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**WORKSHOP ON HIV/AIDS AND ADULT MORTALITY
IN DEVELOPING COUNTRIES**

Population Division
Department of Economic and Social Affairs
United Nations Secretariat
New York, 8-13 September 2003

**A HISTORY OF THE HIV/AIDS EPIDEMIC WITH
EMPHASIS ON AFRICA ***

UNAIDS and WHO **

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Quality and Coverage of HIV Sentinel Surveillance

With a brief History of the HIV/AIDS Epidemic

**Workshop on HIV/AIDS and Adult Mortality in Developing Countries
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1 History of the HIV/AIDS epidemic with emphasis on Africa

In 1981, a new syndrome, the acquired immune deficiency syndrome (AIDS), was first recognized among homosexual men in the United States. By 1983, the etiological agent, the human immunodeficiency virus (HIV), had been identified. By the mid-1980's, it became clear that the virus had spread, largely unnoticed, throughout most of the world.

The HIV/AIDS pandemic consists of many separate epidemics. Each epidemic has its own distinct origin, in terms of geography and specific populations affected, and involve different types and frequencies of risk behaviors and practices, for example, unprotected sex with multiple partners or sharing drug injection equipment.

Countries can be divided into three states: generalized, concentrated and low.

Low

Principle: Although HIV infection may have existed for many years, it has never spread to significant levels in any sub-population. Recorded infection is largely confined to individuals with higher risk behaviour: e.g. sex workers, drug injectors, men having sex with other men. This epidemic state suggests that networks of risk are rather diffuse (with low levels of partner exchange or sharing of drug injecting equipment), or that the virus has been introduced only very recently.

Numerical proxy: HIV prevalence has not consistently exceeded 5% in any defined sub-population.

Concentrated

Principle: HIV has spread rapidly in a defined sub-population, but is not well-established in the general population. This epidemic state suggests active networks of risk within the sub-population. The future course of the epidemic is determined by the frequency and nature of links between highly infected sub-populations and the general population.

Numeric proxy: HIV prevalence consistently over 5% in at least one sub-population at highest risk, and prevalence below 1% in the general adult population (age 15-49 years) in urban areas.

Generalized

Principle: In generalized epidemics, HIV is firmly established in the general population. Although sub-populations at high risk may continue to contribute disproportionately to the spread of HIV, sexual networking in the general population is sufficient to sustain an epidemic independent of sub-populations at higher risk of infection.

Numeric proxy: HIV prevalence consistently over 1% in pregnant women.

Industrialized Western Countries

HIV infections began to spread extensively shortly before or after 1980. Through the 1980s, the population "groups" affected predominantly were men who had sex with other men and injecting drug users (IDU). In 1985, the majority (63 percent) of European adult AIDS cases were attributed to transmission among homo/bisexual men. In contrast, by 1992, only 42 percent of the reported adult AIDS cases were due to transmission among homo/bisexual men. The proportion of European AIDS case infected through IDU increased from 5 percent in 1985 to 36 percent in the early 1990's. In Spain and Italy, the major form of HIV transmission has been IDU. In

France, Germany and the United Kingdom, it is through men who have sex with men. By the early 1990's, the United States reported that among adults, 57 percent of AIDS cases were infected through male-to-male sex

Data on newly diagnosed HIV infections are now being used to track the HIV epidemic in Europe and provide more relevant information on the current HIV situation since the widespread use of highly active antiretroviral treatment (HAART) in 1996. The number of AIDS cases diagnosed in 2001 was only one-third of that in 1995. However, data for the first 6 months of 2002 suggest that AIDS incidence is now leveling off.

The rate of newly diagnosed HIV infections has increased by 14% between 1997 and 2001. By transmission group the number of new diagnoses decreased slowly among homo/bisexual men and IDU while it has increased steadily among heterosexual contact. However, analysis of these increases indicates that they are mostly due to persons originating from a country with a generalized HIV epidemic.

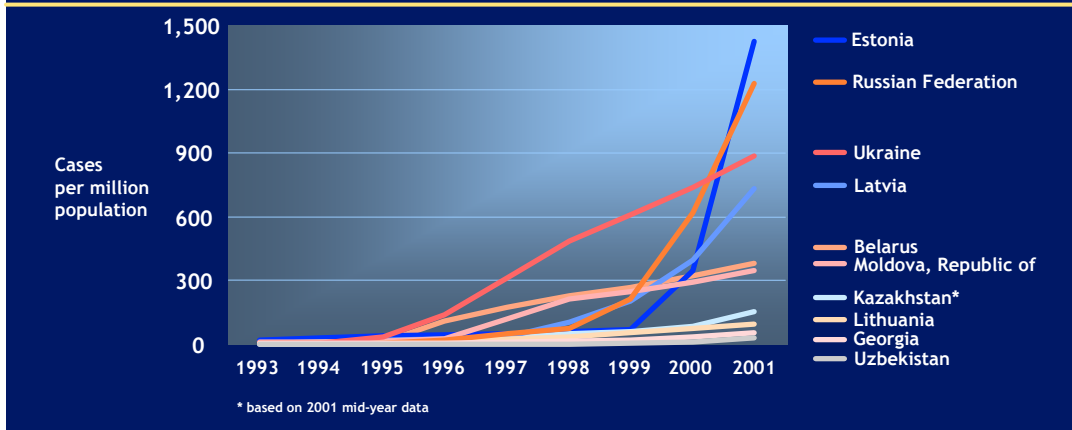
Eastern Europe and Central Asia

Until the mid-1990s, most of the countries of Eastern Europe appeared to have been spared the worst of the HIV epidemic. But between 1995 and 1998, the former socialist economies of Eastern Europe and Central Asia saw infections increase around six-fold. Most of these epidemics are driven by IDU. In Ukraine for example, the number of diagnosed HIV infections jumped from virtually zero before 1995 to around 20,000 a year from 1996 onwards, about 80% of them in IDUs.

HIV/AIDS is spreading rapidly through the countries of this region, which continues to experience the fastest-growing epidemic in the world. Following the rapid increase in Ukraine and Belarus in 1995, the epidemic then started to take off in other countries of the region—Moldova in 1996 and the Russian Federation in 1998, followed by Latvia and then Kazakhstan.

Updated version

Cumulative reported HIV infections per million population in Eastern European countries: 1993 - 2001



Source: European Centre for the Epidemiological Monitoring of AIDS. HIV/AIDS surveillance in Europe. End-of-year report 2001. Saint-Maurice: Institut de Veille Sanitaire, 2001. No. 66



Latin America and the Caribbean

Extensive spread of HIV probably began in the early 1980s, initially predominately among MSM and IDU residing in large cities. The spread of HIV/AIDS has been slower in Latin America and the Caribbean than in other developing regions of the world, but sentinel surveillance data are rare and information on HIV prevalence is difficult to find. What can be determined to date is that the HIV epidemic varies from country to country.

Many of the epidemics can be described as being in the low level and concentrated stage. In these countries, the HIV epidemics are found mostly among MSM and IDU. However, 12 countries in this region have an estimated HIV prevalence of 1% or more among pregnant women. In several of the countries forming the Caribbean Basin, adult HIV prevalence rates are surpassed only by the rates experienced in sub-Saharan Africa, making this the second most affected region in the world.

South and South-East Asia

The HIV/AIDS epidemic arrived later in Asia, in the mid- to late-80s. In the early 1990's Thailand and India accounted for the majority of reported infections. In Bangkok, Thailand, HIV prevalence among IDU increased from less than 1% in late 1987 to about 50% in 1990. In India, high levels of HIV prevalence were found among sex workers tested in Mumbai. By 1992, a number of countries were facing increasing numbers of infections. There were generally concentrated in groups such as IDU and sex workers. By 1993, 10% to 30% of IDUs in Yunnan Province, China were found to be infected with HIV.

Thailand, which has experienced what is probably the best-documented epidemic in the developing world, began showing evidence of a fall in new infections, especially among sex workers and their clients. But Thailand is still one of the only three countries, including Cambodia and Myanmar with HIV prevalence among 15-49 year olds over 1%.

Sub-Saharan Africa

Most of the available epidemiological data indicate that the extensive spread of HIV started in sub-Saharan Africa in the late 1970s. By the early 1980s, HIV was found in a geographic band stretching from West Africa across to the Indian Ocean, the countries north of the Sahara and those in the southern cone of the continent remained apparently untouched. By 1987, the epidemic began gradually to move south. Some of the most explosive epidemics have been seen in Southern Africa. South Africa has the largest number of people living with HIV/AIDS in the world, 5 million. Botswana and Swaziland have the highest prevalence levels, 38% and 33% respectively. West Africa has been relatively less affected by HIV infection than other regions of sub-Saharan Africa.

Uganda and Senegal represent two success stories. Uganda has brought estimated prevalence rate down to 5% by the end of 2001 from an estimated peak of close to 14% in the early 1990s with strong prevention campaigns. HIV prevalence has stabilized in Senegal at a relatively low level.

2 Tracking HIV in Africa: the systems

Pregnant women: the key data source

Virtually all countries in the WHO African Region have generalized epidemics, which are defined as HIV/AIDS epidemics with at least 1% of pregnant women attending antenatal clinics in the urban areas HIV infected. In most countries, surveillance systems primarily rely on monitoring HIV prevalence among women attending antenatal clinics. HIV prevalence among pregnant women is a good indicator of the spread of the epidemic in the general population, as the level of HIV infection among pregnant women is close to the prevalence in the general population of men and women 15-49 years. Additional sources of data on the course of the epidemic are prevalence surveys in specific risk populations (such as sex workers or mobile populations), routine screening of blood donors, and patients with sexually transmitted diseases (STDs), and tuberculosis (TB) patients.

While monitoring of HIV prevalence among pregnant women attending antenatal clinics has consistently been the main approach for surveillance, countries have used different approaches to select the antenatal clinic sites. Most countries have selected one or two sites in the majority of the nation's provinces or regions. Often one site is in the regional capital, the second site in a semi-urban area within the same region or province. The surveillance systems in Ethiopia, Ghana, Kenya, Nigeria, and Uganda are examples of this approach. Tanzania uses a similar system but selected six of the country's 20 regions for surveillance and established four sites in each region. The surveillance system in Cote d'Ivoire also covers all regions with one urban site, but in four regions three smaller rural clinics are included. While the urban site include 300 pregnant women in a surveillance round, each of the three rural sites aims for a sample size of 100. The combined data from the three clinics make up a rural site with 300 women. Countries like Botswana,

Lesotho, Swaziland have selected clinics located in a city/large town as well as nearby smaller health facilities in the same district to constitute a "sentinel site". South Africa uses probability proportional to size sampling to select sentinel sites with each public health facility in the province acting as a sampling unit with about 400 sites participating in each round of survey. Each site enrolls a minimum of 40 pregnant women.

Quality of Surveillance Systems

The UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance has developed coding schemes to represent four dimensions related to the quality of surveillance systems:¹

- Frequency and timeliness of data collection;
- Appropriateness of populations under surveillance;
- Consistency of the sites/locations and groups measured over time; and
- Coverage/representativeness of the groups for the adult populations.

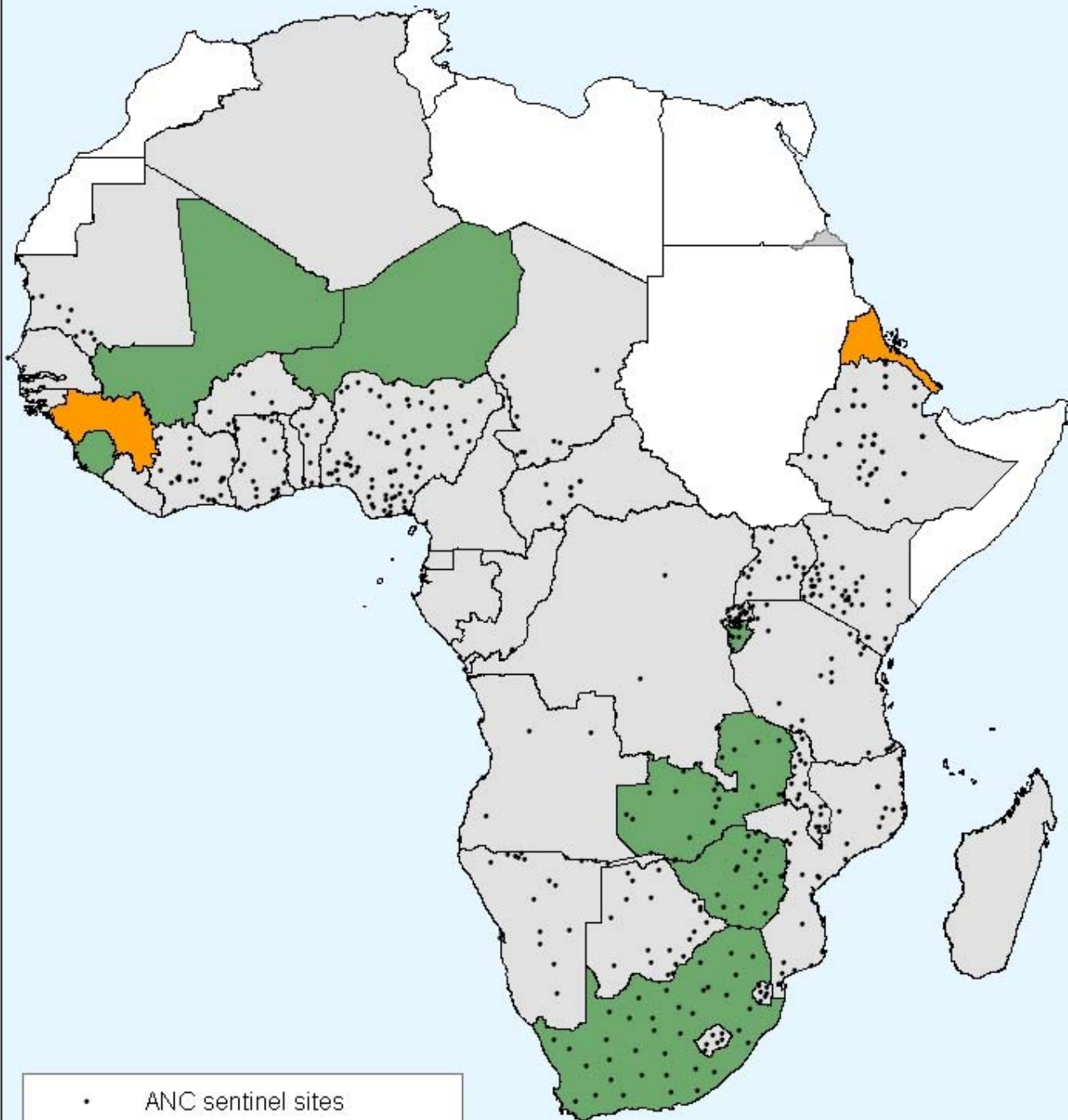
The coding schemes depend on the level of the HIV epidemic in a country. The levels are defined as generalized, concentrated and low.²

Sub-Saharan Africa is the most affected region by the HIV/AIDS epidemic. Among the 44 countries scored, all but 4 have generalized epidemics. Surveillance systems in this region have considerable variability in quality. Fifteen countries have systems that we categorized as being fully implemented as of 2001. Fourteen countries do not have the most basic components for a HIV/AIDS surveillance system. The remaining 11 countries have some or most of the components of a fully implemented surveillance system in place, but have yet to build a system that is capable of providing the data required to track the epidemic accurately. Fortunately, most of the countries that are most affected by the epidemic also have the systems that are fully implemented or have systems with some or most aspects implemented. Also, we are now receiving information for the 2002 and 2003 rounds of surveillance and countries such as Angola and Chad have expanded and improved their systems and if these stay in place will have higher quality systems for tracking HIV.

Surveillance systems are improving

HIV surveillance in Africa has improved in recent years, notably in terms of coverage and reporting of prevalence among young antenatal women. During 2002 approximately 220,000 pregnant women attending antenatal clinics were HIV tested for the purpose of surveillance. These women attended about 625 antenatal clinics throughout the region, not including an additional 400 clinics in the Republic of South Africa where antenatal clinics are selected according to statistical sampling (**Figure 1**).

HIV surveillance activity in the WHO African Region 2001 - 2002



• ANC sentinel sites

■ National population based survey

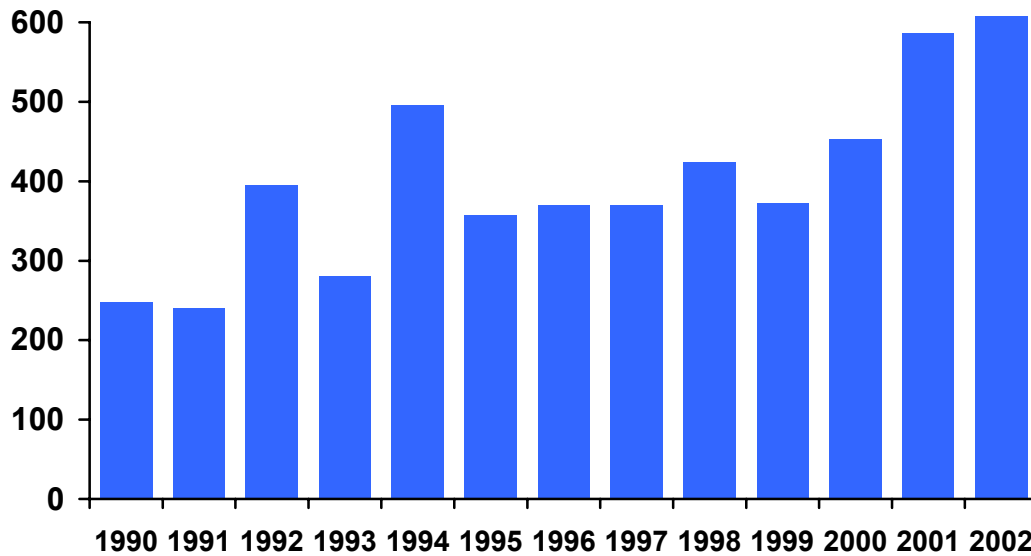
■ Special populations survey

■ WHO African Region

0 412.5 825 1,650 Kilometers

Several countries increased the number of antenatal clinics in the surveillance system to obtain better coverage of rural population, where almost two-thirds of the population in the region lives. Until recently, most clinics were located in urban and semi-urban areas. The number of clinics participating in the surveillance in 2001 and 2002 was considerably higher than during the nineties (Figure 2).

Figure 2 Number of sentinel antenatal clinics reporting HIV prevalence, WHO African Region, 1990-2002



Most countries with limited surveillance in recent years experienced political instability, such as Congo, the Democratic Republic of Congo, and Liberia.

Another major development is the implementation of national population-based surveys with HIV data collection. Such surveys had been conducted by several countries in Eastern Africa in the late eighties, but only Rwanda carried out a national survey in the nineties. During 2001-2002 Burundi, Mali, Niger, South Africa, Zambia, and Zimbabwe conducted national surveys which included men and women of reproductive ages. Zanzibar also conducted a HIV survey of its adult population.

Several countries are planning a survey in the coming years. The population-based surveys not only provide HIV prevalence data on all men and women but are also a unique opportunity to assess the extent to which the antenatal clinic-based surveillance system provides accurate data on the spread of HIV. In addition, Eritrea, Guinea and Mali conducted national surveys among a range of high and low risk populations. Table 1 summarizes the most recent HIV surveillance activities by country.

Table 1. HIV surveillance activity in the WHO African Region, by country, from 2000

	Total population (thousands)	Urban population (%)	ANC coverage (%)	Year of last ANC round (from 2000)	No. of ANC sites	Year of last national HIV survey	HIV data available on young people
Southern Africa	118,484	42					
Angola	13,184	35	n.a.	2002	10	—	N
Botswana	1,770	49	97	2002	22	—	Y
Lesotho	1,800	29	88	2003	6	—	Y
Malawi	11,871	15	90	2001	19	—	Y
Mozambique	18,537	33	71	2002	36	—	Y
Namibia	1,961	31	91	2002	21	—	Y
South Africa	44,759	58	94	2002	400	2002	Y
Swaziland	1,069	27	n.a.	2002	17	—	Y
Zambia	10,698	40	96	2002	24	2001/2	Y
Zimbabwe	12,835	36	93	2001	19	2001	Y
Eastern Africa	180,646	22					
Burundi	6,602	9	79	2001	7	2002	Y
Eritrea	3,991	19	49	—	—	2001	Y
Ethiopia	68,961	16	27	2001	34	—	Y
Kenya	31,540	34	76	2002	34	—	Y
Rwanda	8,272	6	92	2002	24	—	N
United Republic of Tanzania	36,276	33	93	2002	24	—	Y
Uganda	25,004	15	91	2001	15	—	N
Central Africa	84,674	37					
Cameroon	15,729	50	75	2002	27	—	Y
Central African Republic	3,819	42	67	2002	48	—	Y
Chad	8,348	24	42	2002	11	—	Y
Congo	3,633	66	n.a.	2002	3	—	Y
Democratic Republic of the Congo	51,201	31	n.a.	2003	9	—	Y
Equatorial Guinea	481	49	37	—	—	—	N
Gabon	1,306	82	94	2002	2	—	N
Sao Tome and Principe	157	48	—	—	—	2001 —	N
Western Africa	269,478	43					
Algeria	31,266	58	58	2000	5	—	N
Benin	6,558	43	80	2002	6	—	Y
Burkina Faso	12,624	17	61	2002	5	—	N
Cape Verde	454	64	99	—	—	—	N
Côte d'Ivoire	16,365	44	88	2002	28	—	Y
Gambia	1,388	31	na	2002	4	—	N
Ghana	20,471	36	88	2002	24	—	Y
Guinea	8,359	28	71	2001	5	2001	Y
Guinea-Bissau	1,449	9	62	—	—	—	N
Liberia	3,239	45	83	—	—	—	N
Mali	12,623	31	47	2002	9	2001	Y
Mauritania	2,807	59	48	2000	13	—	N
Niger	11,544	21	41	2000	5	2001	Y
Nigeria	120,911	45	64	2001	86	—	Y
Senegal	9,855	48	77	2002	11	—	Y

	Total population (thousands)	Urban population (%)	ANC coverage (%)	Year of last ANC round (from 2000)	No. of ANC sites	Year of last national HIV survey	HIV data available on young people
Sierra Leone	4,764	37	86	—	—	2001	N
Togo	4,801	34	82	2000	2	—	N
Indian Ocean	18,953	31					
Comoros	747	34	74	—	—	—	N
Madagascar	16,916	30	73	—	—	—	N
Mauritius	1,210	42	n.a.	—	—	—	N
Seychelles	80	65	n.a.	—	—	—	N
AFRO	672,235	36					

ANC, antenatal clinic; AFRO, WHO African Region.

n.a., data not available; —, no survey carried out; Y, yes; N, no.

Source: Population data from United Nations Population Division, 2002; ANC coverage from UNICEF, 2002, and DHS surveys.

In Recent years many countries in the region have made progress in establishing second generation surveillance systems. Such systems not only include HIV surveillance tailored to the type of epidemic, but also make efforts to measure levels and trends in other sexually transmitted infections (STIs) and in sexual risk behaviours.

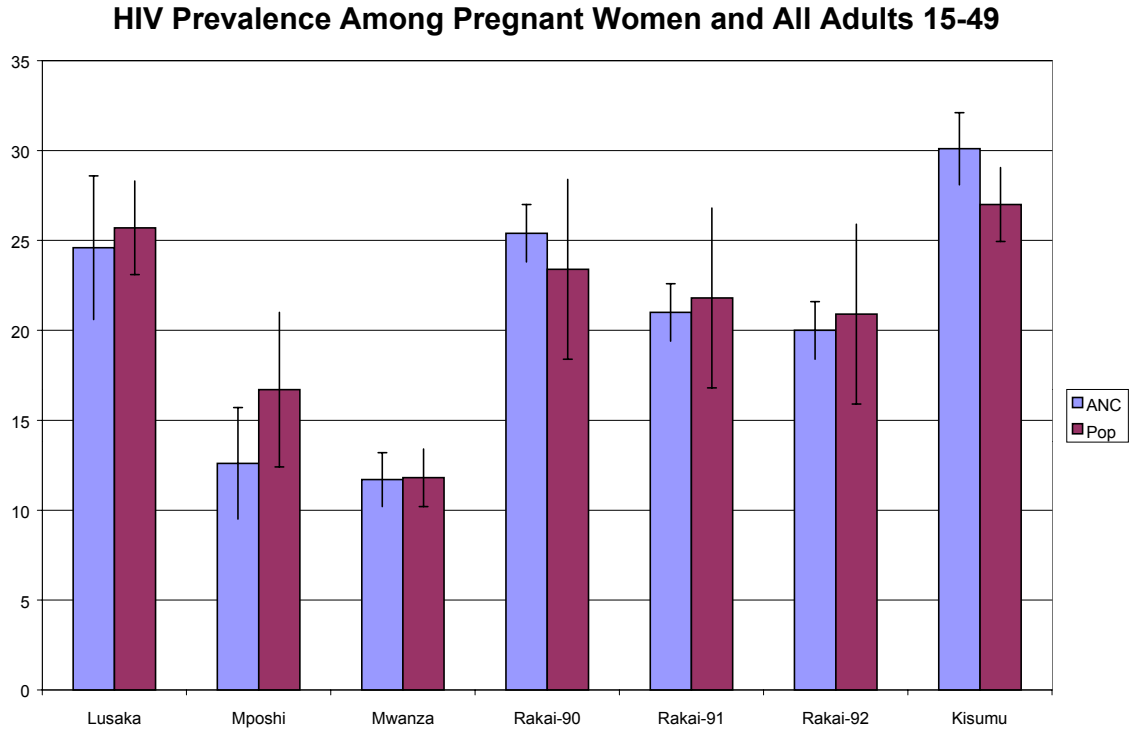
3 Estimating HIV Prevalence over time in Countries with Generalized Epidemics

In countries with generalized epidemics, the procedures use HIV prevalence in pregnant women to approximate prevalence in all adults, male and female, between the ages 15-49. Estimates of HIV prevalence among pregnant women and in community surveys among all men and women aged 15-49 are available from a number of sites.

Prevalence in pregnant women is a good proxy measure of adult prevalence. Prevalence data from pregnant women are sorted into two geographic categories: major urban areas and outside major urban areas. Epidemic curves are then fit to these data sets using the UNAIDS Estimation and Projection Package (EPP).

The fitted curves give yearly HIV point prevalence estimates for urban and non-urban areas. The actual prevalence used for the non-urban areas is adjusted as many countries' surveillance systems do not cover rural areas well. It is assumed that HIV prevalence is lower in rural areas and therefore if a country's system does not reflect the population in those areas the non-urban prevalence produced by EPP is adjusted downwards by 20% to reflect this bias.

Figure 3



Adjusted HIV prevalence in pregnant women in urban and rural areas is applied to the population (15-49) in urban and non-urban areas to produce estimates of the number of adults living with HIV/AIDS in the two areas. When combined this gives the estimate of adults living with HIV/AIDS in the country.

The software package Spectrum is used to produce estimates of adult incidence and mortality, as well as estimates for children infected via mother-to-child transmission and orphans. Spectrum uses the prevalence curves and applies a set of assumptions to produce age-and sex-specific estimates of incidence, prevalence, and mortality for adults and children. These assumptions are: 1) female-to-male prevalence ration, 2) effects of HIV on fertility, 3) transmission of HIV from mother to child, 4) survival time from infection to death for adults and children, 5) age patterns of prevalence, and 6) effects and coverage levels for ARVs.