

HIV/AIDS in Sub-Saharan Africa

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Sub-Saharan Africa is the region most severely affected by the HIV/AIDS pandemic. Of the 40 million HIV infected individuals at the end of 2003, 26 million (65%) were living in the area. Reasons for the high infection rate include historical, political, economic, and cultural factors. The diversity of populations, combined with destitution, political and economic instability and hunger, has led to a number of strategies for combating the disease in Sub-Saharan Africa. These include voluntary counseling and testing, community involvement, facilitating behavior modifications, which include consistent and correct use of condoms, reduction in the number of sexual partners, increasing antiretroviral availability, and the involvement of non-governmental organizations in prevention, treatment, care, and support of the infected population. While Uganda has accomplished significant success through these mechanisms, other countries have not yet been able to control the disease. The populations requiring special attention include women of child-bearing age, who make 55% of the Sub-Saharan Africa's HIV infected population, children and the elderly. In this review, the current state of HIV/AIDS in Sub-Saharan Africa will be explored, in many cases referring to the situation in the southern African country of Malawi. Lessons will be highlighted and hopefully will contribute to the debate on HIV/AIDS and success of current and future prevention and control efforts.

Key words: *acquired immunodeficiency syndrome; coitus; disease transmission, vertical; HIV; Malawi; sexual abstinence*

HIV/AIDS is a major global health concern. Though Sub-Saharan Africa is the most affected region, no country can ignore the problem. The incidence and prevalence of HIV continue to rise. Despite increasing management options, adequate control is still out of reach. The disease is causing social and economic havoc around the world.

Why is the HIV/AIDS pandemic so severe in Sub-Saharan Africa? What effect does HIV/AIDS have on society? What is the outlook for HIV/AIDS in the future? And how is the problem being addressed? These questions and more will be considered in this review. The Sub-Saharan African experience will also be evaluated for lessons that may help the international community limit the epidemic.

Scope of the Problem

At the end of 2003, it was estimated that globally 40 million people were living with HIV/AIDS and 2.5 million of those people were children under the age of 15. In 2003, there were 5 million new cases of HIV and over 3 million deaths due to the disease (1). Of the 40 million HIV positive individuals, 26 million (65%), were living in Sub-Saharan Africa (Table 1). In 2003, there were approximately 3.2 million new cases of HIV in the region. During the same period, HIV claimed the lives of over 2.3 million Africans (1).

At the end of 2001, over 30% of the people in Botswana, Lesotho, Swaziland, and Zimbabwe were infected. Namibia and Zambia had rates exceeding 20%. At least 15% of the populations in Kenya and Malawi were infected (2).

In Sub-Saharan Africa, women are the most affected group. They represented 58% of all of the infected adults in 2001 while 10% were children under the age of 14. Furthermore, the disease has orphaned over 11 million children in the region (2). In the 15 to 24 age groups, women were 2.5 times more likely to be infected with HIV than men in 2003 (1).

The morbidity and mortality associated with the HIV/AIDS pandemic has major economic and social implications: poverty and hunger are on the rise, children have become increasingly vulnerable as a result of the epidemic, the education sector is deteriorating, people are suffering from AIDS related isolation, life expectancy is decreasing and so on.

These socioeconomic effects have spread far beyond households and communities to the national and international level (3). Sequelae of HIV are consuming tremendous resources. For example, the seroprevalence of HIV in hospitalized medical patients was 70% in Malawi's major government hospital; amongst 30-40 year old hospitalized patients, rates reached 91% (4). Unfortunately, Sub-Saharan Africa's

Table 1. Population and population-HIV-infected statistics in Africa, 2001*

Country	Adults and children	Adults 15-49	Women 15-49	Children 0-14
Total	40,000,000	37,100,000 (1.2)	18,500,000	3,000,000
Sub-Saharan Africa	28,500,000	26,000,000 (9.0)	15,000,000	2,600,000
Angola	350,000	320,000 (5.5)	190,000	37,000
Benin	120,000	110,000 (3.6)	67,000	12,000
Botswana	330,000	300,000 (38.8)	170,000	38,000
Burkina Faso	440,000	380,000 (6.5)	220,000	61,000
Burundi	390,000	330,000 (8.3)	190,000	55,000
Cameroon	920,000	860,000 (11.8)	500,000	69,000
Central African Rep.	250,000	220,000 (12.9)	130,000	25,000
Chad	150,000	30,000 (3.6)	76,000	18,000
Comoros	not available	Not available	not available	not available
Congo	110,000	99,000 (7.2)	59,000	15,000
Cote d'Ivoire	770,000	690,000 (9.7)	400,000	84,000
Dem. Rep. Congo	1,300,000	1,100,000 (4.9)	670,000	170,000
Djibouti	not available	Not available	not available	not available
Equatorial Guinea	5,900	5,500 (3.4)	3,000	420
Eritrea	55,000	49,000 (2.8)	30,000	4,000
Ethiopia	2,100,000	1,900,000 (6.4)	1,100,000	230,000
Gabon	not available	Not available	not available	not available
Gambia	8,400	7,900 (1.6)	4,400	460
Ghana	360,000	330,000 (3.0)	170,000	34,000
Guinea	not available	Not available	not available	not available
Guinea-Bissau	17,000	16,000 (2.8)	9,300	1,500
Kenya	2,500,000	2,300,000 (15.0)	1,400,000	220,000
Lesotho	360,000	330,000 (31.0)	180,000	27,000
Liberia	not available	Not available	not available	not available
Madagascar	22,000	21,000 (0.3)	12,000	1,000
Malawi	850,000	780,000 (15)	440,000	65,000
Mali	110,000	100,000 (1.7)	54,000	13,000
Mauritania	not available	Not available	not available	not available
Mauritius	700	700 (0.1)	350	< 100
Mozambique	1,100,000	1,000,000 (13.0)	630,000	80,000
Namibia	230,000	200,000 (22.5)	110,000	30,000
Niger	not available	Not available	not available	not available
Nigeria	3,500,000	3,200,000 (5.8)	1,700,000	270,000
Rwanda	500,000	430,000 (8.9)	250,000	65,000
Senegal	27,000	24,000 (0.5)	14,000	2,900
Sierra Leone	170,000	150,000 (7.0)	90,000	16,000
Somalia	43,000	43,000 (1.0)	not available	not available
South Africa	5,000,000	4,700,000 (20.1)	2,700,000	250,000
Swaziland	170,000	150,000 (33.4)	89,000	14,000
Togo	150,000	130,000 (6.0)	76,000	15,000
Uganda	600,000	510,000 (5.0)	280,000	110,000
United Rep. Tanzania	1,500,000	1,300,000 (7.8)	750,000	170,000
Zambia	1,200,000	1,000,000 (21.5)	590,000	150,000
Zimbabwe	2,300,000	2,000,000 (33.7)	1,200,000	240,000

*Infected population percentage is listed in parentheses. Source: ref. 2

epidemic is not expected to peak for another decade. The rising prevalence of HIV/AIDS means that the toll on society will only increase. Box 1 highlights the features of HIV/AIDS in Africa.

Why Sub-Saharan Africa?

Sub-Saharan Africa's vulnerability to the HIV pandemic is multi-factorial. Table 2 enumerates contributory factors. Historically, Africa has been in a state of socio-economic flux. It is unique in its combination of sustained political disruption, exploitation and bad government. Income inequality and lack of social cohesion have played major roles. Even colonial stability was at best a *façade*. Since the end of colonial rule, ever-present instability has been aggravated by economic crises. Unfair international trade practices continue to contribute to the impoverishment of many southern African countries. With population relocation, inequality, civil unrest, infrastructure prone to increased mobility, and changing beliefs, Sub-Saharan Africa is a high-risk environment for the spread of an infectious disease (5).

While historical factors set the stage for the spreading of disease, the interplay of contemporary behavioral patterns and biological factors facilitate the extensive spreading of HIV-1 infection. Indeed, heterosexual intercourse is the largest contributor to new HIV infections in Sub-Saharan Africa. The least

Box 1

HIV/AIDS in Africa (2,5):

- In 12 out of 44 Sub-Saharan African countries, at least 10% of the population is infected with HIV.
- 6 Sub-Saharan African nations have HIV infection rates exceeding 20%.
- In countries with HIV infection rates over 10%, nearly 80% of deaths in young adults (age 25-45) will be HIV related.
- Infection rates in young African women are much higher than in young African men. Rates in teenage girls are five times those of boys the same age. Among people in their early twenties, rates are three times higher in women.
- In 1997, public health spending for AIDS exceeded 2% of gross domestic product in 7 African countries. Total health spending accounted for 3-5% of gross domestic product in those countries.
- Botswana has the highest rate of HIV infection: 38.8% of the population was infected at the end of 2001. Zimbabwe is a close second, with 33.7% of the population infected at the end of 2001.

Table 2. Key factors contributing to AIDS in Sub-Saharan Africa

Factor	Importance	Impact/comment
Early introduction of HIV into Africa	Earliest cases occurred in Tanzania and Uganda during the late 1970's. African populations were amongst the first to confront HIV.	Africa is ahead of other populations in terms of HIV history. The epidemic has had more time to exact a toll on African populations.
Rate of spread of HIV	HIV has spread more rapidly in Sub-Saharan Africa compared to Western and Central Africa. Rate of spread varies greatly among Sub-Saharan African populations.	High sexually transmitted infections prevalence, inadequate management fuelling spread. As prevalence increases, rates of spread also increase. This vicious downward spiral will continue unless current trends change.
Sexual practices	Multiple partnerships are more common. Rates of condom use are relatively low. Frequenting of sex workers is often commingled with regular partnerships. Younger women tend to partner with older men for socioeconomic reasons.	Prevalence of HIV is greatest among young women. Multiple partnerships and employment of sex workers increases risk of transmission.
Cultural paradigms	Traditional practices, often conducted in secrecy, may carry increased risk of sexually transmitted infections. Multiple partnerships are more socially acceptable than in other cultures. Social position of women is subordinate. HIV is considered a taboo subject in most communities. Many prevention efforts have been developed for Western societies.	Women have little control over their sex lives, and thus little control over their HIV risk. Discussion of HIV is often stifled, hindering diagnosis, treatment and prevention efforts. Culture specific community interventions should be developed.
Food shortages	Poor nutritional status increases susceptibility to disease, including HIV. Sex may be exchanged for food.	Hunger may lead people to unduly expose themselves to HIV through transactional sex. Areas with food shortages will suffer increased impact as resources will be directed toward obtaining food instead of preventing and treating HIV.
Economic conditions	People who lack resources have difficulty accessing HIV resources. The poor tend to have less impact on policy makers, thus may be overlooked. People may exchange sex for financial security.	A large sector of the population suffers reduced access to medical care for HIV. Poverty may lead to undue HIV exposure.
Political instability	Political instability has led to a decline in social services. Medical care, including supply of ART, is inconsistent.	Instability makes initiation and maintenance of public health measures difficult. International organizations may be hesitant to invest resources. Countries in transition are amongst those most in need of HIV programs, but suffer reduced access.
Violence	Conflict and war facilitate extortion of sexual favors. Rape is more common in conflict zones. Sanitation, basic health care, and preventative programs are forgone. Resources are diverted away from health promotion.	Frequent conflict in African nations makes outreach difficult and inconsistent. People are not motivated to change their behavior when the future is bleak. Psychological impact of conflict engenders disregard for personal health.
Urbanization	As Sub-Saharan Africa becomes increasingly developed, individuals become more mobile. Breakdown of "helpful" cultural taboos in urban areas. In some traditional cultures, multiple sexual partners and extramarital sex may be perceived negatively. In urban areas, such practices may escape notice. Transactional (commercial) sex flourish in urban areas compared to rural communities.	HIV infected individuals migrate in and out of different areas more easily. They bring with HIV with them. Commercial sex is a risk factor for HIV transmission.
Antiretroviral therapy (ART) availability	Supply of ART is not entirely reliable. ART is limited. Most countries have one primary option. ART is not affordable for candidates. Rural areas suffer poorer access than cosmopolitan centers.	Interruptions in therapy lead to resistance. Second line options for those who fail first line therapy are scarce. Untreated individuals may be more likely to transmit HIV due to increased viral loads.
Lack of knowledge	Unawareness of risk factors may contribute to spread. Unfortunately, better education does not necessarily lead to behavioral change.	Encouraging voluntary behavioral change through education will likely be insufficient to control the spread of HIV.
Public health policy	Africa has been slow to acknowledge the impact of HIV. HIV prevention and treatment efforts have not traditionally been a priority. Increasing reliance has been placed on international assistance, rather than community based interventions.	Sub-Saharan African leaders need to acknowledge the impact of the HIV epidemic. Resources need to be devoted to development of HIV prevention and treatment programs. Inadequate attendance to the issue will result in worsening of the epidemic.
Historical factors	Sustained political disruption, exploitation, and bad government have plagued Africa. International trade practices contribute to impoverishment. Population relocation, inequality, civil unrest, infrastructure facilitate mobility, and loss of traditional boundaries.	Colonial, post-colonial history has set the stage for Sub-Saharan Africa to be at high-risk for the spread of infectious disease. Many lessons can be learned from history. We should use these to curtail the epidemic.

number of HIV infections is caused by transmissions via blood transfusions, infected needles, and scarification (6). Thus, sexual behavior mostly affects the spreading of HIV infection.

Sexual behavior is affected by socioeconomic and cultural factors. In Sub-Saharan Africa, the subordinate position of women in society, impoverishment and the decline of social services, and rapid urbanization and modernization have played a significant role. How would urbanization facilitate the spread of HIV in Africa? Firstly, the migration of people from rural into urban areas results in the loss of traditional and cultural values and thus leads to multiple sexual partnerships. In urban areas, individuals are no longer under the influence of the rural traditional environment and its sanctions and consequently adopt an individualistic lifestyle. Another reason is the large number of people in urban areas as compared with rural areas. The high population level in urban areas is, for some people, an incentive to become involved in extramarital or multiple partner sexual relations without being discovered by one's partner.

Another factor could be that adoption of a cash system (exchange of goods and services for cash) correlates with the situations where sex is bought and sold as a commodity. There is indirect evidence to support this notion from Blantyre, Malawi, where women with husbands of high socio-economic status were more likely to be HIV infected compared with women with lower socio-economic status spouses (7). Furthermore, traditional gender roles dictate that the female has little control over her sex life and that the male ought to be very knowledgeable; migratory practices force spouses to be separated for extended periods of time; extramarital relationships are common; and the risk of HIV is of secondary importance compared to day-to-day survival (8).

Populations are thus becoming trapped in a vicious cycle. HIV/AIDS leads to high mortality rate in economically productive age groups. As HIV spreads, it causes further impoverishment and exacerbates instability, which facilitates the further spreading of disease. In this context, HIV/AIDS has rapidly reached epidemic proportions in Sub-Saharan Africa.

How is Sub-Saharan Africa Combating HIV/AIDS?

The importance of HIV/AIDS control practices varies amongst the diverse countries of Sub-Saharan Africa. In general, education, promotion of (male) condom use and of sexual abstinence among unmarried people have been the *modus operandi*. Some countries are also addressing the psychosocial impact of the disease. However, efforts have been generally inadequate.

In many cases, non-governmental organizations (NGOs) are leading HIV/AIDS control endeavors. While this is fine in the short run, Africa and its communities will need to assume responsibility and leadership in the future. To address this issue, NGOs and governments are trying to "scale-up" HIV/AIDS intervention programs. Some of the main goals are to broaden outreach programs, improve training, reduce staff

turnover, pool resources and create an environment that facilitates scaling-up of prevention efforts (9).

However, the work of NGOs may sometimes undermine the public health system. Skilled health care workers are leaving the public health sector in favor of much fairer remuneration practices associated with the NGO sector. The end result is an internal "brain drain" of human resources. A current example is an NGO organized HIV/AIDS program in Thyolo district, Malawi where in order to provide various services, including antiretroviral (ARV) therapy, some 41 local health care workers had to be employed (10).

At the national level, HIV/AIDS is regarded as an uncontrolled epidemic. In a few cases, for example Uganda, results have been encouraging. These are the exception rather than the rule. Control efforts are often hindered by lack of resources, political turmoil, violence, and focusing on other priorities. The role of multilateral lending agencies in destabilizing African economy is also important.

Uganda's curtailing of the epidemic was facilitated by President Museveni's proactive role in addressing the issue. Behavior modification, including promotion of and empowerment to choose sexual abstinence among young people, as well as consistent and correct use of condoms, likely contributed to the reduction of HIV rates (11). Though Uganda still has a long way to go, the model provides an excellent example of how control can be kept (12,13). Unfortunately, the population level behavioral response to HIV in Uganda does not apply to other populations. Furthermore, the practice of scaling up biomedical and risk reduction elements may not reduce sexual transmission in the population. A broad shift in health policy is needed, with a special attention paid to epidemiological surveillance and communication to stimulate risk avoidance (14).

Uganda also became a role model in care and support of HIV/AIDS patients, even before availability of antiretroviral therapy. In 1994, Uganda established Hospice Uganda, which has spearheaded the provision of holistic care, including pain and symptoms control amongst HIV infected persons (15). This has probably led to a reduction of stigmatization and discrimination against HIV/AIDS patients.

On the other hand, another African country, Malawi, has not been able to reverse the trend of its rising HIV epidemic. While there has been a steady increase of reported condom use among high-risk groups, ART is not widely or consistently available; health care resources are inadequate; and social instability and famine are increasing the vulnerability of most population sectors (16). In the face of these limitations, Malawi is expanding availability of ART and re-evaluating its approach to effecting behavioral change. At this time, reproductive health education has been intensified through the public media. It is expected that people will become more responsible and that sexual behavior will eventually become safer.

Conflict zones such as Angola, Democratic Republic of Congo, and Rwanda face yet another set of problems. Numerous people have been displaced by civil strife. Many now reside in refugee camps, where

poor sanitation, hunger, abuse, and sexual indiscretion are wide-spread. The associated disruption of social and governance systems has further exacerbated vulnerability. In these cases, peace efforts are critical. Condoms, education, and counseling are being offered to some populations. Nonetheless, it is anticipated that the epidemic will continue growing in conflict zones (13).

Unfortunately, many countries are struggling with the same issues. None have yet accomplished Uganda's success. Although many African nations have begun to move in the right direction, they have a long way to go before eventually controlling the epidemic.

Voluntary Counseling and Testing

Voluntary HIV counseling and testing (VCT) is a pivotal intervention that informs individuals of their serostatus and helps them access appropriate services. For those testing negative, VCT can be a powerful tool for encouraging behavioral change and reducing risks. For those testing positive, VCT services can inform clients of their care options as well as help them reduce the risk of HIV transmission.

Through VCT, clients can find out about their HIV serostatus and create personalized HIV risk reduction plans. A key component of VCT is both pre-test and post-test counseling. VCT is confidential and usually free. It provides the support and resources needed to change risky behavior. This strategy seems to be effective with adults. However, the value of VCT for youths and adolescents is still being evaluated (17).

Antiretroviral Therapy (ART)

Treatment of those already infected presents a noble task. Though a diagnosis of HIV previously resulted only in depression, treatment options are increasing. For example, the Global HIV/AIDS Fund is improving accessibility of ART at the national level for countries whose proposals have been accepted and funded. Other countries, such as Mozambique, will benefit from the Clinton Fund and other international funding sources. Non-governmental organizations are also gathering resources to control the epidemic. It is important to consider the cost of drugs (18). Due to proven benefit together with price reductions from pharmaceutical companies and development of generic versions, tremendous demand for medications has arisen (19,20).

However, ART is still unavailable to most of the Sub-Saharan Africa's population. Only a small fraction of the millions of HIV infected people are currently receiving ART. People most in need of drugs often rely on the public sector, but have difficulty accessing care. Furthermore, laboratory equipment, such as that to monitor CD4⁺ cell counts, is often lacking. To increase access, standardized treatment programs are being proposed as a resource to poor settings such as Sub-Saharan Africa (21,22).

In order to equitably and judiciously allocate resources, standardized treatment guidelines should be employed. Table 3 shows the WHO staging system for HIV. Table 4 shows the WHO recommendations

for starting ART. Table 5 shows recommended first and second line regimens.

Guidelines for managing toxicity and prevention of resistance must also be established. While first and second line treatment options may be amenable to such standardization, later alternatives will need to be individualized.

Treatment of opportunistic infections must also improve. Many important causes of HIV-related diseases in Africa could be prevented, specifically tuberculosis and bacterial infections (19). Like ART, prophylactic medications for opportunistic infections should be prescribed according to guidelines and monitored appropriately. Use of prophylaxis, for example, to treat *Cryptococcal meningitis* and *Pneumocystis carinii* pneumonia, will likely increase as necessary medications become more affordable and accessible.

Community Involvement

Community involvement is the key to the sustaining of HIV/AIDS programs. It facilitates broadening of activities, draws attention to affected groups and enhances services. Community members are often willing to invest their own resources, including money, labor, time, and materials, into HIV/AIDS related activities. Though interventions involving community members are more likely to be effective and sustainable, mobilizing the community is a challenge.

Several community-based initiatives have successfully expanded the scope of grass roots activities. For example, the Indeni Petroleum Company of Ndola Zambia was providing education, medical care, and condoms while addressing the need of employing the families affected by HIV. However, the committee staff did not feel they were sufficiently changing people's attitude and behavior. Thus they developed culturally appropriate counseling methods through a series of workshops and field exercises. As a result, participants felt more skillful and committed (25).

In Lusaka, Zambia, children orphaned by AIDS are being trained in income generating skills under the guidance of *Kwash Mukenu* women's group. Proceeds from their work are being used to purchase equipment and materials, thus expanding the program. As a result, participants have developed a sense of purpose and determination (26).

The results from community-based programs have been encouraging. By involving the very people affected by the epidemic, they inspire hope rather than helplessness.

Youth Programs

Recent data indicates that about half of all new HIV infections occur in the 15 to 24 year old age group, mostly amongst females. This group also has the highest incidence of sexually transmitted infections (STI). Studies suggest that knowledge regarding basic reproductive issues, including pregnancy and transmission of STI, is poor amongst youth (17).

The behavior of today's youth will influence the course of the AIDS pandemic in the years to come. Thus programs must help them adopt safe behavior.

Table 3. World Health Organization (WHO) staging system for HIV in adults and adolescents (23)

Clinical stage I	
Asymptomatic	
Persistent generalized lymphadenopathy	
Performance scale 1: asymptomatic, normal activity	
Clinical stage II	
Weight loss, < 10% of body weight	
Minor mucocutaneous manifestations (seborrheic dermatitis, prurigo, fungal nail infections, recurrent oral ulcerations, angular cheilitis)	
<i>Herpes zoster</i> within the last five years	
Recurrent upper respiratory tract infections (ie, bacterial sinusitis)	
And/or performance scale 2: symptomatic, normal activity	
Clinical stage III	
Weight loss, > 10% of body weight	
Unexplained chronic diarrhoea, > 1 month	
Unexplained prolonged fever (intermittent or constant), > 1 month	
Oral candidiasis (thrush)	
Oral hairy leukoplakia	
Pulmonary tuberculosis within the past year	
Severe bacterial infections (ie, pneumonia, pyomyositis)	
And/or performance scale 3: bedridden < 50% of the day during the last month	
Clinical stage IV	
HIV wasting syndrome, as defined by the Centers for Disease Control and Prevention*	
<i>Pneumocystis carinii</i> pneumonia	
<i>Toxoplasmosis</i> of the brain	
<i>Cryptosporidiosis</i> with diarrhoea > 1 month	
<i>Cryptococcosis</i> , extrapulmonary	
<i>Cytomegalovirus</i> disease of an organ other than liver, spleen or lymph nodes	
<i>Herpes simplex</i> virus infection, mucocutaneous > 1 month, or visceral any duration	
Progressive multifocal leukoencephalopathy	
Any disseminated endemic mycosis (ie, histoplasmosis, coccidioidomycosis)	
Candidiasis of the oesophagus, trachea, bronchi or lungs	
Atypical mycobacteriosis, disseminated	
Non-typhoid <i>Salmonella</i>	
Extrapulmonary tuberculosis	
Lymphoma	
Kaposi's sarcoma	
HIV encephalopathy, as defined by the Centers for Disease Control and Prevention [†]	
And/or performance scale 4: bedridden > 50% of the day during the last month	

* HIV wasting syndrome: weight loss of > 10% of body weight, plus either unexplained chronic diarrhoea (> 1 month) or chronic weakness and unexplained prolonged fever (> 1 month).

[†] HIV encephalopathy: clinical findings of disabling cognitive and/or motor dysfunction interfering with activities of daily living, progressing over weeks to months, in the absence of a concurrent illness or condition other than HIV infection which could explain the findings.

Issues such as early marriage, sexual activity due to poverty and sexual abuse need to be addressed. While some VCT and community based measures are targeting youth, the action needs to be scaled up if we hope to control the HIV/AIDS pandemic (17).

Addressing Sex Workers

Sex workers and their clients are one of the most vulnerable populations to HIV/AIDS. However, the illicit nature of the industry in many African countries makes it an exceptionally difficult community to reach. Though some interventions, such as the female condom, have shown promise, HIV continues to spread rapidly among this group (27).

Other regions may provide some clues. Policy in Asian countries has had mixed results. Though HIV awareness is high, this did not cause a reduction of prevalence rates amongst sex workers (28). An intervention program targeting commercial sex workers in Thyolo, Malawi reportedly increased condom use, while simultaneously pointing out impediments towards its consistent use (29). The reasons individuals engage in commercial sex work are multi-factorial, including poverty, deviancy, search for pleasure, and such. Successful interventions will need to address the problems of violence, low literacy, dangerous working conditions, and discriminatory attitudes through comprehensive actions.

Condom Promotion

Transmission through sexual contact accounts for 75-85% of HIV infection worldwide. Nearly 20 years into the epidemic, the main tool to stall the spread continues to be advocating change in sexual conduct. Barrier contraception, especially condoms, is the best method to reduce both infectiousness and susceptibility to HIV. Spermicidal agents did not reduce the transmission (30).

Table 4. Recommendation for initiating antiretroviral therapy in adults and adolescents with documented HIV infection (24)

CD4 testing available	<ul style="list-style-type: none"> • WHO stage IV disease irrespective of CD4 count • WHO stage I, II or IIIa disease with CD4 count less than $200 \times 10^9/L$
CD4 testing unavailable	<ul style="list-style-type: none"> • WHO stage IV disease irrespective of lymphocyte count • WHO stage II or III disease with total lymphocyte count less than $1,200 \times 10^9/L$

Table 5. Recommended first-line and second-line regimens for treatment of adults and adolescents with HIV infection (23)

First line	Second line for treatment failure
Zidovudine / 3TC / Efavirenz or Nevirapine	D4T / ddl / Indinavir, Lopinavir, or Saquinavir
Zidovudine / 3TC / Abacavir	Efavirenz or Nevirapine / Lopinavir ± D4T or ddl
Zidovudine / 3TC / Indinavir, Lopinavir, Saquinavir or Nelfinavir	D4T / ddl / Efavirenz or Nevirapine

Use of barrier methods is one of the few behavioral strategies that individuals can adopt to protect themselves against sexual transmission of HIV. Male condoms are the most widely available barrier method. Female condoms are becoming more available in some countries. Population Services International has launched several multinational programs to promote the use of condoms (30,31). However, the cost of female condoms is unaffordable to the majority of women in areas where it has been either introduced or researched (29). While condom use is on the rise, many cultural, gender, economic, and service-delivery limitations impede its consistent and broad use in HIV/STI prevention.

Maternal-Fetal Transmission

Mother to child transmission is the most frequent way of passing of the HIV infection after sexual intercourse. Approximately 600,000 infants are born with HIV each year. A child can be infected prenatally, during delivery, or postnatally via breastfeeding. Intra-partum transmission is the most common. In observational cohort studies, cumulative transmission rates are between 25% and 45%, compared to 10-30% in developed countries (33). The risk of intra-uterine transmission is 5-10%. Intrapartum transmission carries a 10-20% risk (34). Estimates of breastfeeding transmission vary from 10-20% depending upon the circumstances (35). Risk is directly associated with the mother's viral load and inversely with her CD4 count (5). This is probably the reason ART reduces transmission rates.

There are three main ART options for pregnant mothers. For women already on ART, the regimen is generally continued. For those who are not already on ART a regimen consisting of twice a day zidovudine intake during the second half of pregnancy with an infusion during labor and subsequent treatment of the infant for six weeks can be used. A common alternative in the situation of limited resources is a single dose of nevirapine to the mother at the onset of labor and to the baby within 72 hours of delivery. The last option is the most cost-effective (36). In addition, infected mothers should deliver by Caesarian section.

Post-partum mothers are generally advised not to breast-feed since this is another potential route of transmission. Transmission of HIV through breastfeeding is facilitated by the mother's recent HIV acquisition, high viral load, terminal HIV/AIDS disease and mastitis (37). However, in the setting of poverty, avoidance of breast-feeding could lead to an increased risk of children dying of other causes, such as infections and diarrhea due to poor nutritional status, unhygienic practices, and lack of the beneficial aspects of human breast milk. Furthermore, formula feeding means that mothers can be labeled as "HIV positive". Nonetheless, avoidance of breast-feeding can be beneficial to both infant and mother. A study in Kenya reported adverse events amongst HIV infected women who breastfed when compared to HIV infected women who avoided-breastfeeding (38). Recent work also suggests the key to minimizing risk is consistency in either breast or formula feeding (5).

The implementation of services for the prevention of mother to child transmission has been low in Africa. About 20% of pregnant HIV-1 positive women identified through VCT start ART to prevent transmission (39). It is hoped that expanding efforts to control HIV/AIDS, such as the global fund, will lead to a reduction of mother to child transmission.

The rising number of children infected by their mothers places enormous burden on the communities. This burden is only expected to grow over the next several years. Nonetheless, improvements in antenatal care, VCT, ART availability, and breast-feeding alternatives may help to curtail the burden (40).

Special Populations

Women, particularly those of childbearing age, orphans of HIV/AIDS parents and the elderly are sub-populations which need special consideration. They face unique challenges in an inhospitable sociopolitical climate. While targeted public health interventions do help, re-evaluation of ingrained values may be required to curtail the effects of HIV in these groups.

Women and HIV/AIDS

The women of childbearing age account for 55% of HIV-1 positive adults. Twice as many young women as men are infected in Sub-Saharan Africa. In 2001, 6-11% of young women, as opposed to 3-6% of young men were infected with HIV (41). African women generally become infected early in their reproductive years and have a median survival of 9 years without care (42).

Why does HIV affect so many young African women? Females are commonly disadvantaged, especially in African society. They suffer reduced access to education, employment, health care, land and inheritance. Relationships with men, both casual and formal, may provide financial and social security. Older men are more likely to offer such security. Still, they are also more likely to be HIV infected. Furthermore, social and cultural systems in African society dictate that women have little control over their sex lives, or the behavior of their husbands outside marriage (43). This situation means that women are often unable to demand safer sex or to end relationships that carry the threat of infection.

Furthermore, young women tend to marry men several years older, thus increasing their risk of infection. Concomitant ignorance regarding sexual health and HIV/AIDS is widespread. Young women are also biologically more prone to infection due to cervical immaturity resulting in increased HIV susceptibility. These factors contribute to the large discrepancy in HIV prevalence between young females and males (1).

Orphans

AIDS has orphaned more than 14 million children in Sub-Saharan Africa. In this setting, extended families usually care for children. As more and more children are rendered parentless by the AIDS pandemic, the burden is stressing the extended family to the point of collapse. The ever-increasing number of

Table 6. Strategies for intervention to support African children orphaned by HIV/AIDS

Strategy	Activity
Strengthen the coping capacity of families	Improve access to savings and credit mechanisms
Home based care for HIV/AIDS parents	Train family members
	Provide food and medications
Mobilize and strengthen community based responses	Protect property and inheritance rights
	Establish district AIDS committees to raise funds, facilitate education, and develop day care centers
Strengthen the capacity of children and youth to meet their own needs	Waive school fees and requirements
	Support youth involvement
Ensure governments protect vulnerable children and provide essential services	Encourage political will with adequate data collection and communication of information
	Develop national AIDS plans
	Reduce stigma through AIDS awareness
Create an enabling environment for affected children and families	Develop and enforce laws to protect women and children
	Encourage partnership and leadership

homeless children in developing countries shows the magnitude of the problem (5).

HIV/AIDS affects not only the children, but also the families that care for them and the communities in which they live. Orphans lose the support of the nuclear family and are prematurely thrust into adult roles. They must support themselves and often care for younger children. They assume farm and household responsibilities. And they must earn money for basic necessities. As a result, these children may neglect their education, suffer reduced access to resources and become vulnerable to malnutrition. They are also vulnerable to sexual abuse and may be driven to crime, violence, and commercial sex in the quest for survival (44).

The orphan burden has serious consequences for all of society. Several non governmental organizations are addressing these issues. For example, United States Agency for International Development (USAID) currently funds initiatives in 24 developing countries to support vulnerable children and adolescents. Through these initiatives, USAID is improving access to education, providing supportive services and expanding preventative efforts. Still, it is impossible for it to keep up with the increasing burden (45). According to USAID, several broad strategies to support children orphaned by HIV/AIDS should be developed in comprehensive programs. These strategies are enumerated in Table 6.

The Elderly

Population aging is a global phenomenon. Despite the decreasing life expectancy in many parts of Sub-Saharan Africa, the older sector of the population is growing. Thus more and more people are becoming dependent on others. However, decimation of younger, traditionally productive sectors of society means that the tradition of caring for the older generation is no longer sustainable. Instead, the elderly are caring for their sick children and grandchildren. They are left with no support. Loss of family and concern about funerary rights contribute to depression. Poverty is exacerbated (5).

Like children of HIV, the elderly are becoming more vulnerable. Unfortunately, the elderly are a less attractive group to charities. They may receive assistance as a by-product. But, few groups are targeting their needs.

Cultural Considerations

Sub-Saharan Africa is composed of many diverse countries. Within each country, there are varied communities. It is thus very difficult to make general policies that are appropriate for all of Africa. Furthermore, policy makers commonly extrapolate Western approaches to African nations. This practice may not be effective given geographic and societal differences.

In most African communities, HIV/AIDS is a taboo subject. People do not want to discuss the disease, let alone determine their serostatus. They believe, often accurately, that diagnosis of HIV positivity is associated with negative social stigma. To avoid being ostracized by their community, they ignore warning signs. In many cases, patients evade the issue even in the face of life threatening complications.

The high frequency of multiple sexual partners further exacerbates the issue. Programs to promote abstinence, monogamy, and condom use are receiving mixed responses. Also, gender roles make it difficult for women to demand safe sexual practices from their partners (46). HIV thrives in this setting of secrecy and sexual indiscretion.

There has been widespread reluctance to use condoms during sexual intercourse as many individuals report lack of sensation or pleasure when condoms are used. A common saying employed to describe sexual intercourse while using a condom is that "one can not eat a lolly or sweet without removing the wrapper". People would rather have *nyama kwa nyama* (skin to skin) sex, and not allow a condom "stand between the two individuals having sex". A study by Zachariah et al (29) reported that Malawian men prefer ejaculating quickly rather than spend a long time coming. Condoms are usually blamed for delaying ejaculation, leading to poor levels of acceptability.

As a result of the desire to enhance sexual pleasure and ejaculate quickly, "dry sex" is preferred by some people (47). The practice of "dry sex" occurs when a woman aims to reduce the amount of vaginal fluids by using various means such as inserting absorbent materials such as cotton wads, cloth, and herbs into the vagina. These absorbents result in a dry vagina, which is preferred. Increased production of vaginal secretions prior to sexual intercourse is considered so undesirable that they cause divorces and ex-

tramarital relationships. Increased vaginal wetness has also been described among women using contraceptive injections in South Africa. Such women were described as "tasteless", "wet", or "cold" (48). Unfortunately, "dry sex" results in increased likelihood of genital injuries, which facilitates the transmission of HIV. Like many of the cultural practices done in secret, the prevalence of such customs is unknown.

What is sexual intercourse after all? There are some people who equate sexual intercourse with exchange of body fluids (vaginal and seminal fluids). The generally accepted view is that a man must ejaculate during sexual intercourse.

In a number of eastern and southern African countries, some men believe that having sex with a virgin cures HIV infection. There have been reports, especially in the media, about young virgin girls sexually molested or abused by HIV infected men who are searching for a cure.

Widow inheritance is another cultural practice that has been blamed for the escalation of HIV infection rates (49). In this practice, the widow is customarily required to marry a brother or any other suitable male relative of her deceased husband. If one of the participants is HIV infected, HIV can be transmitted to subsequent partners. The practice of widow inheritance (*chokolo*) exists among the *Ngoni* of southern Africa and is practiced in most of the countries of the Southern African Development Community (SADC). Widow inheritance came into practice over a hundred years ago when it was deemed that a widow needed socio-economic support after the death of her husband. Remarriage to a member of her deceased husband's family solved the problem.

Infertility is a major problem in Sub-Saharan Africa, due to a variety of reasons including STIs. When it is suspected that inability to conceive is the result of male infertility, traditional leadership arrange for the woman in the infertile couple to have intercourse with another man who can impregnate her. Such practices, known as *fisi* (hyena), are carried out in extreme secrecy. They can result not only in conception, but also transmission of HIV.

Many Sub-Saharan African societies initiate young girls and boys as they attain adolescence. For boys, initiation may include circumcision by traditional leaders. Several issues arise from initiation practices. Firstly, the same blade/knife is often used to circumcise more than one person. Such poor infection prevention methods could result in the transmission of HIV. Fortunately, pre-initiation boys are likely to be non-infected. Secondly, newly initiated are sometimes told that they need *kuchotsa fumbi* (removing the dust) or *kudzola mafuta* (rubbing the oil) after circumcision in order to prevent bad omens from falling on their household. These practices essentially require that young initiates engage in sexual intercourse to enter adulthood.

When an individual dies, it is tradition to bathe the body before it is properly dressed and buried. It has been suggested that this practice could promote the transmission of HIV.

Alternatively, some cultural practices may help curb the epidemic. In several cultures, premarital sex is associated with communal sanctions. Young people are therefore encouraged to practice sexual abstinence in order to preserve their own and their families' dignity. Another practice requires an individual to be sexually abstinent when there has been a death in the community, or when one's wife has delivered a baby. In terms of prolonged postpartum abstinence by men, people believe that extramarital or marital sexual intercourse should be avoided if one wants their baby to be strong. Lack of intra-marital sexual abstinence may promote HIV infection; some men have extramarital sexual relations when sex is not culturally allowed within the family.

Many cultural practices have implications for the spread of HIV. But as they are often carried out in secrecy, the prevalence and consequences of such practices cannot be accurately estimated.

Hunger and HIV/AIDS

Millions of people in Sub-Saharan Africa face a risk of starvation. Disease and nutritional status are inexorably linked. At least 25% of malnourished children are infected with HIV (50). The current situation is not simply a result of natural disasters, but rather a complex interplay of political instability, weakness of policy, cultural factors and weather conditions. Unfavorable international trade practices and donor agencies' economic sanctions have also been blamed for the worsening food crisis in Africa (51).

Food emergencies increase rates of HIV transmission, which further exacerbate the food crisis. In Malawi, for example, the World Food Program has identified several links between the epidemic and food insecurity. These include loss of labor, decreased family income, the burden of orphans, child headed families and increased health care and funeral expenses (1). Addressing the current nutritional crisis will be an integral part to confronting the HIV/AIDS pandemic.

Conflict Settings

Conflicts cause many of the conditions and human rights abuses in which the HIV/AIDS epidemic flourishes. Poverty, powerlessness, and social instability, all of which facilitate HIV/AIDS transmission, are exacerbated by war. Physical and sexual violence, forced displacement, destitution and the collapse of social structures put people at risk for HIV.

Rwanda provides an illustration of spreading of HIV in the face of conflict. Prior to the 1994 genocide, studies had shown HIV prevalence rates to be about 1% in rural areas and up to 10% in urban areas. By 1997, HIV prevalence was 11% in both populations. Of the more than 3% of women who had been raped during the genocide, 17% tested HIV positive versus 11% of those who had not been raped (52,53).

Disruption of access to basic necessities, fragmentation of families and displacement make people, particularly women, vulnerable to sexual predation of those who control access to resources. Conflict thus

leads to increased HIV susceptibility. Unfortunately, cessation of fighting does not necessarily remove the heightened risk of disease spread. Those returning home place their sexual partners at serious risk of infection.

There has been a varied response of governments, NGOs and international agencies to HIV in conflict settings. In many camps, basic needs cannot even be met. Thus services to educate occupants about sexually transmitted diseases provide condoms and prevent mother-to-child transmission lose importance. Humanitarian agencies are now increasing efforts to provide basic services, which include HIV/AIDS information, condom access and materials for universal infection precautions. These measures will hopefully improve the HIV/AIDS management in emergency settings (1).

Politics of HIV/AIDS

Sub-Saharan African governments have tried to ignore HIV/AIDS for many years. However, the sheer magnitude of the epidemic has forced the issue into the spotlight. High-level politicians are now addressing the problem, facilitating more open discussions. National coalitions are being formed to write guidelines based on local experience and resources. And HIV/AIDS programs continue to attract international funding. For example, the Global Fund to Fight AIDS, Tuberculosis and Malaria has approved more than 50 financing applications since its establishment (54).

With HIV draining manpower and other resources, contributing to famine, destroying infrastructure and at the forefront of international agendas, the epidemic can no longer be ignored. Social policies are being re-written and Sub-Saharan Africa is looking for ways to curtail the epidemic. At the local, national and international level, HIV/AIDS is an important public health issue.

Silver Lining in Frightening Trends

Without initiation of drastic preventative measures, the HIV/AIDS pandemic will only escalate over the next decade. At present, the situation is still in the early stages. Incidence and prevalence are on the rise. Control is inadequate. HIV/AIDS continues to claim lives and leave orphans. And cultural factors have been insufficiently addressed. The culminating socio-economic impact is expected to take Sub-Saharan Africa farther down the path to destitution.

Though overall trends are frightening, there are a number of encouraging sub-trends that may provide clues for reducing HIV related morbidity and mortality. By learning from these lessons, Sub-Saharan Africa may be able to curb this catastrophe. A look at the results from Uganda, South Africa, and Ethiopia provide insight into the situation.

Uganda is one of the best HIV control success stories. Over the past decade, the country had experienced substantial declines in prevalence, particularly amongst younger cohorts. National seroprevalence in 15-19 year old pregnant women, which is believed to be reflective of HIV incidence, peaked in 1991 at

around 15%. By 2001, the national prevalence had fallen to 5%. Prevalence was estimated to be 8% in the main city of Kampala in 2002 (1).

The reasons for Uganda's success are multiple. From the outset, government took a proactive role in developing programs and acknowledging the threat of HIV. It also empowered local communities by involving them in planning and implementation of interventions. High-risk groups, cultural issues, and the control of sexually transmitted infection control received attention. Voluntary counseling and testing was promoted. Even religious organizations joined the fight. Condom marketing also played a role. All of this has, most importantly, led to behavioral change. People have fewer sexual partners, are less likely to have premarital intercourse and are more likely to use condoms (55).

In South Africa, HIV prevalence rates fell from 21% in 1998 to 15.4% in 2001 amongst women under 20 attending antenatal clinics. However, rates in other groups have not yet declined. 2002 surveillance data show that the average rate of HIV prevalence in all pregnant women attending antenatal clinics is approximately 25%. Nonetheless, there has been a concurrent decrease in syphilis rates amongst all pregnant women (1). Recent surveys indicate that 55% of sexually active teenage girls are using condoms (13). This suggests that awareness and prevention campaigns are starting to pay off.

Though Ethiopia is anticipated to be part of the next HIV/AIDS wave, HIV prevalence is declining among young women in Addis Ababa. Infection levels among 15-24 year old women attending antenatal clinics dropped from 24.2% in 1995 to 15.1% in 2001. However, other areas did not experience similar declines. While the decline of HIV prevalence in young Addis Ababa women is encouraging, the epidemic is expected to increase over the next several years. Significant contributing factors include lack of attention from the Ethiopian government and war (56).

These lessons suggest that a comprehensive behavioral change strategy involving political commitment and community participation may be an effective prevention approach. Furthermore, we must not assume that simple dissemination of information will necessarily effect behavioral change (57). Cultural ideas and exacerbating factors such as war, poverty, and social instability need to be addressed simultaneously.

Vaccine Prospects

While treatment and prevention of HIV is key to addressing the epidemic, a vaccine is thought to be the best solution to long-term control. There are many reasons why it is thought that an effective HIV vaccine is on the horizon. First, studies of non-human primates that were given candidate vaccines based on HIV or SIV (simian immunodeficiency virus) have developed some protection against wild type virus. Also, vaccines have been developed against other retroviruses. Lastly, most humans develop some form of immune response to HIV infection (58). For in-

stance, some exposed individuals have remained uninfected or have been able to control the viral infection over long periods. Others have remained free of disease for up to 20 years, often with undetectable viral loads. A group of sex workers from Nairobi and South Africa has remained HIV negative despite continuing high-risk exposure. It is thought that resistance to HIV infection in these people is due to their ability to raise the protective immune responses to HIV, rather than to any innate host genetic factors (59).

Vaccine trials have taken place on several continents. The first African trial took place in Uganda. However, it was based on a vaccine designed to combat HIV subtype B, which is more prevalent in the Western world, rather than subtypes A and D, which predominate in Uganda. Still, the Ugandan experience highlighted a number of social, political, legal, and ethical barriers to vaccine trials. Many of the problems stemmed from misconceptions about the vaccine as well as ulterior motives (60).

In 2001, Africa's first HIV vaccine trial of a product targeting HIV strains from the continent began in Nairobi, Kenya. The vaccine is based on the gag gene of HIV-1 subtype A and multiple cytotoxic T lymphocyte epitopes, including some identified in the exposed, uninfected Kenyan sex workers (61).

While no vaccine has yet been successfully developed, the prospects provide hope for future disease control. Vaccine trials continue to provide valuable information that will help with further development efforts.

Lessons from Sub-Saharan Africa

What has the experience in Sub-Saharan Africa taught us? Where do we proceed from here? Is there a way to control this epidemic?

HIV/AIDS is a global public health emergency. Without proper interventions, it will only continue to grow. The Sub-Saharan Africa experience has revealed a number of lessons. For one, the epidemic has not yet neared its natural limits. Disease prevalence is still on the rise. Also, educational programs have helped disseminate a lot of information, but have not effected an overall behavioral change. Uganda, the exception, has been able to curtail its epidemic. Furthermore, much of Africa did not immediately acknowledge the magnitude of the problem, or even the existence of HIV. Addressing the epidemic must start with recognition of the problem. Human, material and financial resources must be allocated for HIV/AIDS interventions.

It has been argued that a uniform global approach may not be suited to the heterogeneity of the HIV/AIDS pandemic. Specific interventions used in countries with lower disease prevalence may not be appropriate for Sub-Saharan Africa in light of its high prevalence. One of the most controversial components of such an approach would be mandatory testing. Mandatory testing is actually widely practiced for reasons other than prevention, ie pre-employment screening, bank loans and insurance purposes. Though it probably contributes very little to HIV pre-

vention, it could significantly impact disease management (62). Principles of a potential new approach are listed in Box 2.

Box 2

Alternative public health approach to HIV/AIDS in Sub-Saharan Africa (62):

- Voluntary counseling, testing, and partner notification
- Routine HIV testing in prevention services such as mother to child transmission prevention and treatment for sexually transmitted infections
- Routine diagnostic HIV testing for patient seeing medical treatment

It is not too late for Sub-Saharan Africa to curtail the HIV epidemic. Prevention programs must respond to region-specific needs as they scale up. However, this must be done rapidly. Delays will only make subsequent efforts more difficult. Thus action must come from all levels of society – individuals, communities, nations and international sources. These groups must unite forces to combat a common enemy.

Next Wave

Five populous countries – Nigeria, Ethiopia, Russia, India, and China – are anticipated to fuel the continued pandemic. In these nations, the number of infected people will grow from the current 14 to 23 million to an estimated 50 to 75 million by 2010. This greatly surpasses the anticipated 30 to 35 million cases by the end of the decade in central and southern Africa, the current focal point of the pandemic (56). The next wave countries, Nigeria and Ethiopia, are where the epidemic is most advanced. In all cases, risky sexual behaviors are driving infection rates upward at a precipitous rate.

Without dramatic priority shifts, these epidemics will escalate unchecked. The disease has built up significant force, health services are inadequate, and the cost of education and treatment programs will overwhelm available resources. Government leaders will have trouble maintaining a priority on HIV/AIDS – which has been key to stemming the disease in Uganda, Thailand, and Brazil – because of other pressing issues and the lack of AIDS advocacy groups (63-65).

The economic, social, political, and military impact will vary substantially among the five countries, due to differences in the development of the disease, likely government responses, available resources, and demographic profiles. Drug-resistant strains are likely to spread because of the inconsistent use of antiretroviral therapies and the manufacture of unregulated, substandard drugs (66). Furthermore, the cost of ART remains prohibitively high for most people in populous, low-income countries.

The outlook for HIV/AIDS is sobering. However, up-scaling of preventative measures, increased access to ART and potentially a vaccine may help address the problem. At this point, we are only beginning to face the challenge.

Final remarks

Sub-Saharan Africa has yet to realize the full impact of the HIV/AIDS epidemic. Over the next several years, the number of affected people will continue to grow. Already strained resources will be overwhelmed. And social structures will collapse under the burden.

Nonetheless, a number of initiatives are addressing the problem. VCT and ART access are improving. Awareness is growing. A vaccine may be on the horizon. Resources are being allocated to HIV/AIDS. Still, the all-important behavioral change has yet to occur.

Though the general outlook is dismal, Sub-Saharan Africa can still control the epidemic with the right combination of action and resources. The case of Uganda where HIV incidence has fallen due to increased targeted communication, reduction of number of sexual partners, use of condoms and other measures provides hope for most of Africa (14). Rolling out lessons from this experience will help the world fight the HIV/AIDS scourge.

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