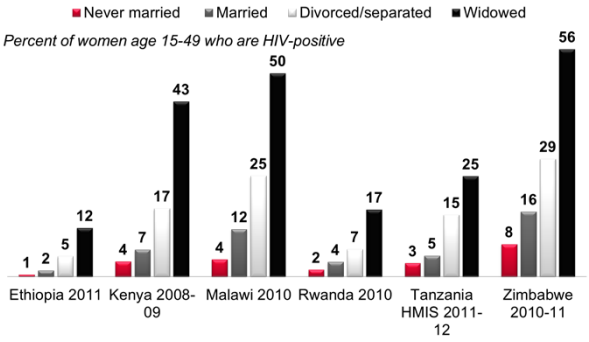
## HIV Prevalence by Marital Status, Women

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# Module 6
# Session 5

Measuring Trends in HIV Prevalence

## Interpreting Trends in HIV Prevalence

Many different groups around the world are working to combat the HIV pandemic. Everyone wants to know if programs are working and if HIV prevalence has decreased.

People look to DHS data on HIV prevalence from different years to measure progress and determine trends in HIV prevalence.

However, caution must taken when interpreting these trends.

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## Survey Statistics

Remember that DHS data are from samples—we don't interview everyone in a country. If everyone was interviewed, it would be a census, rather than a survey.

If the DHS were a census, there would be no uncertainty around our statistics.

Because DHS uses a sample of people to make estimates about an entire population, it's important to remember that DHS statistics represent the "best estimate" of a statistic (such as HIV prevalence), but it is not necessarily "the truth" for the entire population.



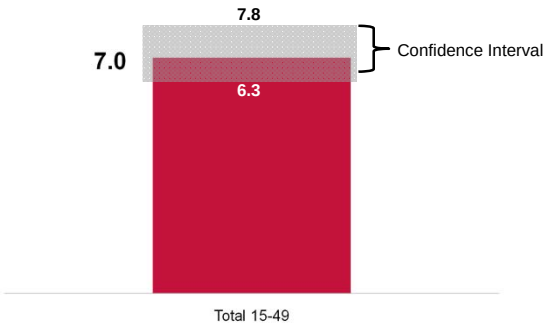
## Confidence Intervals

Every estimate from a sample survey is subject to a certain degree of uncertainty. The values shown in DHS tables are the middle of a range of possible values. This range reflects the range of uncertainty of the estimate.

This range of possible values is called the confidence interval. Researchers are confident that the "truth," or the value we would get if we surveyed every single person in the population (rather than using a sample) lies within this range.



## Confidence Intervals in the 2003-04 Tanzania HIV/AIDS Indicator Survey

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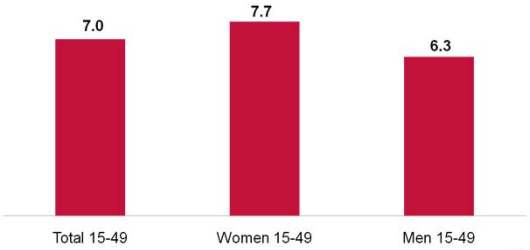
## Confidence Intervals in the 2003-04 Tanzania HIV/AIDS Indicator Survey

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## Finding Confidence Intervals in DHS Reports

1

Table B.2

Sampling errors, Total sample - Tanzania 2003-04

| Variable | Value (R) | Standard error (SE) | Number of cases: Un-weighted (N) | Number of cases: Weighted (WN) | Design effect (DEFT) | Relative error (SE/R) | Confidence limits: R-2SE | Confidence limits: R+2SE |
|---|---|---|---|---|---|---|---|---|
| | | WOMEN | | | | | | |
| Urban residence | 0.309 | 0.009 | 6863 | 6863 | 1.677 | 0.030 | 0.290 | 0.327 |
| No education | 0.222 | 0.009 | 6863 | 6863 | 1.859 | 0.042 | 0.203 | 0.240 |
| Secondary or higher education | 0.084 | 0.008 | 6863 | 6863 | 2.262 | 0.090 | 0.069 | 0.100 |
| Never married (in union) | 0.246 | 0.008 | 6863 | 6863 | 1.473 | 0.031 | 0.231 | 0.261 |
| Currently married (in union) | 0.636 | 0.009 | 6863 | 6863 | 1.510 | 0.014 | 0.618 | 0.653 |
| Had first sex before age 18 | 0.556 | 0.009 | 5397 | 5379 | 1.371 | 0.017 | 0.537 | 0.574 |
| Had two or more sexual partners in past 12 months | 0.061 | 0.004 | 5300 | 5289 | 1.222 | 0.066 | 0.053 | 0.069 |
| Had higher risk sex (with a non-marital, non-cohabiting partner) in the past 12 months | 0.231 | 0.008 | 5300 | 5289 | 1.328 | 0.033 | 0.216 | 0.247 |
| Condom use at last higher risk sex - all | 0.380 | 0.019 | 1220 | 1222 | 1.384 | 0.051 | 0.341 | 0.418 |
| Condom use at last higher risk sex - youth | 0.417 | 0.027 | 642 | 658 | 1.412 | 0.066 | 0.362 | 0.472 |
| Abstinence among youth (never had sex) | 0.588 | 0.016 | 1467 | 1486 | 1.222 | 0.027 | 0.557 | 0.619 |
| Sexual activity in past 12 months among never-married youth | 0.330 | 0.015 | 1467 | 1486 | 1.210 | 0.045 | 0.300 | 0.360 |
| Had injection in past 12 months | 0.383 | 0.007 | 6863 | 6863 | 1.209 | 0.019 | 0.369 | 0.398 |
| Had HIV test and received results in past 12 months | 0.049 | 0.004 | 6863 | 6863 | 1.415 | 0.075 | 0.041 | 0.056 |
| Accepting attitude towards people with HIV | 0.272 | 0.009 | 6800 | 6801 | 1.665 | 0.033 | 0.254 | 0.290 |
| Using any method | 0.282 | 0.011 | 4396 | 4362 | 1.348 | 0.037 | 0.261 | 0.303 |
| Using any modern method | 0.234 | 0.010 | 4396 | 4362 | 1.408 | 0.043 | 0.213 | 0.255 |
| HIV prevalence | 0.077 | 0.005 | 6066 | 5753 | 1.333 | 0.059 | 0.068 | 0.086 |

2

3

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## Statistical Significance

In statistics, a conclusion that is unlikely to have occurred simply by chance is called statistically significant.

If a measure is statistically significant, researchers are confident that the difference between two figures is actually real, and not just a result of chance.

In order to determine if HIV prevalence has really changed, statistical tests need to be performed to determine if the difference in HIV prevalence estimates is statistically significant.

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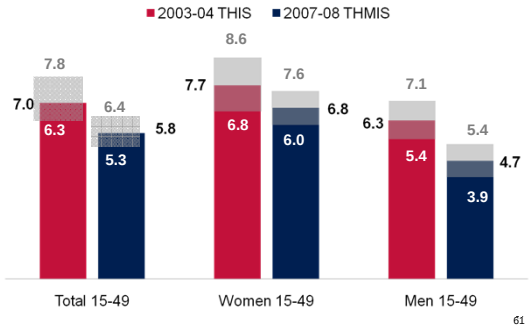
## HIV Prevalence Trends for Mainland Tanzania: Confidence Intervals

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## How to Talk About Trends In HIV Prevalence

Despite apparent decreases in HIV prevalence estimates for different years, we cannot be certain that HIV prevalence has really changed unless statistical tests determine that the changes are statistically significant.

Among the 15 countries where HIV testing has been carried out twice in a DHS, statistically significant changes in HIV prevalence have been shown only in:

- Tanzania (total and men)
- Dominican Republic (total)

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# Handout 6.1

# HIV testing in national population-based surveys: experience from the Demographic and Health Surveys

Vinod Mishra,[a] Martin Vaessen,[a] J Ties Boerma,[b] Fred Arnold,[a] Ann Way,[a] Bernard Barrere,[a] Anne Cross,[a] Rathavuth Hong,[a] & Jasbir Sangha[a]

**Objectives** To describe the methods used in the Demographic and Health Surveys (DHS) to collect nationally representative data on the prevalence of human immunodeficiency virus (HIV) and assess the value of such data to country HIV surveillance systems.
**Methods** During 2001–04, national samples of adult women and men in Burkina Faso, Cameroon, Dominican Republic, Ghana, Mali, Kenya, United Republic of Tanzania and Zambia were tested for HIV. Dried blood spot samples were collected for HIV testing, following internationally accepted ethical standards. The results for each country are presented by age, sex, and urban versus rural residence. To estimate the effects of non-response, HIV prevalence among non-responding males and females was predicted using multivariate statistical models for those who were tested, with a common set of predictor variables.
**Results** Rates of HIV testing varied from 70% among Kenyan men to 92% among women in Burkina Faso and Cameroon. Despite large differences in HIV prevalence between the surveys (1–16%), fairly consistent patterns of HIV infection were observed by age, sex and urban versus rural residence, with considerably higher rates in urban areas and in women, especially at younger ages. Analysis of non-response bias indicates that although predicted HIV prevalence tended to be higher in non-tested males and females than in those tested, the overall effects of non-response on the observed national estimates of HIV prevalence are insignificant.
**Conclusions** Population-based surveys can provide reliable, direct estimates of national and regional HIV seroprevalence among men and women irrespective of pregnancy status. Survey data greatly enhance surveillance systems and the accuracy of national estimates in generalized epidemics.

Bulletin of the World Health Organization 2006;84:537-545.

*Voir page 543 le résumé en français. En la página 544 figura un resumen en español.*

يمكن الاطلاع على الملخص بالعربية في صفحة 544.

## Introduction

Reliable data on the spread of human immunodeficiency virus (HIV) and its risk factors in the general population are essential for an effective response to the epidemic and its consequences. In countries with generalized epidemics, national estimates of HIV prevalence and trends in the adult population are generally derived indirectly from HIV surveillance among pregnant women attending selected antenatal clinics.[1–4]

Facilitated by biomedical progress, such as the use of dried blood spot (DBS) samples on filter paper for HIV testing, the collection and testing of blood samples has become feasible in large-scale national surveys. In recent years, the Demographic and Health Surveys (DHS) programme has become a major source of data on HIV prevalence in many countries. Since 2001, 12 countries have completed a DHS or similar survey that has included HIV testing and more than a dozen are in various stages of implementation. The DHS are primarily health interviews with questions on maternal and child health, family planning, nutrition and related issues, but increasingly they include collection of other biological and clinical data such as anthropometric measurements and testing for anaemia. The surveys also include an acquired immunodeficiency syndrome (AIDS) module. In some countries, the survey has exclusively focused on the collection of information on HIV/AIDS (AIDS Indicator Survey).

This article describes the methods used in DHS to collect nationally representative data on HIV prevalence. Results from the first eight national surveys during 2001–04 are presented and evaluated for bias due to non-response. The potential role of national population-based surveys in national systems for HIV surveillance is discussed.

## Methods

### General survey methodology

The DHS programme has conducted more than 200 national household surveys in more than 70 developing countries worldwide since 1984. The challenges in designing and implementing DHS in developing countries, as well as the lessons learned from more than 20 years of experience, are discussed elsewhere.[5] It is well recognized that all aspects of survey planning and implementation, such as sample design, developing and field-testing survey instruments, training of survey personnel, and careful supervision of data collection and processing, are critical in collecting high-quality data in such surveys.[6]

Of particular importance for the interpretation of the results on HIV prevalence from the surveys is the sampling methodology. The DHS selects random sample clusters from a national sampling frame, usually from the national

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[b] World Health Organization, Geneva, Switzerland.
Ref. No. **05-029520**
(*Submitted: 27 December 2005 – Final revised version received: 29 April 2006 – Accepted: 5 May 2006*)

population census. Within the selected clusters, a full listing of all households is made before the survey and a systematic random sample of households is taken. During the main fieldwork, eligible women and men, usually aged 15–49 and 15–59 years, respectively, are selected for HIV testing. An individual is only considered absent after three callback visits.

To obtain reliable national estimates of HIV prevalence disaggregated by sex and urban versus rural residence, a representative sample of at least 3000 households is required. If, on average, there is one eligible male and one eligible female in each sample household and if 10% of those eligible do not participate in the survey, this yields a final sample of approximately 5400 tested adults. For a population with an estimated HIV prevalence of 5%, such a sample would provide a 95% confidence interval of 4.3–5.7% at the national level. Larger sample sizes are required if the prevalence of HIV is lower or if further disaggregation of HIV estimates is desired.

## Specimen collection

In most surveys, HIV testing is done using DBS samples of capillary blood from a finger prick, collected on special filter paper. The only exceptions are the 2002 Dominican Republic DHS, which used oral mucosal transudate, and the 2001–02 Zambia DHS and the 2004–05 Uganda HIV/AIDS Sero-Behavioural Survey where venous blood was used (data from Uganda not yet available). Use of capillary blood for HIV testing is the preferred method in population-based surveys because obtaining samples from a finger prick is considered less painful and less invasive than drawing venous blood samples. Moreover, DBS specimens are easier to collect, store and transport than venous blood samples.

Three to five preprinted circles on the blood-spot collection card are filled with blood drops. Samples collected on filter paper are allowed to dry overnight in a drying box with desiccant and a humidity indicator card, after which the field worker packs each sample in a low gas-permeable zipper-locked plastic bag with desiccant and a humidity indicator card. All individually-packed samples from a cluster are then packed in a larger zipper-locked plastic bag with desiccants and the necessary tracking information. Appropriately packed DBS samples are stored in an insulated box and transported to a central laboratory for HIV testing.[7]

## Laboratory testing

A well-recognized central laboratory is identified to process the DBS samples for HIV testing after a careful assessment. Prior to the start of the survey field operations, the central laboratory is required to provide evidence of its ability to produce valid antibody test results from DBS samples with the two different assays chosen for the testing. The testing follows a standard laboratory algorithm designed to maximize the sensitivity and specificity of HIV test results.

The standard testing algorithm uses two different HIV antibody enzyme-linked immunosorbent assays (ELISAs), based on different antigens. All discordant samples that are positive in the first test and negative in the second test are retested using both ELISAs. Discordant samples from this second round of testing are classified as "indeterminate". The "indeterminate" samples are subjected to a western blot confirmatory test, the result of which is considered final for the indeterminate samples. These steps are repeated for a random selection of 5–10% of the samples that gave negative results in the first test.[8]

During sample processing, the laboratory adheres to an approved quality assurance and quality control plan with both internal and external components. For external quality assessment, a subset of DBS samples (usually about 5%) is submitted to an outside reference laboratory for retesting.

## Ethical issues

The general health interview is conducted before collecting blood samples for HIV testing. The selected participant is asked to provide informed voluntary consent to the testing. A written statement describing the procedures to be used in testing and the potential benefits and risks is read to each respondent. The respondents are given an opportunity to ask any questions about the survey that may help them decide whether or not they want to participate. The interviewer records the respondent's decision on the questionnaire and signs it affirming that he or she has read the statement and that the decision recorded is that given by the respondent.[7]

To protect the confidentiality of the participants, the data are "anonymized" by scrambling the cluster and household numbers associated with each participant in such a way as to make it impossible to associate an individual data record with a particular place and household. The results of the HIV test are linked to data from the questionnaires using barcodes only after the identity codes have been scrambled and after the files containing the original identity codes have been destroyed. Because the test results cannot be linked to a respondent's identity, there is no possibility of inadvertent disclosure. Any paper records that might compromise the confidentiality of the respondents, such as the pages of the questionnaires containing barcodes, are also destroyed.

In the first three DHS surveys that included HIV testing — in the Dominican Republic, Mali and Zambia — only age, sex, urban versus rural residence, and geographical region of residence of the tested individuals were recorded on the blood samples. In these surveys, HIV test results cannot be linked to the information in the household and individual questionnaires.

All HIV testing procedures are reviewed by the ethical review boards of ORC Macro (a US-based company that provides technical assistance to DHS worldwide), the host country and any other implementing partners.

All survey participants are given country-specific information brochures on HIV/AIDS in their local language. Each respondent eligible for HIV testing, whether or not he or she accepts testing, is also given information on the nearest facility providing voluntary counselling and testing (VCT) and is encouraged to use these services. If VCT services are not free, eligible participants are given a voucher that entitles them to go to the closest VCT facility for free HIV counselling and testing if they so desire. In countries with inadequate VCT facilities, efforts are made to improve access to VCT services. For example, in the survey in Kenya in 2003, arrangements were made for mobile VCT teams to follow up after the survey interview to counsel and test willing survey respondents.

In addition to protecting confidentiality and providing information and VCT services, it is important to ensure the safety of both the respondents and survey teams. DHS has developed procedures and guidelines on safety in the collection and handling of biological specimens and for disposal of biohazards.[7]

# Handout 6.1



Table 1. **Response rates for eight Demographic and Health Surveys with HIV testing, by sex and reasons for non-response**

| Country/sex (age range) | Year | Household response rate | Individual response rate | No. eligible for HIV testing | HIV response rate | Reasons for non-response to human immunodeficiency virus (HIV) testing | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Refused | Absent | Other/ missing |
| Mali | 2001 | 97.9 | | | | | | |
| Male (15–59) | | | 83.8 | 4062 | 75.6 | n/a | n/a | n/a |
| Female (15–49) | | | 94.9 | 4556 | 85.2 | n/a | n/a | n/a |
| Zambia | 2001–02 | 98.2 | | | | | | |
| Male (15–59) | | | 88.7 | 2418 | 73.3 | 14.9 | 8.1[a] | 3.7[b] |
| Female (15–49) | | | 96.4 | 2689 | 79.4 | 15.7 | 3.0[a] | 1.9[b] |
| Dominican Republic | 2002 | 97.9 | | | | | | |
| Male (15–59) | | | 80.5 | 14456 | 80.9 | n/a | n/a | n/a |
| Female (15–49) | | | 92.8 | 12514 | 89.0 | n/a | n/a | n/a |
| Kenya | 2003 | 96.3 | | | | | | |
| Male (15–54) | | | 85.5 | 4183 | 70.3 | 13.0 | 12.2 | 4.4 |
| Female (15–49) | | | 94.0 | 4303 | 76.3 | 14.4 | 6.0 | 3.3 |
| Ghana | 2003 | 98.7 | | | | | | |
| Male (15–59) | | | 93.8 | 5345 | 80.0 | 10.7 | 7.2 | 2.2 |
| Female (15–49) | | | 95.7 | 5949 | 89.3 | 5.7 | 3.4 | 1.7 |
| Burkina Faso | 2003 | 99.4 | | | | | | |
| Male (15–59) | | | 90.5 | 3984 | 85.8 | 6.6 | 4.8 | 2.8 |
| Female (15–49) | | | 96.3 | 4575 | 92.3 | 4.4 | 1.9 | 1.5 |
| United Republic of Tanzania | 2003–04 | 98.5 | | | | | | |
| Male (15–49) | | | 91.3 | 6196 | 77.1 | 13.9 | 8.7[c] | 0.4 |
| Female (15–49) | | | 95.9 | 7154 | 83.5 | 12.3 | 4.1[c] | 0.2 |
| Cameroon | 2004 | 97.6 | | | | | | |
| Male (15–59) | | | 93.0 | 5676 | 89.8 | 5.6 | 3.7 | 0.9 |
| Female (15–49) | | | 94.3 | 5703 | 92.1 | 5.4 | 1.7 | 0.7 |

[a] Absent and other categories combined.
[b] Includes only missing cases.
[c] Includes all non-interviewed.

## Analysis

In five surveys — Burkina Faso, Cameroon, Ghana, Kenya and the United Republic of Tanzania — HIV test results can be linked anonymously to all the information on the respondent collected in the questionnaires after scrambling the household and cluster identification codes. To estimate the extent of non-response bias and its potential impact on the observed HIV prevalence in these five countries, all eligible respondents were divided into four groups: (1) interviewed and tested; (2) not interviewed, but tested; (3) interviewed, not tested; and (4) not interviewed, not tested.

To evaluate the effect of non-response bias on the survey estimates, HIV prevalence was predicted among the two non-responder groups (3 and 4) based on multivariate models of HIV for those who were tested, using a common set of predictor variables. A logistic regression model was used, after accounting for clustering in the survey design, to calculate predicted HIV prevalence separately for group 4 (not interviewed, not tested) and group 3 (interviewed, not tested). Predictions for group 4 were based on a limited set of variables (from the household questionnaire only), but predictions for group 3 also used information on several individual sociodemographic and behavioural characteristics of the respondents, collected in the survey.

Variables for predicting prevalence in group 4 included age, education, wealth index, urban versus rural residence and geographical region. Additional variables for predicting prevalence in group 3 included marital union, childbirth in last 5 years (women only), work status, media exposure, ethnicity, religion, circumcision, sexually transmitted infection (STI) or symptoms of STI in the last 12 months, alcohol use, cigarette smoking/tobacco use, age at sexual debut, number of sex partners in last 12 months, condom use at last sex in last 12 months, paid for sex (for men) or exchange of money, gifts or favours for sex (for women), higher-risk sex (i.e. sex with a non-marital, non-cohabiting partner) in last 12 months, perceived risk of contracting AIDS, willingness to care for a family member with AIDS, number of times slept away from home in last 12 months (men only), away for more than one month in last 12 months (men only), and participation in household decision-making (women only). Because data on all of these variables were not available for every country, the actual set of variables included in the models varies slightly from country to country.

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Data processing was done using CSPro, a software package developed by DHS and the United States Bureau of the Census. For multivariate analyses, STATA version 8.0 was used. All analysis was carried out separately for males and females for each of the five countries with linked data. Adjusted HIV prevalence was calculated as a weighted average of observed prevalence among those who were tested, and predicted prevalence in the two groups of non-tested respondents. Sampling weights were applied in accordance with standard DHS procedures. We used HIV sampling weights for the tested groups (1 and 2), individual sampling weights for group 3 (interviewed, not-tested), and household sampling weights for group 4 (not interviewed, not tested). Further details of the analysis are available from the authors.

## Results

Table 1 shows the response rates and reasons for non-response to HIV testing for eight completed national surveys. Household response rates were very high in all surveys, and individual response rates to the questionnaire were also over 90% in most surveys. Response rates for HIV testing for women ranged from 76% in Kenya to 92% in Burkina Faso and Cameroon. For men, the corresponding range was from 70% in Kenya to 90% in Cameroon. In all surveys, the response rates were lower for men than for women. Refusal was a more important reason for non-response than absence for both males and females. But absence was a more important reason for non-response for males than for females. Non-response rates were higher in urban areas than in rural areas (both due to absence and refusal), and there were substantial within-country regional variations in response rates (data not shown). Non-response rates were also higher among better educated and wealthier respondents, but there was no clear pattern by sexual risk behaviours (data not shown). This pattern of non-response is typical of most household surveys in developing countries.

Table 2 presents HIV prevalences by sex and urban versus rural residence for the eight countries. Total HIV prevalence in these countries ranged from 1% in the Dominican Republic to 16% in Zambia. Among the sub-Saharan African countries, prevalence was lowest in the three West African countries of Burkina Faso, Ghana and Mali.

Table 2. **Observed human immunodeficiency virus (HIV) prevalence by sex and urban/rural residence in eight countries with HIV testing data**

| Country/sex (age range) | Year | Urban | Rural | Total | Urban:rural ratio | Female:male ratio |
|---|---|---|---|---|---|---|
| Mali | 2001 | | | | | |
| Male (15–59) | | 1.9 | 1.1 | 1.3 | 1.7 | |
| Female (15–49) | | 2.5 | 1.9 | 2.0 | 1.3 | |
| Total (15–49) | | 2.3 | 1.5 | 1.8 | 1.5 | 1.5 |
| Zambia | 2001–02 | | | | | |
| Male (15–59) | | 18.7 | 8.8 | 12.6 | 2.1 | |
| Female (15–49) | | 26.3 | 12.4 | 17.8 | 2.1 | |
| Total (15–49) | | 23.1 | 10.8 | 15.6 | 2.1 | 1.4 |
| Dominican Republic | 2002 | | | | | |
| Male (15–59) | | 1.0 | 1.3 | 1.0 | 0.8 | |
| Female (15–49) | | 0.9 | 1.0 | 0.9 | 0.9 | |
| Total (15–49) | | 1.0 | 1.5 | 1.2 | 0.7 | 0.9 |
| Kenya | 2003 | | | | | |
| Male (15–54) | | 7.8 | 3.7 | 4.7 | 2.1 | |
| Female (15–49) | | 12.3 | 7.5 | 8.7 | 1.6 | |
| Total (15–49) | | 10.2 | 5.6 | 6.8 | 1.8 | 1.8 |
| Ghana | 2003 | | | | | |
| Male (15–59) | | 1.7 | 1.7 | 1.7 | 1.0 | |
| Female (15–49) | | 2.9 | 2.5 | 2.7 | 1.1 | |
| Total (15–49) | | 2.3 | 2.0 | 2.2 | 1.1 | 1.6 |
| Burkina Faso | 2003 | | | | | |
| Male (15–59) | | 3.6 | 1.4 | 1.9 | 2.6 | |
| Female (15–49) | | 4.0 | 1.2 | 1.8 | 3.3 | |
| Total (15–49) | | 3.5 | 1.3 | 1.8 | 2.7 | 0.9 |
| United Republic of Tanzania | 2003–2004 | | | | | |
| Male (15–49) | | 9.6 | 4.8 | 6.3 | 2.0 | |
| Female (15–49) | | 12.0 | 5.8 | 7.7 | 2.1 | |
| Total (15–49) | | 10.9 | 5.4 | 7.0 | 2.0 | 1.2 |
| Cameroon | 2004 | | | | | |
| Male (15–59) | | 4.7 | 2.8 | 3.9 | 1.7 | |
| Female (15–49) | | 8.4 | 4.8 | 6.8 | 1.8 | |
| Total (15–49) | | 6.7 | 4.0 | 5.5 | 1.7 | 1.7 |

HIV prevalence was considerably higher among women than among men in all countries except Burkina Faso and the Dominican Republic where differences were negligible. The female: male HIV prevalence ratio was highest in Kenya where women were 1.8 times more likely to be infected than men.

HIV prevalence was much higher in urban areas than in rural areas except in the Dominican Republic and Ghana, for both sexes. In Burkina Faso, United Republic of Tanzania and Zambia, prevalence among adults aged 15–49 years was at least twice as high in urban areas as that in rural areas.

Fairly consistent age patterns of HIV infection were found (Fig. 1). In almost all countries, HIV prevalence was consistently higher among women than among men at younger ages, with a cross-over occurring when the respondents were in their late thirties or early forties.

Table 3 shows how the predicted prevalence of HIV among non-responders differed from the observed HIV prevalence among tested respondents, and what impact this non-response bias had on the adjusted prevalence estimate for all eligible respondents. On average, predicted HIV prevalence was about 15% higher among male non-responders and about 9%

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Fig. 1. **Prevalence of HIV by age and sex in eight countries with HIV data from Demographic and Health Surveys**

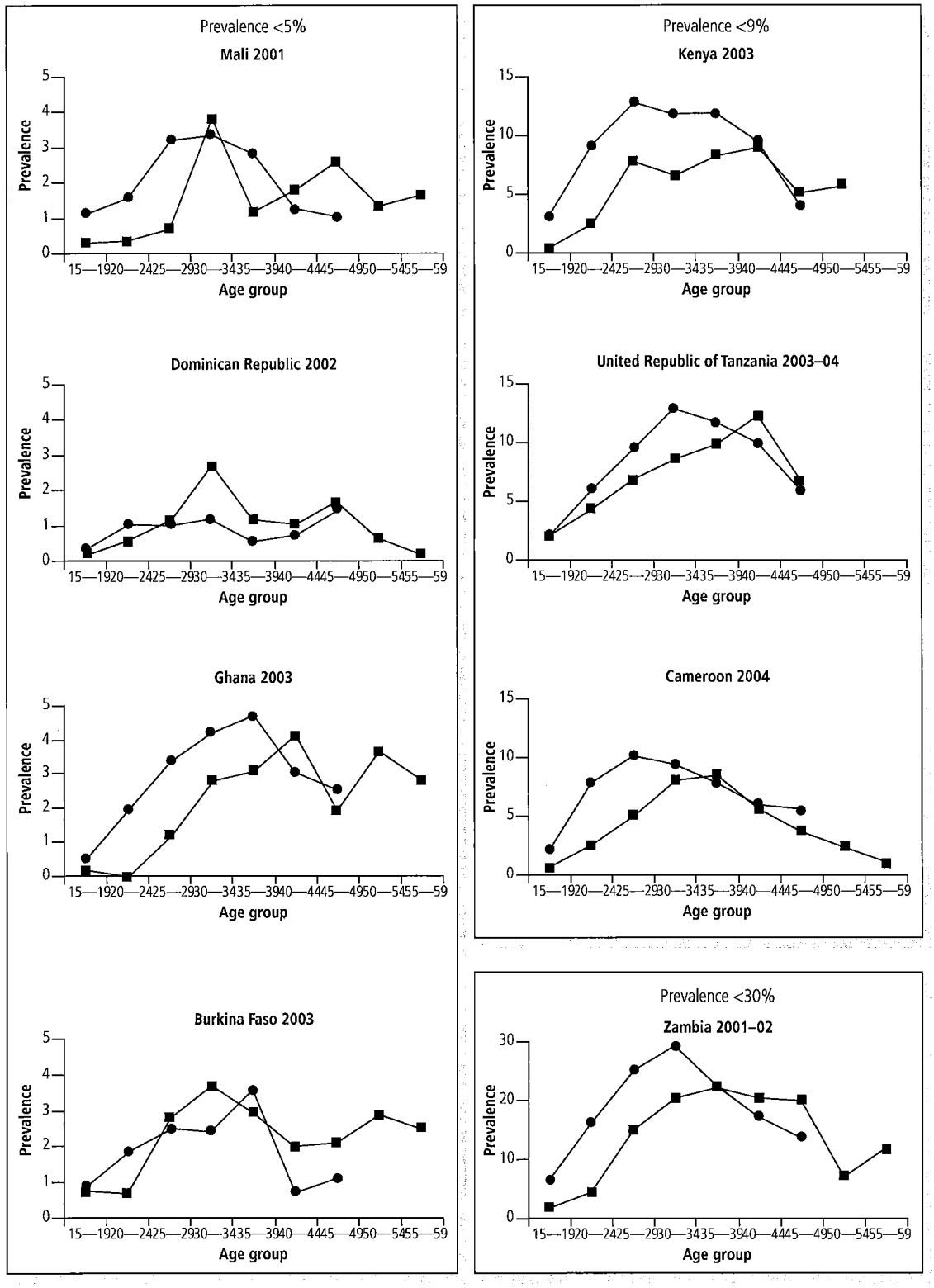


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Table 3. **Predicted HIV prevalence among non-respondents and adjusted human immunodeficiency virus (HIV) prevalence estimates for all eligible males and females in five countries with linked HIV testing data**

| Country/sex (age range) | Year | Observed prevalence among those tested (95% CI[a]) | Predicted prevalence among those not tested (95% CI) | Ratio of non-tested to tested | Adjusted prevalence among all eligible respondents (95% CI) | Ratio of adjusted to tested |
|---|---|---|---|---|---|---|
| Kenya | 2003 | | | | | |
| Male (15–54) | | 4.71 (3.94–5.47) | 5.10 (4.70–5.50) | 1.08 | 4.81 (4.25–5.38) | 1.02 |
| Female (15–49) | | 8.70 (7.73–9.66) | 7.52 (7.05–7.99) | 0.87[b] | 8.44 (7.68–9.20) | 0.97 |
| Ghana | 2003 | | | | | |
| Male (15–59) | | 1.66 (1.28–2.05) | 1.79 (1.62–1.95) | 1.07 | 1.69 (1.38–2.00) | 1.01 |
| Female (15–49) | | 2.70 (2.26–3.13) | 2.78 (2.52–3.03) | 1.03 | 2.71 (2.32–3.10) | 1.00 |
| Burkina Faso | 2003 | | | | | |
| Male (15–59) | | 1.94 (1.48–2.40) | 2.47 (2.18–2.76) | 1.27 | 2.01 (1.61–2.41) | 1.04 |
| Female (15–49) | | 1.83 (1.43–2.23) | 3.29 (2.73–3.84) | 1.80[b] | 1.95 (1.57–2.32) | 1.06 |
| United Republic of Tanzania | 2003–04 | | | | | |
| Male (15–49) | | 6.26 (5.58–6.95) | 7.08 (6.77–7.40) | 1.13[b] | 6.45 (5.91–6.99) | 1.03 |
| Female (15–49) | | 7.70 (7.02–8.37) | 8.22 (7.70–8.73) | 1.07 | 7.79 (7.22–8.36) | 1.01 |
| Cameroon | 2004 | | | | | |
| Male (15–59) | | 3.91 (3.38–4.44) | 5.16 (4.76–5.57) | 1.32[b] | 4.04 (3.56–4.52) | 1.03 |
| Female (15–49) | | 6.75 (6.07–7.43) | 7.81 (6.91–8.71) | 1.16 | 6.82 (6.17–7.46) | 1.01 |

[a] CI = confidence interval.
[b] Significantly different at 5% from observed prevalence among those tested.

higher among female non-responders than the corresponding observed HIV prevalence among tested males and females. In all countries, predicted prevalence among male non-responders was higher than the observed prevalence among those who were tested. This bias was particularly large in Cameroon (32%) and Burkina Faso (27%). For women, this bias was most pronounced in Burkina Faso, where non-responding women had a predicted prevalence 80% higher than the observed prevalence among those tested. In Cameroon, predicted prevalence of HIV among non-responding women was 16% higher than among those tested, but in Kenya, non-responding women had a predicted HIV prevalence that was 13% lower than the prevalence in tested women, largely due to higher response rates in groups with higher HIV prevalence, for example among Luo women.

Adjusting the observed national estimates of HIV prevalence from tested men and women by accounting for the predicted rates among the non-responders generally made little difference to the observed estimates. Even in countries where predicted prevalence among the non-responders was substantially higher than the observed prevalence, the adjusted prevalence for all eligible respondents was about the same as the observed prevalence based only on the tested respondents. The small effects of the non-response bias on the observed national estimates are due to the proportion of non-responders being much smaller than the proportion who were tested. Even in Kenya, where the non-response rates were the highest of the five countries in this analysis and where predicted HIV prevalence among non-responding males was about 8% higher than the observed prevalence, the adjusted prevalence estimate of 4.8% for all eligible males was only slightly higher than the observed estimate of 4.7% for tested males.

## Discussion

Inclusion of HIV testing (and other biomarkers, such as anaemia testing) has further complicated the planning and implementation of already complex national population-based surveys, and has given rise to a number of challenges. The major challenges in obtaining reliable estimates of HIV prevalence from population-based surveys are to obtain a representative sample of adults, keep non-response rates for HIV testing to a minimum, and employ sound laboratory testing procedures, while maintaining the highest ethical standards. The results from the first eight national surveys to include HIV testing provide important evidence that the additional costs and managerial challenges are a worthwhile investment.

What are the benefits? Most countries with generalized epidemics generate HIV prevalence data from surveillance systems based in antenatal clinics. The primary purpose of surveillance systems is to track trends, but they are also used extensively to estimate prevalence levels.[9] The limitations of such data are well known: they include the under-representation of remote rural populations in clinic-based systems, the lack of data on men and non-pregnant women and the limited ability to assess risk factors.[10] The added value of population-based surveys is primarily that they provide direct data on the distribution of HIV infection among the general adult population, remote rural populations (often a large part of the population), men, young non-pregnant women, and regions or provinces. A detailed comparison of the survey results with the Joint United Nations Programme on HIV/AIDS (UNAIDS)/WHO estimates of HIV prevalence based on surveillance data from antenatal clinics is beyond the scope of the present study, but in almost all countries, estimates of HIV prevalence are adjusted downwards following the survey.

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In addition, the survey protocol allows HIV test results to be linked with all the information on sociodemographic and behavioural characteristics of the respondents collected in the survey. Finally, HIV prevalence data from population-based surveys can be used to calibrate estimates from clinic-based surveillance and may lead to adjustments in the number and location of surveillance sites.

How good are the data? First and foremost, high-quality survey procedures are necessary at all stages. DHS work with experienced survey organizations and invest considerably in survey design and implementation, which pays off in the high quality of data. The consistent high quality of DHS data has enabled the world to closely monitor key health indicators such as child mortality rates in developing countries. Data on HIV prevalence are subjected to the same thorough survey procedures, and additional investments are being made to ensure the high quality of biomarker data collection and analysis.

Minimizing non-response is a major challenge to all population-based surveys. The main reasons for non-response are refusal to participate and absence. There is evidence that absence may be related to higher risk of HIV infection.[11–14] The analysis of non-response in five countries with linked HIV data (Burkina Faso, Cameroon, Ghana, Kenya and the United Republic of Tanzania) indicates that non-response does not bias national HIV estimates from population-based surveys significantly. Although prevalence of HIV is predicted to be higher in men and women who are not tested than in those who are tested in all five countries studied (except for females in Kenya), the overall effects of non-response on observed national estimates of HIV prevalence tend to be small. Therefore, for non-response in the surveys to have any strong effect on observed estimates of national HIV prevalence (based on tested respondents), the non-response rate, the relative risk of HIV among non-responders, or both have to be substantial.

The adjustments only partially address non-response bias. The estimates can only be adjusted to the extent that the sociodemographic and behavioural characteristics included in the analysis are correlated with the risk of HIV infection in each country. The scope for adjustments was limited in countries with low prevalence (Burkina Faso and Ghana) given that these datasets had less power to find significant associations, as they did not adjust the sample size to the expected low HIV prevalence. Another limitation is that the adjustments for the "not interviewed, not tested" respondents (mostly absentees) were based on limited information. From the data available, it is not possible to fully adjust for bias due to absence. Future surveys should seek to obtain more information about sexual risk factors and mobility of absentees. But if the proportion of absentees is small (as in the surveys in Burkina Faso and Cameroon), bias due to absence should have little influence on the estimate of overall prevalence.

Moreover, our adjustments for non-response do not account for any bias due to exclusion of population members not living in households, such as those living on the street or in institutions (e.g. prisons, boarding schools, military barracks, refugee camps and brothels). The survey-based estimates of HIV prevalence are likely to be underestimates to the extent that the prevalence of HIV in these "non-household" populations is higher than that in household populations, but given that the proportion of non-household populations in the total population tends to be small, any effect of excluding these populations on the national estimates obtained from a household-based sample is likely to be small, except possibly in low-prevalence countries.

In conclusion, population-based surveys can provide high-quality, reliable, representative national estimates of HIV seroprevalence in countries with generalized epidemics, especially in countries with relatively high prevalence (at least 2–3%). These data can be useful for identifying geographical areas with elevated HIV infection rates; higher-risk and vulnerable populations; understanding risk behaviours; assessing availability and access to HIV-related health services; and planning for prevention, care and support, and treatment programmes. Furthermore, the population-based survey data can greatly enhance clinic-based surveillance systems and the accuracy of national estimates of HIV prevalence in generalized epidemics. ■

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**Competing interests:** none declared.

## Résumé

### Dépistage du VIH dans le cadre des enquêtes nationales en population : expérience fournie par les enquêtes démographiques et de santé

**Objectifs** Décrire les méthodes utilisées dans les enquêtes démographiques et de santé (DHS) pour recueillir des données représentatives au plan national sur la prévalence du virus de l'immunodéficience humaine (VIH) et évaluer l'utilité de ces données pour les systèmes nationaux de surveillance du VIH.

**Méthodes** Entre 2001 et 2004, on a procédé à un dépistage du VIH sur des échantillons provenant d'hommes et de femmes adultes au Burkina Faso, au Cameroun, au Ghana, au Mali, au Kenya, en République dominicaine, en République-Unie de Tanzanie et en Zambie. Des échantillons de sang séché ont été prélevés sélectivement en vue de dépister le VIH conformément à des normes éthiques internationalement acceptées. Les résultats pour chaque pays sont présentés en fonction de l'âge, du sexe et du milieu (urbain ou rural). Pour estimer les effets des non-réponses, la prévalence du VIH chez les non-répondants hommes et femmes a été évaluée en appliquant aux sujets testés des modèles statistiques multivariés utilisant une série courante de variables prédictives.

**Résultats** Les taux de dépistage se situaient entre 70 % chez les hommes au Kenya et 92 % chez les femmes

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au Burkina Faso et au Cameroun. Malgré les différences considérables de prévalence relevée par les enquêtes (1-16 %), des schémas d'infection par le VIH assez comparables ont été observés selon l'âge, le sexe et le milieu (urbain ou rural), les taux d'infection étant considérablement plus élevés en milieu urbain et chez les femmes, notamment les plus jeunes. L'analyse du biais lié aux non-réponses indique que malgré la prévision d'une prévalence plus élevée chez les personnes non testées comparativement aux personnes testées, l'effet global des non-réponses sur les estimations nationales étudiées de la prévalence du VIH est insignifiant.

**Conclusions** Les enquêtes en population peuvent fournir des estimations fiables et directes de la séroprévalence nationale et régionale du VIH chez les hommes et les femmes, que celles-ci soient enceintes ou non. Les données fournies par les enquêtes améliorent sensiblement les systèmes de surveillance et la fiabilité des estimations nationales en cas d'épidémies généralisées.

## Resumen

### Pruebas de detección del VIH en encuestas nacionales de base poblacional: experiencia de las encuestas sobre demografía y salud

**Objetivos** Describir los métodos utilizados en las encuestas sobre demografía y salud para recopilar datos sobre la prevalencia del virus de la inmunodeficiencia humana (VIH) que sean representativos a nivel nacional, y determinar el valor de esos datos para los sistemas nacionales de vigilancia del VIH.

**Métodos** Durante el periodo 2001–2004 se efectuaron pruebas de detección del VIH en muestras nacionales de mujeres y hombres adultos de Burkina Faso, Camerún, Ghana, Kenya, Malí, República Dominicana, República Unida de Tanzanía y Zambia. Las muestras de gotas de sangre secas para las pruebas de detección del VIH se obtuvieron siguiendo las normas éticas aceptadas internacionalmente. Los resultados de cada país se presentan estratificados en función de la edad, sexo y lugar de residencia (urbano o rural). Para estimar los efectos de la ausencia de respuestas, se calculó la prevalencia del VIH en los hombres y mujeres que no respondieron, utilizando para ello los modelos estadísticos multivariados obtenidos en aquellos que respondieron y que contenían un conjunto común de variables independientes.

**Resultados** Las tasas de realización de pruebas de detección del VIH oscilaron entre el 70% en los varones de Kenya y el 92% en las mujeres de Burkina Faso y Camerún. Pese a las grandes diferencias entre las distintas encuestas con respecto a la prevalencia del VIH (1–16%), la distribución de la infección por VIH en función de la edad, sexo y lugar de residencia fue muy homogénea, registrándose tasas considerablemente mayores en las zonas urbanas y en las mujeres, sobre todo en las más jóvenes. El análisis del sesgo inducido por la ausencia de respuestas mostró que, a pesar de que la prevalencia prevista del VIH tendía a ser más elevada en los hombres y mujeres no sometidos a las pruebas que en los sometidos a ellas, los efectos generales de la ausencia de respuesta sobre las estimaciones nacionales de la prevalencia del VIH son insignificantes.

**Conclusiones** Las encuestas de base poblacional pueden proporcionar estimaciones directas y fiables de la seroprevalencia nacional y regional del VIH en hombres y mujeres, independientemente de que estén embarazadas o no. Los datos de las encuestas mejoran mucho los sistemas de vigilancia y la precisión de las estimaciones nacionales en las epidemias generalizadas.

## ملخص

### اختبارات فيروس العوز المناعي البشري في المسوحات الوطنية السكانية: الخبرة المستفادة من المسوحات الصحية الديموغرافية

**الهدف:** وصف الطرق المستعملة في المسوحات الصحية والديموغرافية لجمع المعطيات الممثّلة على الصعيد الوطني لمعدلات انتشار فيروس العوز المناعي البشري، وتقييم حجم هذه المعطيات ضمن نظم ترصد فيروس العوز المناعي البشري في البلدان.

**الطريقة:** أجريت، في الأعوام 2001 – 2004، اختبارات على عينات وطنية من الرجال والنساء من كلٍّ من بوركينا فاسو، والكاميرون، وجمهورية الدومينيكان، وغانا، ومالي، وكينيا، وجمهورية تنزانيا المتحدة، وزامبيا، لكشف فيروس العوز المناعي البشري. وقد جمعت العينات من نقاط الدم الجافة عند إجراء اختبار كشف فيروس العوز المناعي البشري وفقاً لمعايير أخلاقية مقبولة دولياً. وعرضت النتائج الخاصة بكل بلد موزعة وفق العمر والجنس والإقامة في المدن والأرياف. وللتعرف على تأثيرات عدم الاستجابة، تم التنبؤ بمعدلات انتشار فيروس العوز المناعي البشري بين الرجال والنساء غير المستجيبين، وذلك باستخدام نماذج إحصائية متعددة المتغيرات مستمدة ممن أجري لهم اختبارات، ومع مجموعة مشتركة من متغيرات التنبؤ.

**النتائج:** لقد تراوحت معدلات اختبارات الكشف عن فيروس العوز المناعي البشري بين 70% لدى الرجال في كينيا و92% لدى النساء في كلٍّ من الكاميرون وبوركينا فاسو. ورغم الفروقات الكبيرة في معدلات انتشار فيروس العوز المناعي البشري بين مسح وآخر (1 – 16%)، فقد لوحظ وجود نماذج تتمتع بقدر جيد من الاتّساق بالنسبة للعمر والجنس والإقامة في المدينة أو في الأرياف، مع معدلات أعلى بكثير لدى المناطق الحضرية لدى النساء ولاسيّما من كان منهن في أعمار شابة، ويشير تحليل التحيز لعدم الاستجابة أنه بالرغم من ميل معدلات انتشار فيروس العوز المناعي البشري للازدياد لدى الرجال والنساء ممن لم تجر لهم الاختبارات أكثر مما لدى ممن أجريت لهم الاختبارات، فإن التأثيرات الإجمالية لعدم الاستجابة على التقديرات الوطنية لمعدلات انتشار فيروس العوز المناعي البشري لم تكن ذات أهمية كبيرة.

**الاستنتاج:** يمكن للمسوحات السكانية أن تقدّم تقديرات مباشرة وموثوقة لمعدلات الانتشار المحلية الإقليمية لفيروس العوز المناعي البشري بين الرجال والنساء بغض النظر عن حالة الحمل لدى النساء. إن معطيات المسح تعزز إلى حد كبير من نظم الترصد ودقة التقديرات الوطنية أثناء الأوبئة المتعممة.

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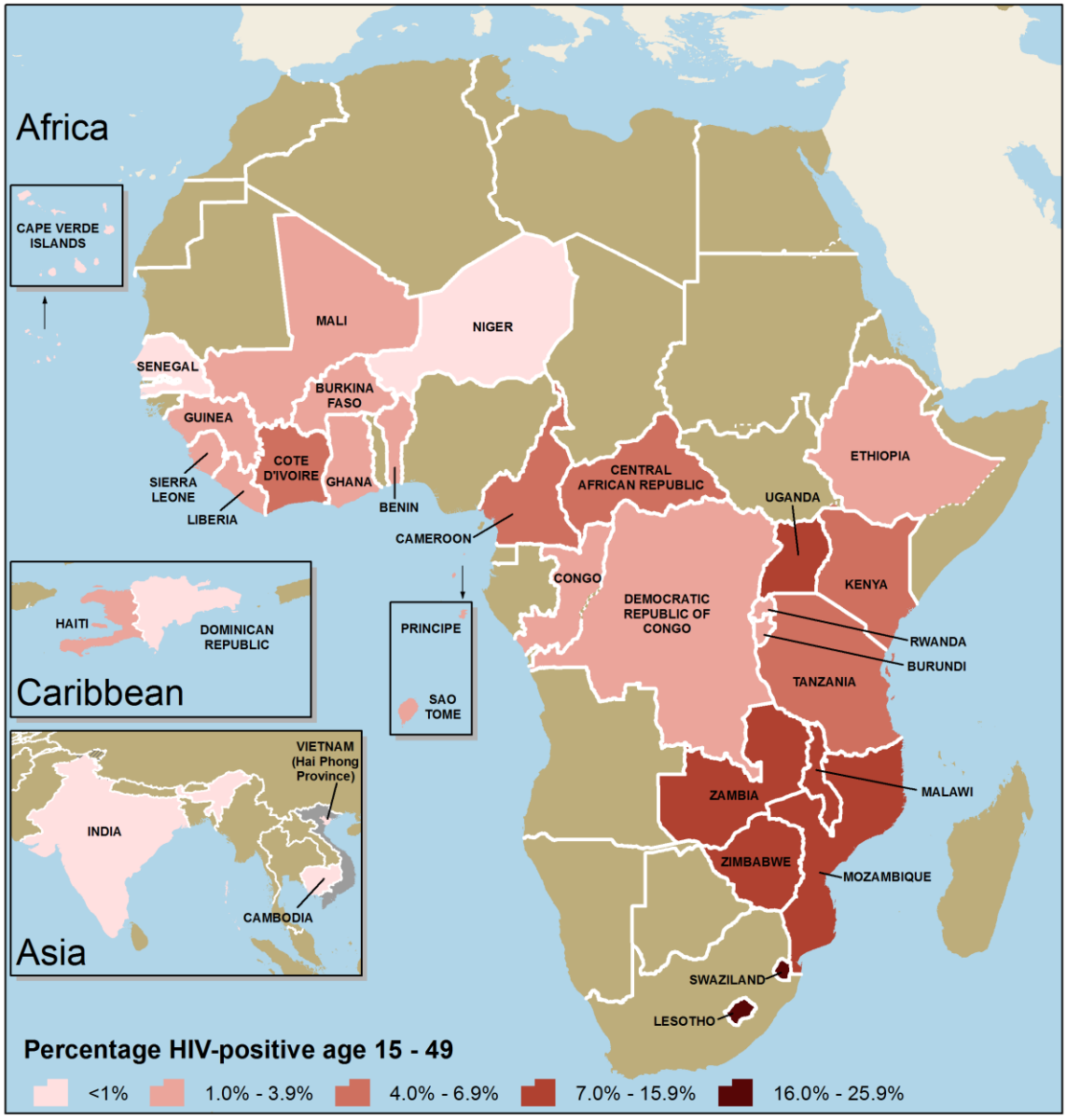
# Handout 6.2

**Comparing Sentinel Surveillance Data and Population-based Surveys**

| | Sentinel Surveillance (ANC sites) | Population-based Surveys (DHS/AIS) |
|---|---|---|
| **Population studied** | | |
| **Frequency** | | |
| **Location** | | |
| **Strengths** | | |
| **Weaknesses** | | |

# National HIV Prevalence - 2012

Percent of women and men age 15-49 who are HIV-positive



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# Results of recent population-based surveys

**(from UNAIDS website: http://www.unaids.org/en/KnowledgeCentre/HIVData/EpiUpdate/EpiUpdArchive/2007/default.asp, 6 July 2007)**

## 1. How have results of population-based surveys been used in refining AIDS estimates?

Since 2000, several countries have conducted nationally representative population-based surveys with HIV prevalence measurement. The first ones were conducted in Mali and Zambia in 2001-2002. By mid 2007, a total of 26 countries in sub-Saharan Africa had conducted surveys. In addition the two countries in the Caribbean with the largest HIV burden, Haiti and the Dominican Republic, as well as India and Cambodia in Asia, had also conducted population-based surveys.

The information from available surveys has helped to refine UNAIDS-published estimates. Where surveys were available prior to the publication of each of the UNAIDS biannual Global Reports, the prevalence estimates from the surveys have been used to inform the estimates in the UNAIDS Global Reports, and consequently the two are very close to each other. As shown in the Table in Handout 6.3, all but one of these surveys (Uganda) has shown a lower prevalence in the survey compared to previously published estimates based on sentinel surveillance data.

The results of a number of surveys however have become available after the 2006 UNAIDS Global Report. Most of these have already been incorporated in the regional estimates published in the 2006 AIDS Epidemic Update, notably Cote d'Ivoire, Cambodia and Haiti. It is noteworthy that the recent survey in the Central African Republic showed a prevalence of 6.2% in 2006 compared to the published estimate of 10.7% for 2005. In other countries in sub-Saharan Africa recent estimates from the population-based surveys are close to previously

published estimates (Benin, Mali [2006], Niger [2006], Zimbabwe). In Asia, besides India, a population-based survey has also been conducted in Cambodia, suggesting a lower prevalence (0.6% in 2005) than previously estimated (1.6% in 2005).

**2. Where can we expect significant differences in the results of population-based surveys and AIDS estimates?**

Population-based surveys with HIV prevalence measurement are currently planned or ongoing in several countries in sub-Saharan Africa including the Democratic Republic of Congo, Eritrea, Gabon, Gambia, Liberia, and Madagascar. There are no population-based surveys planned in other countries outside of sub-Saharan Africa, as most countries have low prevalence and would not benefit from this type of survey.

**3. What is the impact of the differences in the results of population-based surveys and AIDS estimates?**

According to the 2006 AIDS Epidemic Update report, the estimated number of people living with HIV in 2006 was 39.5 million people (range 34.1 - 47.1 million). Although several countries report lower prevalence, the total number is still well within the estimated global range for 2006 and remains large.

Cambodia was previously estimated to have 130,000 people living with HIV (range 74,000-210,000). Any changes in Cambodia's estimates would therefore only have a minor impact on regional and global estimates. In sub-Saharan Africa too, it is expected that the new figures will only have a minor impact on regional prevalence (currently estimated at 5.9% [24.7 million]) and are well within the regional range (5.2% - 6.7% [21.8 - 27.7 million]).

GLOBAL REPORT

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FACT SHEET

## The global AIDS epidemic

- In 2009, there were 2.6 million [2.3 million–2.8 million] new infections, down from 3.1 million [2.9 million–3.4 million] in 1999.
- In 2009 there were 1.8 million [1.6 million–2.1 million] AIDS-related deaths, lower than the 2.1 million [1.9 million–2.3 million] in 2004.
- In 2009, some 33.3 million [31.4 million–35.3 million] people were living with HIV compared to 26.2 million [24.6 million–27.8 million] in 1999.
- In 2009, around 370 000 [230 000–510 000] children were born with HIV, bringing to 2.5 million [1.6 million–3.4 million] the total number of children under 15 living with HIV.
- The total number of children aged 0–17 years who have lost their parents due to HIV increased to 16.6 million [14.4 million–18.8 million] in 2009.
- Since the beginning of the epidemic, more than 60 million people have been infected with HIV and nearly 30 million people have died of HIV-related causes.
- One in four AIDS deaths is caused by tuberculosis, a preventable and curable disease.

### Global and regional statistics

| | People living with HIV | New HIV infections 2009 | AIDS-related deaths 2009 | Adult HIV prevalence (%) |
|---|---|---|---|---|
| **Sub-Saharan Africa** | 22.5 million [20.9–24.2 million] | 1.8 million [1.6–2.0 million] | 1.3 million [1.1–1.5 million] | 5% [4.7%–5.2%] |
| **South and South-East Asia** | 4.1 million [3.7–4.6 million] | 270 000 [240 000–320 000] | 260 000 [230 000–300 000] | 0.3% [0.3%–0.3%] |
| **East Asia** | 770 000 [560 000–1.0 million] | 82 000 [48 000–140 000] | 36 000 [25 000–50 000] | <0.1% [0.1%–0.1%] |
| **Central and South America** | 1.4 million [1.2–1.6 million] | 92 000 [70 000–120 000] | 58 000 [43 000–70 000] | 0.5% [0.4%–0.6%] |
| **North America** | 1.5 million [1.2–2 million] | 70 000 [44 000–130 000] | 26 000 [22 000–44 000] | 0.5% [0.4%–0.7%] |
| **Western and Central Europe** | 820 000 [720 000–910 000] | 31 000 [23 000–40 000] | 8500 [6 800–19 000] | 0.2% [0.2%–0.2%] |
| **Eastern Europe and Central Asia** | 1.4 million [1.3–1.6 million] | 130 000 [110 000–160 000] | 76 000 [60 000–95 000] | 0.8% [0.7%–0.9%] |
| **Caribbean** | 240 000 [220 000–270 000] | 17 000 [13 000–21 000] | 12 000 [8500–15 000] | 1.0% [0.9%–1.1%] |
| **Middle East and North Africa** | 460 000 [400 000–530 000] | 75 000 [61 000–92 000] | 24 000 [20 000–27 000] | 0.2% [0.2%–0.3%] |
| **Oceania** | 57 000 [50 000–64 000] | 4500 [3400–6000] | 1400 [<1000–2400] | 0.3% [0.2%–0.3%] |
| **Total** | **33.3 million [31.4–35.3 million]** | **2.6 million [2.3–2.8 million]** | **1.8 million [1.6–2.1 million]** | **0.8% [0.7%–0.8%]** |

Source: The 2010 UNAIDS *Report on the global AIDS epidemic*

### HIV prevention

- New HIV infections have reduced by nearly 20% in the past 10 years. Among young people in 15 of the most severely affected countries, HIV prevalence has fallen by more than 25% as young people adopt safer sexual practices.
- The percentage of HIV-positive pregnant women who received treatment to prevent transmission of the virus to their child increased from 35% in 2007 to 53% in 2009.
- There are two new HIV infections for every one person starting HIV treatment.

### HIV treatment

- In 2009, 5.2 million people in low- and middle-income countries had access to antiretroviral treatment, up from 700 000 in 2004.
- In 2009, 700 000 people received antiretroviral treatment in high-income countries.
- There are 10 million people still in need of treatment who do not have access.

### Antiretroviral therapy (ART) coverage, 2009

| Geographical region | People receiving ART, 2009 | People needing ART, 2009 | ART coverage 2009 | People receiving ART, Dec. 2008 | People needing ART, 2008 | ART coverage 2008 |
|---|---|---|---|---|---|---|
| **Sub-Saharan Africa** | 3.9 million | 10.6 million [9.7–11.5 million] | 37% [34–40%] | 2.9 million | 10.4 million [9.5–11.3 million] | 28% [26–31%] |
| **Latin America and the Caribbean** | 478 000 | 950 000 [810 000–1million] | 50% [46–59%] | 439 000 | 910 000 [790 000–1million] | 48% [44–56%] |
| **East, South and South-East Asia** | 739 000 | 2.4 million [2–2.9 million] | 31% [26–36%] | 571 000 | 2.3 million [2–2.9 million] | 25% [20–29%] |
| **Europe, Central Asia** | 114 000 | 610 000 [550 000–710 000] | 19% [16–21%] | 84 400 | 570 000 [510 000–660 000] | 15% [13–17%] |
| **Middle East, North Africa** | 12 000 | 100 000 [88 000–120 000] | 11% [10–14%] | 9 100 | 91 000 [75 000–110 000] | 10% [9–12%] |
| **Total** | **5.25 million** | **14.6 million** [13.5–15.8 million] | **36%** [33–39%] | **4 million** | **14.3 million** [13.2–15.4 million] | **28%** [26–31%] |

Source: *Towards universal access: scaling up priority HIV/AIDS interventions in the health sector: progress report 2010*, WHO/UNAIDS/UNICEF

### Human rights and gender

- More than 90% of governments reported that they address stigma and discrimination in their HIV programmes, however, less than 50% costed or budgeted such programmes.
- Less than half of countries reporting have a budget for HIV programmes for women.
- Same sex relations are still criminalised in 79 countries and six apply the death penalty.

### Resource availability and needs

- In 2009, US$ 15.9 billion was estimated to be available from all sources for HIV, US$ 10 billion short of the US$ 26.8 billion needed for HIV services in 2010.
- Donor government's disbursements for the AIDS response in 2009 were US$ 7.6 billion, lower than the US$ 7.7 billion available in 2008.

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**UNAIDS**, the Joint United Nations Program on HIV/AIDS, is an innovative United Nations partnership that leads and inspires the world in achieving universal access to HIV prevention, treatment, care and support. Learn more at unaids.org.

## Module 6 Pre-Test

1. **Blood spots sent to the lab for HIV testing do not have names on them, so the DHS cannot identify by name the person from whom the blood was collected.**
    - **a.** True
    - **b.** False

2. **DHS HIV prevalence results have been lower than previous estimates.**
    - **a.** True
    - **b.** False

3. **Which of the following is true about population-based testing and sentinel surveillance?**
    - **a.** Only population-based testing should be used because it is more accurate.
    - **b.** Only sentinel surveillance testing should be used because it is more practical.
    - **c.** Both methods should be used.

4. **While surveys offer a statistic for HIV prevalence, the actual value lies within a range around that number.**
    - **a.** True
    - **b.** False

5. **Population-based HIV testing is different from testing at sentinel surveillance sites because**
    - **a.** it includes women and men
    - **b.** it includes those who are not pregnant or sexually active
    - **c.** it covers all parts of the country and both rural and urban areas
    - **d.** it is more expensive and costly
    - **e.** all of the above.

## Module 6 Post-Test

1. **Blood spots sent to the lab for HIV testing do not have names on them, so the DHS cannot identify by name the person from whom the blood was collected.**
    - **a.** True
    - **b.** False

2. **DHS HIV prevalence results have been lower than previous estimates.**
    - **a.** True
    - **b.** False

3. **Which of the following is true about population-based testing and sentinel surveillance?**
    - **a.** Only population-based testing should be used because it is more accurate.
    - **b.** Only sentinel surveillance testing should be used because it is more practical.
    - **c.** Both methods should be used.

4. **While surveys offer a statistic for HIV prevalence, the actual value lies within a range around that number.**
    - **a.** True
    - **b.** False

5. **Population-based HIV testing is different from testing at sentinel surveillance sites because**
    - **a.** it includes women and men
    - **b.** it includes those who are not pregnant or sexually active
    - **c.** it covers all parts of the country and both rural and urban areas
    - **d.** it is more expensive and costly
    - **e.** all of the above.

# ANSWER KEY

## Module 6

1. **Blood spots sent to the lab for HIV testing do not have names on them, so the DHS cannot identify by name the person from whom the blood was collected.**
   ***a. True***
   **b.** False

2. **DHS HIV prevalence results have been lower than previous estimates.**
   ***a. True***
   **b.** False

3. **Which of the following is true about population-based testing and sentinel surveillance?**
   **a.** Only population-based testing should be used because it is more accurate.
   **b.** Only sentinel surveillance testing should be used because it is more practical.
   ***c. Both methods should be used.***

4. **While surveys offer a statistic for HIV prevalence, the actual value lies within a range around that number.**
   **a. True**
   **b.** False

5. **Population-based HIV testing is different from testing at sentinel surveillance sites because**
   **a.** it includes women and men
   **b.** it includes those who are not pregnant or sexually active
   **c.** it covers all parts of the country and both rural and urban areas
   **d.** it is more expensive and costly
   ***e. All of the above.***