

The spread and effect of HIV-1 infection in sub-Saharan Africa

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Africa is the continent most severely affected by the global HIV-1 epidemic, with east and southern Africa in general more severely affected than west and central Africa. Differences in the spread of the epidemic can be accounted for by a complex interplay of sexual behaviour and biological factors that affect the probability of HIV-1 transmission per sex act. Sexual behaviour patterns are determined by cultural and socioeconomic contexts. In sub-Saharan Africa, some traditions and socioeconomic developments have contributed to the extensive spread of HIV-1 infection, including the subordinate position of women, impoverishment and decline of social services, rapid urbanisation and modernisation, and wars and conflicts. Populations in many parts of Africa are becoming trapped in a vicious circle as the HIV-1 epidemic leads to high mortality rates in young and economically productive age groups, and thus leads to further impoverishment. Interventions to control HIV-1 should not only target individuals, but also aim to change those aspects of cultural and socioeconomic context that increase the vulnerability to HIV-1 of people and communities.

AIDS was first described in 1981 in homosexual men in North America.^{1,2} The first report on AIDS in patients from central Africa was published in 1983,³ and by 1986 it was clear that HIV-1 had spread in the populations of many countries in sub-Saharan Africa and was posing a major public health problem.⁴ The discovery of AIDS in African patients who were neither homosexual men nor intravenous drug users led to the realisation that AIDS could be transmitted through heterosexual intercourse. Indeed, sexual intercourse between men and women results in most HIV-1 infections acquired by adults in sub-Saharan Africa. Transmission through blood transfusions, injections with infected needles, and scarification are thought to represent only a few infections.⁵

A striking feature of the HIV-1 epidemics in sub-Saharan Africa is their severity. Of the estimated 40 million people who were living with HIV-1/AIDS at the end of 2001, 70% were from sub-Saharan Africa, which houses about 10% of the world's population.⁶ According to the UNAIDS/WHO Working Group on Global HIV/AIDS/STI (sexually-transmitted infection) Surveillance, an HIV-1 epidemic is generalised if the prevalence in pregnant women repeatedly exceeds 1%.⁷ In 1999, the HIV-1 epidemic was generalised in all countries of sub-Saharan Africa with the exception of Mauritania, Somalia, Equatorial Guinea, and the islands in the Indian Ocean.⁸ By contrast, in Asia, the second most severely affected continent, three countries had generalised epidemics in 1999: Thailand, Cambodia, and Myanmar.

Since HIV-2 causes much fewer HIV infections in sub-Saharan Africa than HIV-1, in this paper we focus on HIV-1 infection. First, we discuss the epidemiology of HIV-1 infection in sub-Saharan Africa. Second, we describe the socioeconomic and cultural context in which the virus has

and continues to spread. Finally, we discuss the demographic effect of the HIV-1 epidemic and the consequences for economic development.

Epidemiological perspective

History

The first cases of AIDS seem to have appeared in Uganda and Tanzania shortly after the liberation war in Uganda in 1978–79.^{9,10} The AIDS epidemic in the Democratic Republic of Congo began around the same time,^{3,11} although HIV-1 infection was present in the population long before then.^{12–14} Additional evidence that the populations of central Africa (figure 1) were the first to have been confronted with the new virus comes from studies on the virus itself. The HIV-1 epidemics in Cameroon, Gabon, and the Democratic Republic of Congo are characterised by many circulating HIV-1 strains—more than in any other population in the world—which suggests that the virus has been present for a long time in these countries.¹⁵ Moreover, evidence exists for the zoonotic transmission of simian immunodeficiency virus_{chimpanzee} (SIV_{cpz}) in Cameroon that gave rise to HIV-1 group N infection in people.¹⁶

In the mid-1980s, the HIV-1 epidemic seemed worst in the Democratic Republic of Congo and Uganda, and, to a lesser extent, in neighbouring countries in east and southern Africa.⁴ In the Democratic Republic of Congo, Cameroon, and Gabon, HIV-1 prevalence has remained fairly stable for many years, and only recently has a worrying increase in prevalence in Cameroon suggested that the epidemic is entering a new phase. In 1999, HIV-1 prevalence in adults in Cameroon was estimated at 7.7%;

Search strategy and selection criteria

For the section on epidemiology, AB used references from her PhD thesis on factors determining the differential spread of HIV in sub-Saharan Africa (Antwerp: University of Antwerp, 2001). These references were supplemented by more recent publications and by abstracts from the 12th International Conference on AIDS and STDs in Africa. For the sections on socioeconomic and cultural context and the effect of the HIV epidemic, KB-N and GM used reports from international organisations working on HIV/AIDS in developing countries (UNDP, UNFPA, UNAIDS, Population Council, World Bank) and papers presented at the Africa Development Forum, 2000.

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in 2000, a prevalence of 11% was noted in a nationwide survey of pregnant women.^{8,17} This relatively slow and recent increase contrasts with the situation in many parts of east Africa and most of southern Africa where the HIV-1 epidemic has run an explosive course since the early 1990s (table, figure 2). In many large cities in these regions, HIV-1 prevalence in pregnant women has exceeded or still exceeds 25%.

In Uganda, the prevalence of HIV-1 infection has fallen since the early 1990s, which has been attributed to changes in sexual behaviour.¹⁸ More recently, a similar, declining trend in HIV-1 prevalence has been noted in Zambia.¹⁹ However, in other parts of southern Africa the epidemic continues to spread unabated (figure 3). The worst affected country so far is Botswana, where an estimated one in three adults are infected.⁸ In west Africa, with the exception of Côte d'Ivoire, Burkina Faso, Nigeria, and Togo, HIV-1 prevalence in pregnant women has so far remained under 5%.⁶

Heterogeneity

The considerable variation in HIV-1 prevalence between different regions in sub-Saharan Africa cannot always be accounted for by differences in the date of introduction of the virus. The rate of spread of HIV-1 infection varies between populations across Africa. Indeed, it seems that the spread of HIV infection has been more rapid in eastern and southern Africa than in western and central Africa (table and figure 2). In a population-based study, differences in sexual behaviour patterns alone could not explain differences between areas in HIV-1 prevalence.²⁰ The study was done in four cities: two (Cotonou in Benin and Yaoundé in Cameroon) with a fairly low prevalence of

HIV-1 of around 5% in the general population; and two (Kisumu in Kenya and Ndola in Zambia) with a prevalence of around 25%. Differences in sexual behaviour were outweighed by differences in the prevalence of factors that alter the probability of transmission during sexual intercourse:²¹ male circumcision and infections that cause genital ulcerations, ie, herpes simplex virus-2 (HSV-2) infection, syphilis, or both.²¹⁻²³ Furthermore, differences in prevalence were not explained by variations in circulating subtypes of HIV-1.²⁴ The findings show how the spread of

HIV-1 infection is determined by a complex interplay of sexual behaviour, including rate of partner change and sexual mixing patterns between different sexual activity classes, different age groups, or both, and biological factors that affect the probability of HIV-1 transmission per sex act.

The study also drew attention to the high prevalence of HIV-1 and other sexually-transmitted infections in young people, especially young women, in many parts of sub-Saharan Africa. For instance in Kisumu, Kenya, 23% of women aged 15-19 years were infected with HIV-1, compared with 3.5% of young men of the same age.²⁰ Female adolescents in Tanzania, Zambia, Zimbabwe, and South Africa have much higher rates of HIV-1 infection than male adolescents.^{25,26} Possible explanations for this discrepancy

include the higher biological vulnerability of young women to HIV-1 and

other sexually-transmitted infections than young men, and sexual relations between young women and older men—who are more likely to be infected than younger men.²⁷ Indeed, sex with older men is a risk factor for HIV-1 infection in young women in Zimbabwe.²⁸ Further work is needed on the sexual behaviour of young people and the biological factors that make young women more susceptible to HIV-1 infection, such as cervical ectopy and HSV-2

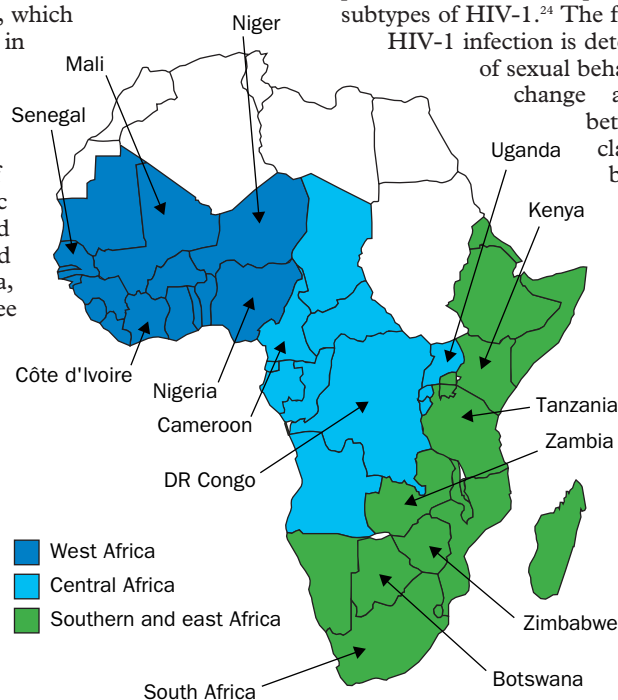


Figure 1: **Map of regions of Africa**
DR Congo=Democratic Republic of Congo.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Central Africa														
Kinshasa (Zaire)*	5.9	5.9	5.7	7.1	6.5	4.8	6.6	10.8	NA	NA	NA	NA	2.7-6.2	NA
Yaoundé (Cameroon)	NA	NA	NA	NA	0.2	1.3	1.6	1.7	1.3	NA	2.7	NA	NA	5.5
West Africa														
Abidjan (Côte d'Ivoire)	NA	3.0	2.6-7.0	NA	5.5	4.0-9.6	10.0	9.0-13.5	NA	NA	8.2-12.0	NA	NA	NA
Cotonou (Benin)	NA	0.0	NA	NA	NA	0.4	0.4	0.0	NA	0.6	NA	NA	NA	NA
Maiduguri (Nigeria)	NA	NA	0.0	2.3	0.1	0.2	NA	NA	NA	NA	NA	NA	NA	NA
East Africa														
Kampala (Uganda)	NA	13.5	NA	NA	24.5	25.0	27.8	29.5	24.9	NA	16.8	15.3	14.9	13.4
Nairobi (Kenya)	2.0	2.8	NA	5.7	NA	5.8-17.5	7.6-15.8	8.5-15.0	NA	8.4-21.2	NA	10.5-20.0	NA	NA
Dar es Salaam (Tanzania)	NA	NA	NA	NA	8.9	9.0	NA	11.0	10.6	13.8	12.2	NA	NA	NA
Southern Africa														
Lusaka (Zambia)†	8.0	NA	11.6	NA	NA	24.5	NA	22.6	26.8	24.7	NA	26.1	NA	25.9
Gaborone (Botswana)	NA	NA	NA	NA	NA	6.0	NA	14.9	19.2	27.8	28.7	NA	34.0	39.1
Gauteng Province (South Africa)	NA	NA	NA	NA	NA	0.7	1.1	2.5	4.1	7.3	12.0	18.7	17.1	22.5

NA=not available. Data source: US Census Bureau, Population Division. HIV/AIDS surveillance data base. Washington: US Department of Commerce, Economics and Statistics, 2000. *From 1985-90 and for 1992, the data are from Mama Yemo Hospital, the largest maternity clinic in Kinshasa. †Data from 1992 onwards are from four sentinel sites in Lusaka where intermediate HIV prevalence rates are noted.

Trends in HIV-1 seroprevalence among pregnant women in sub-Saharan Africa

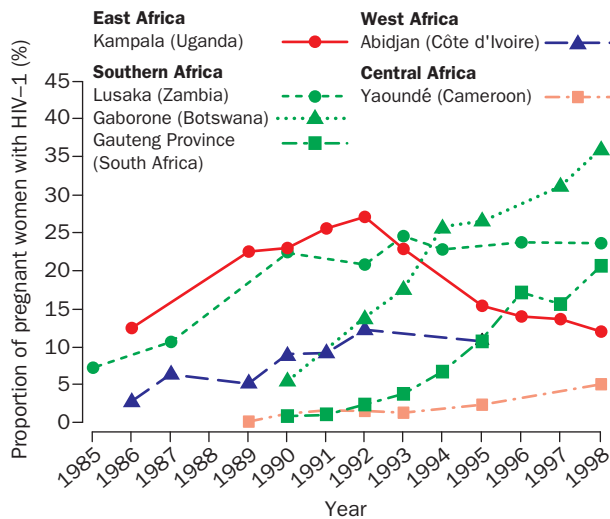


Figure 2: HIV-1 prevalence among pregnant women in selected cities in sub-Saharan Africa

Data source: US Census Bureau, Population Division. HIV/AIDS surveillance data base. Washington: US Department of Commerce, Economics and Statistics, 2000.

infection. Meanwhile, the HIV-1 epidemics in sub-Saharan Africa can, clearly, be stemmed only if the prevalence of HIV-1 infection falls in young people, especially young women.²⁵

Why is sub-Saharan Africa more severely affected than other continents?

By the end of 2001, the HIV-1 prevalence in adults in sub-Saharan Africa was estimated at 8.4%.⁶ Estimated prevalence rates on other continents did not exceed 1%, apart from the Caribbean region, where it was 2.2%. No comparative between-continent data exist on sexual behaviour and other risk factors for HIV-1 infection. However, some comparisons can be made between sub-Saharan Africa and southeast Asia, the subcontinent with the second highest number of people living with HIV-1 infection.

Although HIV-1 epidemics in most parts of Africa started about 10 years earlier than in southeast Asia, this factor is unlikely to fully account for the differences in HIV-1 prevalence between the regions. For instance, the HIV-1 epidemics in South Africa and Thailand both began in the early 1990s, but by 1999, HIV-1 prevalence in the general population was 19.9% in South Africa and 2.2% in Thailand.⁸ Yet, the populations of many parts of Africa and of southeast Asia have at least one risky sexual behaviour pattern in common—ie, sex between men and sex workers. In a multicentre study²⁰ of factors determining different prevalences of HIV-1 in sub-Saharan Africa, the proportion of men who reported at least one contact with a sex worker in the past year ranged between 3% in Kisumu and 12% in Yaoundé, but these figures are thought to be grossly underestimated.²⁰ In a nationwide survey in Thailand, 24.2% of men in urban and 9.5% in rural areas reported paying for sex in the previous year;³⁰ male sexual behaviour in Cambodia follows a similar pattern.³¹

There are, however, important differences between southeast Asia and sub-Saharan Africa. Large-scale interventions to promote condom use with sex workers, which were supported at the highest political level, were initiated earlier in the course of the HIV-1 epidemic in Thailand and Cambodia than in most of sub-Saharan Africa. In Bangkok, Thailand, in 1996, 97% of sex workers based in brothels and 78% of indirect sex workers (such as

beer girls) reported consistent condom use with all their clients.³² In Cambodia, interventions were started later than in Thailand, but by 1999, 78% of sex workers based in brothels reported consistent condom use with all their clients.³³ In sub-Saharan Africa in 1997, only 28% of sex workers in Yaoundé and Ndola, 50% in Kisumu, and 69% in Cotonou reported condom use with their most recent client.²⁹

However, the extent of the spread of HIV-1 in the general population is not only determined by unprotected sexual intercourse between sex workers and their clients, but also by the extent to which male clients of sex workers have intercourse with female partners who are not sex workers who in turn have sex with several other male partners. According to available data, women in sub-Saharan Africa have premarital sex with several partners more often than do women in southeast Asia.³⁴ Therefore, the high HIV-1 rates in young women, which are driving the HIV-1 epidemics in sub-Saharan Africa, are unlikely to be seen in southeast Asia. These high rates may, however, change if young women in southeast Asia change their sexual behaviour, because of a changing socio-economic context.

Socioeconomic and cultural context

Cultural and socioeconomic features common to most societies in sub-Saharan Africa have played, and still play, a part in the spread of HIV-1 infection. These factors include the subordinate position of women in society, impoverishment and the decline of social services, and rapid urbanisation and modernisation. To this gloomy picture must be added the many wars and conflicts in Africa. Since 1980, no less than 28 of 53 African states have been at war.³⁵

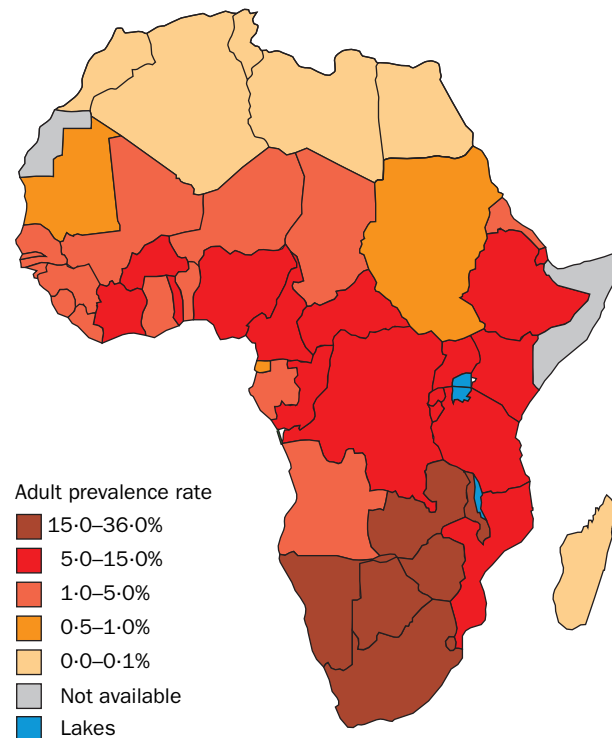


Figure 3: Map of Africa showing HIV prevalence by region (1999)

Joint United Nations Programme on HIV/AIDS (UNAIDS).⁸

Gender roles and the subordinate position of African women

Social and cultural systems in many African societies dictate that women have no control over their sex lives, or the sex lives of their husbands outside marriage.^{36,37} Extramarital affairs by both sexes are tolerated in many parts of sub-Saharan Africa, but most cultures have rules requiring women to have very little sexual experience before marriage and to be monogamous thereafter, whereas for men premarital and extramarital sex are tolerated or even expected. Young men and boys are often encouraged by peers to demonstrate their masculinity through early sexual initiation and many sexual conquests.³⁸ Bride payments—financial compensation to a bride's family by her new husband—perpetuates the idea that a woman is her husband's property. This culturally prescribed lack of control on their sexual relationships has made women, particularly married women, highly vulnerable to HIV-1 infection. Wives are not allowed to refuse sex from their husband, or to use a condom, even if the husband is infected with HIV-1. The subordinate position of women also has implications for safe-sex education. Men are supposed to know everything and cannot admit ignorance, whereas women are not supposed to be aware of issues related to sex.

The gender power differential is compounded by age differences and the economic dependence of women on men. Women typically marry or have sex with older men.^{27,28} In a multicentre study,²⁰ the median age difference between spouses, reported by women, was 6–7 years.³⁹ Furthermore, young married women in Kisumu and Ndola had a higher risk of HIV-1 infection if their husband was more than 3 years older than themselves.²⁷

Women face restrictions such as discriminatory laws, traditions, and values when they try to access education, knowledge, land, capital, and employment. As a result, women are economically dependent on their male partners, which makes negotiation of safe sex difficult. For unmarried women and women who are widowed or separated, sex in exchange for money can be a strategy for survival or acquisition of goods. In a multicentre study,²⁰ 40% of women in Kisumu and Ndola who reported non-spousal partnerships in the previous year, reported sex in exchange for money or gifts; the corresponding figures for Cotonou and Yaoundé were 6% and 14%, respectively. Most of these women were unmarried and could not be termed sex workers.³⁹

Poverty and decline of social services

During the past 20 years, nearly all countries in sub-Saharan Africa have faced slowing economic growth. Between 1980 and 1991, the average yearly growth of per capita gross national product in sub-Saharan Africa was –1.2%.⁴⁰ Structural-adjustment programmes imposed cuts in non-productive spending, including spending on social services. This policy further impoverished African populations, with increases in unemployment resulting from privatisation of public enterprises and loss of jobs in the public sector. The remaining public sector workers saw their purchasing power diminished. Additionally, the provision of social services lessened, including education and health services. Thus, during the 1990s, overall public expenditure on health represented only 1.7% of the gross African domestic product.⁴¹

Poverty is associated with increased vulnerability to HIV-1 and other sexually-transmitted infections. In conditions of poverty, the risk of HIV-1 infection assumes low priority among people's daily concerns. Young people who grow up in poor conditions have little access to schools and few

prospects for their future. They lack recreational facilities and sex becomes a way to pass time.⁴² Poverty can also drive women into exchanging sex for money, food, or other commodities. Poor people in rural areas migrate to towns in search of work, leaving their family and entering an environment where sexual risk-taking is more common than in their rural homes. However, the association between poverty or wealth and the risk of HIV-1 infection is not straightforward. Higher educational attainment can be associated with more risky sexual behaviour and increased risk of HIV-1 infection in individuals,^{8,43–45} which was true especially in the earlier stages of the HIV-1 epidemic.^{46,47} At the population level, there is no simple link between per capita gross national product and the prevalence of HIV-1 infection. Botswana, Namibia, and South Africa have the highest per capita gross national product in sub-Saharan Africa, but are the hardest hit by HIV-1. Mead Over⁴⁸ identified eight epidemiological, social, and economic variables that could account for more than half the variation in HIV-1 prevalence between 72 countries in Africa, Asia, and Latin America. Per capita gross national product was one variable, but also important were inequality of income distribution and the gap between male and female literacy.⁴⁸

The decline of health, education, and other social services implies a loss of opportunities for HIV-1 prevention. People with little or no education have poor access to safe-sex information. For instance, condom use is associated with higher levels of education.⁴⁹ Reduced provision of quality health services also represents a loss of opportunities to control other sexually-transmitted infections, offer reproductive health services, and provide quality care for people infected with HIV-1. For instance in Mwanza region, Tanzania, fewer than 10% of symptomatic sexually-transmitted infections occurring in the population were cured by health services. Health staff had been unable to update their skills and knowledge, and health centres were provided with insufficient and inappropriate antibiotics.⁵⁰

Urbanisation and modernisation

The rapid growth of urban areas in developing countries, resulting from increased urban birth rates and continued migration from rural regions,⁵¹ has fuelled the rapid spread of HIV-1. In most parts of sub-Saharan Africa, HIV-1 prevalence is higher in urban than rural populations, which is one reason why some highly urbanised countries have the highest rates of adult HIV-1 infection (figure 4). Urbanisation and modernisation exchange traditional village norms for an urban modern ethos with fewer restrictions on sexual behaviour and marriage. Part of the high urban prevalence of HIV-1 infection results from massive migration of young, unmarried adults from conservative rural environments to more sexually permissive cities.⁵² Furthermore, loss of culture and erosion of social networks are associated with social problems such as drug abuse, which encourages high-risk behaviour.

Migration to urban areas in search of employment separates spouses for extended periods. Urban men and women who are separated from their spouses are more likely to engage in high-risk sexual behaviour than cohabitants in urban areas.^{36,52} For many decades, rural migrants have typically been young men aged 15–30 years, especially in Africa.⁵³ Male migrants may engage in high-risk behaviour with sex workers, thereby increasing their own and their partners' vulnerability to HIV-1 and other sexually-transmitted infections. Women are now increasingly migrating to cities. These women frequently end up in low-status, low-wage production and

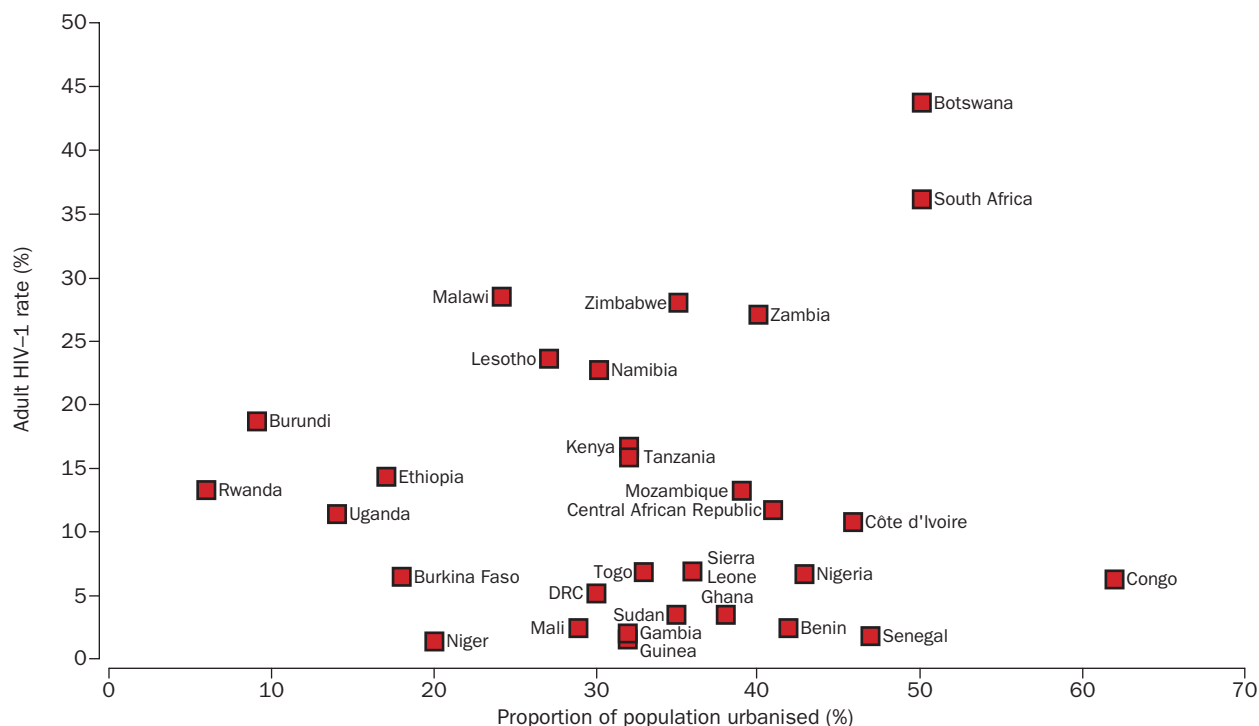


Figure 4: **Adult HIV-1 rate (2001) by percentage urbanisation (1999)**
DRC=Democratic Republic of Congo. Data source: UNAIDS and World Bank data sets, 2001.

service jobs, and may be forced into exchanging sex for money or gifts as a survival strategy.

Rapid urbanisation has been linked to growing urban poverty,⁵⁴ since jobs are scarcer than applicants. Results from a study in Nairobi showed that slum residents initiate sex at younger ages and have more sexual partners than other city residents.³⁸ Additional qualitative data showed that sexual exposure and behaviour of slum residents were strongly affected by their precarious economic and social conditions. Under the population pressure of rapid urbanisation, city infrastructures can collapse and health services deteriorate with concomitant loss of opportunity to prevent the spread of HIV-1.

Modernisation has brought higher mobility. Better communication and transportation now link urban and rural areas economically and socially. Intercountry and intracountry population mobility has been a critical factor in the spread of HIV-1 in many regions.⁵⁵ Key population groups that are highly mobile and at high risk of HIV-1 transmission are sex workers, truck drivers, transport workers, the military, mobile employees of large industries, and seafarers. Occupational travel is associated with high rates of partner change, transactional sex, and unsafe sex. Travellers thus play a part in bridging epidemics between areas of high and lower HIV-1 prevalence.⁵⁵

Wars and conflicts

War and civil strife are conducive to the rapid spread of HIV-1. During conflicts, soldiers are living in a high-risk environment in which the risk of HIV-1/AIDS is balanced by stressful situations and dangers related to war. Civilians are often subjected to human rights abuses, including sexual violence, and are left in conditions of poverty that might lead them to use commercial sex to survive.⁵⁶

Additionally, war and civil strife are associated with massive displacements of people. In January, 2002, more than 6 million people in sub-Saharan Africa fell under the mandate of the United Nations High Commission on

Refugees (UNHCR). Displacement is associated with interruption of social cohesion and relationships, promiscuity, inadequate shelter, and commercial sex. People may also flee from areas with quite low HIV-1 prevalence to an area with a higher prevalence. In Kigali (Rwanda) in 1995, the prevalence of HIV-1 in pregnant women originating from rural areas was higher than expected (24%), which was attributed to rape and displacement during the genocide.⁵⁷

The demographic and economic effect of AIDS in Africa

The HIV-1 epidemics in sub-Saharan Africa are causing profound changes in the population structure in more severely affected countries, mainly as a consequence of high mortality in adults and children younger than 5 years. In community-based studies in Tanzania and Uganda, the adult mortality attributable to HIV-1 infection was 35–47% in Tanzania and 69–74% in Uganda.⁵⁸ In South Africa, where the HIV-1 epidemic is of more recent onset, the Medical Research Council estimates that in the year 2000, 20% of all deaths in adults were due to HIV-1/AIDS.⁵⁹ In rural Botswana, Zimbabwe, and South Africa, life expectancy has been estimated to fall from 60 years in 1990, to about 30 years by 2010.⁶⁰

These high mortality rates in young adults inevitably have an economic effect. The effect of AIDS on households is quite well documented through case studies. AIDS-related illness and death leads to deepening poverty. Furthermore, one of the first actions taken by households to cope with the crisis is to take children out of school, thus jeopardising their future. However, the macroeconomic effect of AIDS is difficult to assess. The macroeconomic effect depends on how the epidemic affects savings and investment rates and whether AIDS affects better-educated employees more than others.⁶¹ A review of published work does not provide a clear picture of the economic effects of HIV-1/AIDS in Africa because of

methodological variation in inclusion of effects at household, company, and civil society levels. Some studies predict negligible macroeconomic effect of HIV-1/AIDS in countries with a high unemployment rate, whereas others predict significant effects on growth rates. In Malawi, for example, the yearly loss in per capita gross domestic product as a result of AIDS is estimated to reach 0.7% by 2010.⁶²

A more useful indicator of the effect of AIDS might be the human development index, which is used to measure achievements in basic human development. The composite index includes life expectancy at birth, education, and adjusted per capita income. For example, Zambia had a lower index in 1997 than in 1975, largely as a result of the effect of HIV-1/AIDS on life expectancy.⁶³

Conclusions

HIV-1 epidemics in sub-Saharan Africa are the result of a complex interplay of behavioural factors and factors that affect the transmission of HIV-1 during sexual intercourse, including other sexually-transmitted infections and male circumcision. Sexual behaviour patterns are determined by cultural and socioeconomic contexts, some of which have contributed to the extensive spread of HIV-1 infection. When designing prevention strategies, interventions should not only target individuals, but also aim to change the aspects of these contexts that increase vulnerability to HIV-1 of people and communities.

Traditional gender roles in most of sub-Saharan Africa enhance the vulnerability to HIV-1 of both women and men. Men and women must work to counter gender discrimination and subordination of women. Central to this process is the full participation of all generations. Law and policy makers, community leaders, and other people in positions of power should recognise the connection between women's economic and social status and their vulnerability to HIV-1 infection. The importance of equal participation of women in identification of interventions and decision-making processes cannot be overemphasised.

The impoverishment of African populations and the many wars and conflicts on this continent constitute a fertile ground for the spread of HIV-1. The epidemics in their turn worsen poverty and jeopardise the future of young generations. Families and communities cannot cope with the many orphans who are left uneducated and with an uncertain future. Until the problem of economic development in Africa is tackled, convincing young people to adapt their sexual behaviour to secure their future will remain difficult. The recent renewed international attention for the HIV-1/AIDS epidemics in sub-Saharan Africa should translate to a commitment to reconstruct social services, especially education and health services, and to tackle economic underdevelopment.

Contributors

Anne Buvé wrote the section on epidemiology and compiled all author contributions. Kizito Bishikwabo-Nsarhaza wrote on economic development, wars and conflicts, and their effects. Gladys Mutangadura wrote about gender roles, urbanisation, and modernisation.

Conflict of interest statement

None declared.

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