# HIV/sexually transmitted infection epidemiology, management and control in the IUSTI Africa region: focus on sub-Saharan Africa

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## INTRODUCTION

Sexually transmitted infections (STI), including those caused by HIV types 1 and 2, remain a major public health problem in Africa, causing death through AIDS, cervical cancer, congenital syphilis and ectopic pregnancy, as well as significant morbidity in terms of HIV-related illness, disseminated syphilitic infection and multiple reproductive tract sequelae. Published estimates, available from the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the WHO, indicate that Africa remains the continent worst affected by HIV/STI.[1 2]

## HIV/AIDS EPIDEMIOLOGY, MANAGEMENT AND CONTROL

According to UNAIDS 2009 estimates, sub-Saharan Africa accounted for 68% of global HIV infections, 68% of new adult HIV infections, 92% of new infections in children and 72% of all AIDS-related deaths.[1] In the same year, regional estimates suggest that more than 14.1 million children have lost one or both parents to AIDS. The HIV/AIDS epidemic continues to have a disproportionate impact on women and girls in sub-Saharan Africa, with women aged 15–24 years being eight times more likely to be infected with HIV than their male counterparts.[1] National household surveys report that HIV affects individuals from all socioeconomic groups and that HIV prevalence is generally higher in urban compared with rural areas.[3]

As with all generalised HIV/AIDS epidemics, heterosexual transmission is the primary mode of HIV transmission in the region and female commercial sex workers (CSW) remain a key population for HIV prevention efforts. Within Africa, the potential importance of men who have sex with men (MSM), in terms of enhanced HIV transmission among MSM sexual networks and 'bridging' into heterosexual sexual networks, is only now being recognised and MSM research remains in its infancy.[4] Although the prevalence of injecting drug users is relatively low in Africa, it is estimated that one in eight injecting drug users are infected with HIV.[5] The proportion of infants infected with HIV through mother-to-child transmission is decreasing in response to the scale-up of antiretroviral therapy (ART) for infected mothers and neonates, particularly in eastern and southern Africa where coverage is best.

There are wide variations in sub-regional HIV prevalence, with the highest prevalence being reported from countries in the southern Africa sub-region (table 1). In 2009, Swaziland topped the world's HIV epidemic tables with a 26% prevalence among adults aged 15–49 years, and South Africa was the country with the world's largest population of people living with HIV (5.6 million).[1] Within eastern and southern Africa, HIV prevalence has now stabilised and there is evidence of a recent decline in incidence in some countries (table 1). The HIV burden in west and central Africa is much lower than the eastern and southern sub-regions (table 1).[1]

The quality and coverage of HIV treatment and care programmes have improved substantially in many African countries. As of December 2008, 44% of adults and children in need of ART were estimated to be receiving this, an impressive scale-up from the estimated 2% coverage in 2003.[5] The ART coverage, particularly for children, is lower in west and central Africa compared with the eastern and southern sub-regions. While this ART scale-up is bearing fruit in many countries in terms of declining AIDS-related mortality, there are still many HIV-infected individuals who remain in need of ART. A key challenge for national programmes remains the low level of uptake of HIV counselling and testing, particularly by men. The introduction of 'opt-out' HIV testing at all entry points to the healthcare system may be an effective and ethically acceptable policy response to Africa's HIV epidemic.[6]

The impressive scale-up of access to ART services will not be enough to curb the HIV/AIDS epidemic in Africa. With the lack of an effective HIV vaccine, other multicomponent prevention efforts require prioritisation for funding and implementation in order to avert new infections. These should be targeted at the drivers of country-specific epidemics and the population groups most affected.

## STI EPIDEMIOLOGY, MANAGEMENT AND CONTROL

As a result of the implementation of syndromic management and poorly functioning or non-existent national microbiological surveillance programmes, there are few recent or reliable data on the prevalence of individual STI pathogens in Africa. In 1999, the WHO reported a global estimate of 340 million new cases of four curable STI (syphilis, gonorrhoea, chlamydial infection and trichomoniasis) in adults aged 15–49 years.[2] Although only 69 million (20%) of these cases were estimated to have occurred in sub-Saharan Africa, this region had the highest regional incidence rate (256 per 1000) when adjusting for the estimated population size.[2] The latest WHO estimates (2005) report a 32% global increase in the number of new

**Table 1** Overview of the HIV epidemic in western, central, eastern and southern regions of sub-Saharan Africa

| Sub-regional country examples | Estimated number of adults (15+ years) living with HIV in 2009 N (95% CI) | Prevalence among adults (15–49 years) in 2009 Percentage (95% CI) | Annual incidence among adults (15–49 years) in 2009 Incidence (95% CI) | Annual incidence among adults (15–49 years) in 2001 Incidence (95% CI) | Trend in incidence |
|---|---|---|---|---|---|
| West Africa | | | | | |
| Côte d'Ivoire | 380 000 (340 000 to 440 000) | 3.4 (3.1 to 3.8) | 0.11 (<0.10 to 0.20) | 0.39 (0.30 to 0.51) | Decrease |
| Nigeria | 2 900 000 (2 600 000 to 3 200 000) | 3.6 (3.3 to 4.0) | 0.38 (0.33 to 0.44) | 0.39 (0.33 to 0.47) | Stable |
| Senegal | 54 000 (46 000 to 63 000) | 0.9 (0.7 to 1.0) | <0.10 (<0.10 to 0.11) | 0.10 (<0.10 to 0.12) | Stable |
| Central Africa | | | | | |
| Cameroon | 550 000 (500 000 to 610 000) | 5.3 (4.9 to 5.8) | 0.53 (0.43 to 0.61) | 0.59 (0.50 to 0.69) | Stable |
| Central African Republic | 110 000 (98 000 to 120 000) | 4.7 (4.2 to 5.2) | 0.17 (<0.1 to 0.25) | 0.56 (0.43 to 0.69) | Decrease |
| Republic of Congo | 69 000 (61 000 to 78 000) | 3.4 (3.1 to 3.8) | 0.28 (0.23 to 0.35) | 0.43 (0.36 to 0.51) | Decrease |
| Eastern Africa | | | | | |
| Kenya | 1 300 000 (1 200 000 to 1 400 000) | 6.3 (5.8 to 6.5) | 0.53 (0.34 to 0.70) | 0.55 (0.38 to 0.76) | Stable |
| United Republic of Tanzania | 1 200 000 (1 100 000 to 1 400 000) | 5.6 (5.3 to 6.1) | 0.45 (0.34 to 0.57) | 0.64 (0.55 to 0.76) | Decrease |
| Uganda | 1 000 000 (940 000 to 1 100 000) | 6.5 (5.9 to 6.9) | 0.74 (0.62 to 0.85) | 0.71 (0.61 to 0.82) | Stable |
| Southern Africa | | | | | |
| South Africa | 5 300 000 (5 100 000 to 5 500 000) | 17.8 (17.2 to 18.3) | 1.49 (1.27 to 1.76) | 2.35 (2.14 to 2.60) | Decrease |
| Swaziland | 170 000 (160 000 to 180 000) | 25.9 (24.9 to 27.0) | 2.66 (2.19 to 3.14) | 4.07 (3.72 to 4.46) | Decrease |
| Zimbabwe | 1 000 000 (950 000 to 1 200 000) | 14.3 (13.4 to 15.4) | 0.84 (0.54 to 1.19) | 1.94 (1.62 to 2.36) | Decrease |

This table has utilised data presented in the UNAIDS report on the global AIDS epidemic 2010.[1] To calculate the adult HIV incidence, the estimated number of adults (15–49 years) newly infected with HIV in 2009 was divided by the 2009 adult population (15–49 years) not infected at the start of 2009 and similarly for 2001.

cases for these same four infections (448 million) in 15–49-year-olds, with an even higher 59% increase in the number of new cases in sub-Saharan Africa (110 million, almost a quarter of the worldwide burden; table 2).[7] However, this increase for Africa is due almost entirely to higher estimates of new cases of trichomoniasis, whereas the new 2005 WHO estimates suggest that the number of new cases of chlamydial and syphilis infections have declined compared with 1999 (table 2).

It should be emphasised that accurate estimation of STI prevalence and incidence relies on good quality and ideally population-based and/or antenatal clinic-based survey data for individual STI pathogens in each country of the region. Within sub-Saharan Africa, apart from data generated from antenatal syphilis non-treponemal antibody-based screening programmes, reliable incidence data are few and far between for most STI pathogens. Accordingly, WHO estimates of new STI cases in both 1999 and 2005 were calculated based on prevalence data, which rely heavily on selected peer-reviewed published research studies, which emanate from only a few African research groups and countries, as well as on access to non-peer-reviewed data and expert local knowledge. The estimation of incidence from prevalence provides a useful approximation but it does not allow for changes in the prevalence of population size over time or for age-related variation in the incidence or duration of infection.

Good STI control has been shown in the past to reduce HIV transmission in situations where the rates of bacterial STI are high and the HIV epidemic is on the rise, a situation pertinent to youth even in mature epidemics.[8] Over the past decade, the syndromic management approach for STI has been successfully integrated into regional primary healthcare settings. It is widely believed to be the most cost-effective approach to STI control, has the key advantage of providing STI treatment on the same day as the first clinical presentation, and avoids the need for expensive laboratory tests; however, the poor performance of some syndrome algorithms, especially those for women, as well as overtreatment and often unnecessary stigmatisation of patients as 'STI-infected' have been noted previously.[9] Most countries have national STI guidelines, but many are outdated and are not always available at the facility level. As a regional initiative, the 15 member states of the Southern African Development Community recently approved a regional STI framework, which includes updated evidence-based STI guidelines. Many facilities also face continued challenges with the management of commodities, especially drugs. In many countries, STI are managed outside of public sector clinics, through private doctors, pharmacists and traditional healers. This poses a challenge in terms of ensuring uniformity in the quality of sexual health services at each access point. In some countries, access to STI healthcare by high-risk groups, for example, female CSW, has been improved though engagement with non-governmental organisations that operate both clinic-based and mobile outreach services employing the syndromic approach and, in some instances, periodic presumptive therapy programmes.

South Africa is the country with the most extensive recent and reliable surveillance data. South Africa's national clinical surveillance programme was established in 2004 and collects STI syndrome data on an annual basis from patients attending 270 sentinel facilities. Aetiological and antimicrobial resistance surveys have been undertaken in most of South Africa's nine provinces since 2006. These surveys have highlighted the rising importance of herpes and the decline of chancroid as a cause of genital ulceration as well as the emergence of quinolone-resistant gonorrhoea.[10 11] A number of other African countries, including Kenya, Madagascar, Namibia, Tanzania and Zimbabwe, have undertaken, are currently undertaking or plan to commence, national *Neisseria gonorrhoeae* antimicrobial susceptibility surveys. Given the importance of CSW and MSM in STI/HIV transmission in the sub-Saharan African setting, the number of aetiological surveys conducted among these populations has been woefully small in recent years, and more research is required to understand better the relative contribution made by such groups to the overall STI/HIV burden within their communities.

The implementation of well-conducted antenatal screening programmes is critical if congenital syphilis is to be eliminated from Africa. A study from Tanzania reported that among

**Table 2** Comparison of the 1999 and 2005 WHO global estimates for four curable STI (gonorrhoea, chlamydial infection, trichomoniasis and syphilis), indicating the proportion of new cases attributable to the sub-Saharan Africa region in each set of estimates

| | WHO estimates of new cases (1999) | | | WHO estimates of new cases (2005) | | | Change in percentage of new cases from 1999 to 2005 | |
|---|---|---|---|---|---|---|---|---|
| | Global | Sub-Saharan Africa | | Global | Sub-Saharan Africa | | Global | Sub-Saharan Africa |
| Disease | New cases | New cases | % Of global new cases | New cases | New cases | % Of global new cases | % Increase (+) or % decrease (−) | % Increase (+) or % decrease (−) |
| Gonorrhoea | 62 000 000 | 17 000 000 | 27.4 | 87 650 000 | 17 520 000 | 20.0 | +41.4 | +3.1 |
| Chlamydial infection | 92 000 000 | 16 000 000 | 17.4 | 101 520 000 | 10 020 000 | 9.9 | +10.3 | −37.4 |
| Trichomoniasis | 174 000 000 | 32 000 000 | 18.4 | 248 480 000 | 78 810 000 | 31.7 | +42.8 | +146.3 |
| Syphilis | 12 000 000 | 4 000 000 | 33.3 | 10 600 000 | 3 410 000 | 32.2 | −11.7 | −14.8 |
| All four above diseases | 340 000 000 | 69 000 000 | 20.3 | 448 250 000 | 109 760 000 | 24.5 | +31.8 | +59.1 |

This table has utilised WHO data.[2 7]
STI, sexually transmitted infection.

unscreened women, 51% of stillbirths, 24% of preterm live births and 17% of all adverse pregnancy outcomes were attributable to maternal syphilis.[12] Many African countries undertake annual serosurveys for syphilis infection among pregnant women using rapid plasma reagin (RPR) assays. Data from South Africa, for example, have shown an impressive decrease in the prevalence of RPR seropositivity among pregnant women from 11.5% in 1997 to 1.9% in 2009. Madagascar's Demographic and Health Survey (2003–4) documented that 3.8% of the adult population is affected by syphilis.[13] Herpes simplex virus type 2 (HSV-2) seroprevalence data demonstrate high rates of HSV-2 infection in sub-Saharan Africa, with the age-adjusted adult prevalence ranging from 30% to 80% in women and 10% to 50% in men.[14] Screening for RPR, HSV-2 and hepatitis B was included as part of Uganda's HIV/AIDS Sero-Behavioural Survey (2004–5), which showed overall RPR, HSV-2 and hepatitis B prevalences of 3.4%, 46.1% and 10.3% among 15–59-year olds, respectively.[15]

## EMERGING ISSUES, CHALLENGES AND OPPORTUNITIES

Many of the key advances in STI/HIV research have been reported from Africa, and several have been translated into daily clinical practice.[16] However, a key challenge for the region is to scale up successful interventions, which requires sustainable funding, adequate infrastructure and a well-trained workforce. The continued success of syndromic management is currently being challenged by a number of issues. First, the emergence and spread of antibiotic-resistant gonorrhoea within the African region, which requires on-going and close monitoring. Second, it has to be appreciated that syndromic management is a tool to treat symptomatic STI in a cost-effective manner and therefore has little impact on the larger burden of asymptomatic infections. Although the use of cheap and easy-to-use point-of-care rapid syphilis tests is now being implemented in many African countries, similar rapid tests are still urgently required to enable the detection of those asymptomatic STI that have important health sequelae, such as gonorrhoea and chlamydial infection. Third, in many countries, healthcare workers remain unable to provide quality STI services for CSW and MSM populations due to discriminatory legislation. Finally, poor quality partner notification remains the 'Achilles heel' of STI control programmes worldwide, and further health systems research is required to demonstrate the potential benefit of introducing expedited partner notification strategies in the African setting.

The current non-affordability of the human papillomavirus (HPV) vaccine for African countries will mean that African women will continue to be put at risk of, and die from, cervical cancer in the years ahead. Efforts are required to engage further with vaccine manufacturers to drive down the cost of these 'life-saving' products, as happened previously with the hepatitis B vaccine. Introduction of the HPV vaccine will be challenging and would need to be integrated into existing national childhood vaccination schedules if the required coverage is to be obtained. Further research is required to determine the value of HPV-DNA testing, using self-collected vulvovaginal swabs, as a cervical cancer prevention strategy, whether as a primary approach or as a 'stop-gap' pending a reduction in vaccine costs.

Without an effective HIV vaccine, HIV prevention activities within Africa are now focused on scaling-up male circumcision, HIV counselling and testing campaigns, behavioural change initiatives and, in the near future, access for women to tenofovir-containing microbicides and commencement of early ART for HIV-infected individuals in serodiscordant sexual relationships. Perhaps the biggest danger facing Africa now is that countries and donors appear to have, in the battle against HIV/AIDS, lost focus on the importance of STI in their own right. For the sake of today's youth and this continent's future generations, there is a need to put sexual and reproductive health back high on the African health agenda before it is too late.[17]

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## REFERENCES

1. **UNAIDS.** *Global Report: UNAIDS Report on the Global AIDS Epidemic 2010*. 2010. http://data.unaids.org/pub/Report/2009/JC1700_Epi_Update_2009_en.pdf (accessed 8 Jul 2011).
2. **World Health Organization.** *Global Prevalence and Incidence of Selected Curable Sexually Transmitted Infections*. 2001. http://whqlibdoc.who.int/hq/2001/WHO_HIV_AIDS_2001.02.pdf (accessed 8 Jul 2011).
3. **HIV/AIDS Survey Indicators Database.** http://www.measuredhs.com/hivdata/surveys/start.cfm (accessed 8 Jul 2011).
4. **Smith AD,** Tapsoba P, Peshu N, *et al*. Men who have sex with men and HIV/AIDS in sub-Saharan Africa. *Lancet* 2009;**374**:416–22.
5. **UNAIDS.** *AIDS Epidemic Update: November 2009*. 2009. http://www.unaids.org/en/media/unaids/contentassets/dataimport/pub/report/2009/jc1700_epi_update_2009_en.pdf (accessed 8 Jul 2011).
6. **April MD.** Rethinking HIV exceptionalism: the ethics of opt-out HIV testing in sub-Saharan Africa. *Bull WHO* 2010;**88**:703–8.
7. **World Health Organization.** *Prevalence and Incidence of Selected Sexually Transmitted Infections*. Geneva: World Health Organisation, 2011.
8. **Grosskurth H,** Gray R, Hayes R, *et al*. Control of sexually transmitted diseases for HIV-1 prevention: understanding the implications of the Mwanza and Rakai trials. *Lancet* 2000;**355**:1981–7.
9. **Pettifor A,** Walsh J, Wilkins V, *et al*. How effective is syndromic management of STDs?: a review of current studies. *Sex Transm Dis* 2000;**27**:371–85.

10. **Mhlongo S,** Magooa P, Muller EE, *et al*. Etiology and STI/HIV coinfections among patients with urethral and vaginal discharge syndromes in South Africa. *Sex Transm Dis* 2010;**37**:566—70.
11. **Lewis DA,** Scott L, Slabbert M, *et al*. Escalation in the relative prevalence of ciprofloxacin-resistant gonorrhoea among men with urethral discharge in two South African cities: association with HIV seropositivity. *Sex Transm Infect* 2008;**84**:352—5.
12. **Watson-Jones D,** Changalucha J, Gumodoka B, *et al*. Syphilis in pregnancy in Tanzania. I. Impact of maternal syphilis on outcome of pregnancy. *J Infect Dis* 2002;**186**:940—7.
13. **Institut National de la Statistique (INSTAT) [Madagascar], ORC Macro.** *Madagascar Demographic and Health Survey 2003—2004: Key Findings*. 2005. http://www.measuredhs.com/pubs/pdf/SR105/SR105MD03-04Eng.pdf (accessed 8 Jul 2011).
14. **Paz-Bailey G,** Ramaswamy M, Hawkes SJ, *et al*. Herpes simplex virus type 2: epidemiology and management options in developing countries. *Sex Transm Infect* 2007;**83**:16—22.
15. **Ministry of Health [Uganda], ORC Macro.** *Uganda HIV/AIDS Sero-Behavioural Survey 2004—2005*. 2006. http://www.measuredhs.com/pubs/pdf/AIS2/AIS2.pdf (accessed 8 Jul 2011).
16. **Mabey D,** Ndowa F, Latif A. What have we learned from sexually transmitted infection research in sub-Saharan Africa? *Sex Transm Infect* 2010;**86**:488—92.
17. **Glasier A,** Gulmezoglu AM. Putting sexual and reproductive health on the agenda. *Lancet* 2006;**368**:1550—1.