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Global Epidemiology of HIV

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INTRODUCTION

The HIV epidemic has shifted over the past 30 years, from the first reported cases in the early 1980s, to an estimated high of 3.7 million new infections in 1997, to declining new infections and AIDS-related mortality throughout the 2000s.[1] In 2012, approximately 9.7 million people in low- and middle-income countries were on antiretroviral drugs (ART).[2] This expansion of ART coverage has dramatically improved survival among people living with HIV (PLHIV), resulting in an increase in the number of PLHIV to an estimated all-time high of 35.3 million in 2012 (Table 1).[3] Increased access to ART has averted an estimated 5.2 million AIDS-related deaths in low- and middle-income countries from 1995 to 2010, with a 28% reduction in deaths from 2006 to 2012 (Table 2).[1,4] Even as PLHIV live longer, the incidence of new infections continues to decline. An estimated 2.3 million new HIV infections occurred in 2012, which is a 34% decrease from 2000 (Table 3).[2] Overall incidence rate for adults 15 to 49 years of age reached a peak of 0.11% in 1997 and decreased to 0.05% in 2012 (Fig. 1).[1] The greatest decrease in HIV incidence is among children, which has been reduced by 52% in 10 years.[2] Many reasons exist for this decrease in incidence, including reduced infectiousness of PLHIV on ART, expansion of programs for prevention of mother-to-child transmission (PMTCT) of HIV, and introduction of harm-reduction programs focusing on safer sex and outreach to high-risk populations.[4]

The World Health Organization (WHO) defines key populations as those who are vulnerable to and most-at-risk for HIV.[5] The guidelines define most-at-risk populations as “men who have sex with men, transgender people, people who inject drugs and sex workers. Most-at-

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risk populations are disproportionately affected by HIV in most, if not all, epidemic contexts."[5] Vulnerable populations can be identified by focusing on the specific social and demographic characteristics of a region, and may vary depending on specific situations and contexts.[5] The concept of key populations relates to the epidemic terminology as defined by the Joint United Nations Programme on HIV/AIDS (UNAIDS), which defines a "concentrated epidemic" as one in which HIV has spread rapidly in one or more populations (usually >5% prevalence) but is not well established in the general population (usually <1% prevalence).[6] A "generalized epidemic" is an epidemic that is self-sustaining in the general population through heterosexual transmission.[6]

The purpose of this paper is to provide an overview of the diversity of the global HIV epidemic by region, including the impact of HIV treatment and prevention programs on epidemiologic trends, over the past decade.

SUB-SAHARAN AFRICA

HIV prevalence and incidence estimates in many developing countries, including those in sub-Saharan Africa, are derived using statistical models based primarily on either sentinel surveys among pregnant women or household surveys. Overall trends in HIV epidemiology show fewer new infections and decreased AIDS-related mortality in sub-Saharan Africa.[1] From 2000 to 2012, HIV incidence among adults in sub-Saharan Africa decreased by more than half, corresponding to an estimated 1 million fewer new HIV infections in 2012 compared with 2000.[1] The concurrent increase in estimated number of PLHIV, from 20.8 million in 2000 to 25 million in 2012, is largely from improved survival because of ART; AIDS-related deaths have decreased from approximately 1.4 million in 2000 to 1.2 million in 2012.[1] Evidence suggests that access to ART has reduced mortality rates and contributed to lower infection rates, resulting in slowly increasing HIV prevalence in most countries, with the notable exception of Angola, where new infections and AIDS-related deaths continue to increase.[1,3,4]

The main mode of transmission contributing to the HIV epidemic in sub-Saharan Africa is unprotected heterosexual intercourse.[1] Risk is increased with multiple sex partners and concurrent sexually transmitted infection, particularly herpes simplex type 2 (HSV-2).[7] A large proportion of new HIV infections may be attributable to long-term heterosexual relationships. Among sub-Saharan African couples in which at least one person is infected with HIV, at least two-thirds are in discordant relationships.[8] In Rwanda and Zambia, up to 95% of new infections occur in individuals who are living with their sex partners.[8] To what extent new infections are introduced into long-term relationships from other sex partners is unknown.

Among HIV-discordant couples in Africa, the man has traditionally been viewed as the infected partner, and most education and prevention programs have focused on reducing risks for male-to-female transmission. However, a meta-analysis by Eyawo and colleagues[8] showed that in approximately 47% of stable, heterosexual, HIV-discordant relationships, the infected partner was the woman. Globally, 50% of PLHIV are women, but this proportion is 59% in sub-Saharan Africa.[1]

Men at risk for HIV through heterosexual intercourse can reduce HIV risk by approximately 50% to 60% through undergoing voluntary medical male circumcision (VMMC).[9–11] A concerted effort has been endorsed by the WHO and UNAIDS since 2007 to prioritize VMMC for HIV prevention in 14 priority countries (Botswana, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe).[12] The number of VMMCs has increased every year during the scale-up, reaching more than 500,000 in 2012.[12] This prevention approach is unique to this region and is specific to countries with low circumcision rates.

Another risk factor for HIV infection in sub-Saharan Africa is mother-to-child transmission of HIV. Although the use of ART in pregnancy can reduce the mother-to-child transmission rate to less than 1%, access to ART, HIV testing, and other PMTCT services remains incomplete.[1,13] In 2011, PMTCT services reached 59% of HIV-positive women in sub-Saharan Africa.[14] The estimated number of children infected each year has decreased from a high of 510,000 in 2002 to 2003 to 230,000 in 2012[1]; more than 350,000 children worldwide avoided acquiring HIV infection from 1995 to 2010, with approximately 86% of these children living in sub-Saharan Africa.[4] In addition, the estimated number of children who avoided infection doubled between 2008 and 2010 because access to ART increased dramatically during this period.[4]

The global trends in mother-to-child transmission of HIV have led to a disproportionate number of children living with HIV in sub-Saharan Africa; approximately 88% of all children younger than 15 years infected with HIV live in this region.[1] Approximately 55% fewer children were infected with HIV in 2012 than in 2003. However, access to ART is lower in children than in adults, and only 28% of children eligible for ART in sub-Saharan Africa are receiving treatment.[15] Frequently delays occur in the diagnosis of infant and pediatric HIV because of limited access to infant diagnostic tests, and the median survival of an untreated child in sub-Saharan Africa is only 12.4 months.[16] Environmental factors, such as greater exposure to infectious agents, reduced rates of vaccinations, and higher rates of malnutrition, cause untreated infants to have much lower rates of survival in sub-Saharan Africa than in industrialized countries.[16]

Although limited data exist on the role of MSM in the HIV epidemic in Africa, some studies have shown HIV prevalence among MSM populations in sub-Saharan Africa to be significantly higher than that of men in the general population.[17] HIV prevalence among MSM in surveyed populations has ranged from approximately 14% in Kampala, Uganda to 17% in surveyed populations in Botswana, Malawi, Namibia, and Nigeria, and up to 50% of MSM in Johannesburg, South Africa.[4] Sex between men remains highly stigmatized in sub-Saharan Africa, and many MSM also maintain sexual relationships with women.[18] To what extent HIV infection among MSM remains behaviorally segregated remains unclear, but viral genotype data from African MSM show the same circulating strains as in the general population, suggesting that overlap exists between MSM-acquired infection and HIV infection acquired through heterosexual transmission.[18] Stigmatization and criminalization of MSM in sub-Saharan Africa have limited the amount of reliable data on HIV prevalence, and few prevention or treatment programs target this key at-risk population.[18]

In addition to MSM, two key populations at risk for HIV infection are female sex workers (FSW) and individuals who pay for sex. An approximately linear relationship exists between HIV risk and number of sex partners for both men and women.[7] HIV prevalence among FSW, on average, is significantly higher (28%) than among women with no history of paid sex (17%).[7] HIV prevalence was also higher among men who reported sex with an FSW than among men who did not report this risk.[7] Research focusing on traditional high-risk groups in Africa, including FSW and MSM, has shown that these groups remain at higher risk for HIV infection than the general population, even in the setting of a generalized epidemic.[7] Injection drug use (IDU) is associated with a small proportion of HIV infections in sub-Saharan Africa, although its importance is increasing in Kenya, South Africa, Mauritius, and the United Republic of Tanzania.[19]

Considerable regional differences exist in the HIV epidemiology within the sub-Saharan Africa region; therefore, although all subregions share many of the epidemiologic characteristics discussed previously to varying degrees, some subregional differences are apparent. The subregion of Southern Africa is composed of countries with the highest estimated HIV prevalence in the world, including Swaziland (26.5%), Lesotho (23.1%), Botswana (23.0%), and South Africa (17.9%).[1] The severe epidemics in this subregion have no single cause. The combination of high rates of HSV-2, low rates of male circumcision, and sexual risk factors, including multiple partners and intergenerational sex, and large migrant populations, may all contribute to the high HIV burden.[20] However, new infections have continued to decline throughout the subregion. For example, approximately 300,000 fewer new HIV infections occurred in South Africa in 2012 than in 2000.[1]

The HIV prevalence is lower in the Eastern Africa region than in Southern Africa, ranging from approximately 2.9% in Rwanda to 7.2% in Uganda.[1] Incidence and AIDS-related deaths are also declining in this region, with the exception of Uganda, where HIV incidence increased throughout the late 2000s.[1] Lower rates of male circumcision, leading to higher risk for both HIV and ulcerative sexually transmitted infection; younger age at marriage; and younger age at sexual debut in Eastern Africa compared with Western Africa led to a more severe HIV epidemic in Eastern Africa.[20] In Western Africa, the HIV prevalence ranges from approximately 1.3% in Gambia to 3.2% in Cote d'Ivoire.[1] The largest estimated number of PLHIV in West Africa live in Nigeria (3.4 million), where there is an HIV prevalence of 3.1% and deaths caused by AIDS continue to increase.[1] The Central African region has an HIV prevalence between that of Eastern and Western Africa, which ranges from approximately 1.1% in the Democratic Republic of the Congo to 4.5% in Cameroon.[1] New infections and AIDS mortality have generally stabilized throughout the Central African subregion.[1]

ASIA

Asia has the second largest HIV burden after Africa. As in sub-Saharan Africa, the incidence of HIV is declining in Asia; however, these areas have important epidemiologic differences, mainly that HIV is concentrated among key populations. Despite reduced rates of HIV transmission, the number of PLHIV has increased to an estimated 4.8 million in 2012 from 3.8 million in 2000, largely because of improved survival.[1] AIDS-related deaths

among adults and children in Asia have slowly declined during the 2000s to reach approximately 260,000 in 2012 from a high of 330,000 in 2005.[1] Although access to ART has improved, PMTCT services remain limited, with fewer than 20% of pregnant women receiving ART.[1] In addition, fewer than 60% of eligible persons were receiving ART in Asia in 2012.[1] Overall, new infections among children in Asia are decreasing.[1] The modes of transmission of HIV in Asia are primarily IDU, paid sex, and MSM, with considerable variations within and between countries.[4]

China and India have the highest burden of HIV in Asia.[1] The major mode of HIV transmission in China is heterosexual transmission; approximately 46.5% of the estimated 780,000 PLHIV in 2011 were estimated to have been infected with HIV through heterosexual transmission.[21] Injection drug use is also an important risk factor for HIV in China and accounts for approximately 28.4% of infections.[21] Among key populations at high risk, there was an HIV prevalence of approximately 0.3% among sex workers and 6.3% among MSM in 2011.[21] A subepidemic unique to China occurred among former plasma donors, which had spread through contaminated equipment during the 1990s.[22]

With 2.1 million PLHIV, India has the largest number of PLHIV in Asia. The overall estimated prevalence of 0.3% among adults aged 15 to 49 is lower than some countries in the region, including Cambodia (0.8%), Myanmar (0.6%), Vietnam (0.4%) and Malaysia (0.4%).[1] Other countries including Laos (0.3%), Nepal (0.3%), Philippines (<0.1%), and Pakistan (<0.1%) have similar or lower estimated adult HIV prevalence than India.[1] Within India, prevalence varies considerably by region, with HIV prevalence approximately 5 times as high in the Southern states of India as in the Northern states.[1,23] A high HIV prevalence exists among sex workers in India and HIV seems to be spreading from sex workers to their clients and to the clients' other sex partners.[23] Studies in India indicate that one-half to two-thirds of male clients of sex workers are either married or in a relationship with a woman.[23] An exception to this general pattern is in the Northeast region where IDU is the main risk factor.[23] As in China, overlapping epidemics exist between people who inject drugs (PWID) and sex workers, with many PWID buying and selling sex. The MSM population in India is not well characterized because sex between men is both stigmatized and illegal. However, limited studies indicate that HIV prevalence among MSM is significantly higher than in the general population (from 2%−19%) and that most MSM have female sex partners.[23]

Thailand, the only country in Asia with a generalized epidemic, had the highest estimated HIV prevalence in Asia, at 1.1% in 2012, although incidence and prevalence have been steadily declining.[1] Approximately 8800 new infections were reported in 2012, down from a high of 150,000 new infections in 1991.[1] Injection drug use is an important risk factor for HIV infection, particularly among women. Women who inject drugs have higher estimated HIV prevalence (30.8%) than men (24.2%), probably because of the overlap between drug use and sex work.[24] Men who have sex with men accounted for approximately 41% of new HIV infections in Thailand in 2010.[24]

NORTH AFRICA AND THE MIDDLE EAST

Unlike the HIV epidemics in sub-Saharan Africa and Asia, the North Africa and Middle East region has ongoing, steady increases in new infections and AIDS-related mortality.[4] From 2000 to 2012, the estimated number of PLHIV increased from 130,000 to 260,000, the estimated number of AIDS-related deaths increased from 7300 to 17,000, and the estimated new infections per year increased from 20,000 to 32,000.[1] Infections and deaths from AIDS among children have also increased.[1,4] Overall, the HIV prevalence is lower in North Africa and the Middle East compared with sub-Saharan Africa.[1] Near-universal male circumcision in the North Africa and Middle East region and lower rates of sexual risk behavior likely contribute to the low HIV prevalence.[25]

The epidemiology of HIV in North Africa and the Middle East has been difficult to track because of limited data, but surveillance is improving. Most countries in North Africa and the Middle East have concentrated epidemics among key populations. Current research indicates that the most important modes of HIV transmission in the region are IDU and unprotected intercourse, including among MSM.[4] Although MSM are stigmatized and precise numbers are difficult to track, research has shown that HIV infection rates among MSM are higher than in the general population.[25] Estimates for 2011 in Sudan indicate an HIV prevalence of 0.53% among adults and 3.64% among MSM.[26] As with MSM, the prevalence of HIV is higher among FSW than among the general population. The generalized HIV epidemics in Djibouti, Somalia, and South Sudan are suspected to be driven by commercial sex networks, but data on sex behavior are limited.[25]

Injection drug use is a significant mode of transmission throughout the region, including Pakistan, Afghanistan, Iran, Tunisia, Libya, Bahrain, Kuwait, and Oman.[25] HIV prevalence among PWID is highest in the Islamic Republic of Iran, where approximately 15% of PWID are HIV-positive.[27] People who inject drugs account for 67% of HIV cases in Iran and as much as 90% in Libya.[25] Levels of heroin and opium use are higher in North Africa and the Middle East than in other areas of the world.[25] The region is a drug route for heroin originating in Afghanistan, where more than 90% of the world's heroin is produced. Injection drug use remains stigmatized and illegal, despite its high prevalence, leading to limited knowledge of the precise prevalence of the risk behavior and the demographic characteristics of PWID.[25]

Despite the generally low prevalence, the increasing incidence of AIDS-related mortality indicates an inadequate response to HIV in North Africa and the Middle East. Only half of the countries in the region have PMTCT programs in place, and ART coverage is among the lowest in the world; only 11% of people in need of ART were on treatment in 2012.[28] The gap is even worse among children in need of ART, of which only 6% are on treatment. This treatment gap may be attributed to the low number of people who know their HIV status and the poor access to ART.[25] Overall, the epidemic is showing evidence of accelerating in this region.[1]

LATIN AMERICA AND THE CARIBBEAN

The HIV epidemic in Latin America (including South America, Central America, and Mexico) has stayed mostly stable over the past decade, with slowly declining HIV incidence and AIDS-related deaths resulting in a slightly increased number of PLHIV; the estimated number of PLHIV increased from 1.60 million in 2000 to 1.75 million in 2012.[1] When compared with South America, where no countries have a generalized epidemic, estimated adult HIV prevalence is higher in the Caribbean and Central America and exceeds 1% in the Bahamas, Belize, Guyana, Haiti, Jamaica, and Suriname.[29] Females constitute a higher proportion of PLHIV (60%) in Latin America and the Caribbean than in any other region of the world. Despite the high burden of HIV in several countries of the Caribbean, however, new infections have decreased by more than 50% over the past decade.[2]

The highest HIV prevalence in Latin America is among MSM; 9 of 14 countries in the region have prevalence rates exceeding 10% among MSM.[4] Some parts of Colombia, Uruguay, and Bolivia have an HIV prevalence among MSM of approximately 20%, and one study showed that MSM in 15 countries in South and Central America are 33 times as likely to be infected with HIV as men in the general population.[4] The highest HIV prevalence among MSM in the world is in the Caribbean region, where approximately 25% of MSM are infected with HIV.[17] Transgender women (TGW) are also at very high risk for HIV infection. The highest HIV prevalence among TGW in Latin America is thought to be in Peru, where approximately 30.0% of TGW are infected with HIV.[29] Female sex workers are another high-risk population in the region, where approximately 6.1% of FSW are HIV-positive.[29]

Injection drug use contributes substantially to HIV transmission in Mexico and the southern areas of South America. In particular, Mexico seems to be experiencing an overlapping epidemic among PWID and FSW. Female sex workers who injected drugs in Ciudad Juarez and Tijuana had an HIV prevalence of 12% in one survey.[30]

Antiretroviral therapy coverage has increased substantially throughout Latin America and the Caribbean. In the Caribbean, approximately 79% of pregnant women with HIV received combined ART therapy, and AIDS-related deaths in the general population have decreased dramatically.[29] The ART coverage in Latin America is even higher, with more than 80% of persons in need receiving treatment.[1]

NORTH AMERICA, WESTERN EUROPE, AND OCEANIA

The epidemiologic methods for HIV surveillance are different in the higher-income countries of North America, Western Europe, and Oceania versus other regions of the world. Countries with fewer resources usually use health survey or sentinel surveillance data to estimate HIV prevalence, incidence, and mortality. In contrast, high-income countries have case-based surveillance systems to describe HIV epidemiology.[31] Overall trends in HIV prevalence are similar among the high-income countries of North America, Western Europe, and Oceania. The estimated number of PLHIV in North America has increased from 940,000 in 2000 to 1.3 million in 2012, but the prevalence among adults has stayed the same, approximately 0.5%, over the same period.[1] The estimated number of adult PLHIV in

Western Europe increased to 860,000 in 2012 from 570,000 in 2000; in Oceania, adult PLHIV increased to 51,000 in 2012 from 34,000 in 2000.[1] In Western Europe, as in Oceania, estimated HIV prevalence among adults has stayed constant at 0.2%.[1] AIDS-related mortality has decreased over the past decade in all 3 regions.[1] Access to ART is high throughout these regions; 89% of HIV-positive persons receiving medical care in the United States underwent ART in 2010.[32]

All countries in North America, Western Europe, and Oceania have had steady or increasing numbers of PLHIV from 2006 to 2011.[1] All countries had more men infected with HIV, with approximately 2.5 men infected with HIV for every woman infected with HIV. The highest disparity was in Germany, where there are 5.6 infected men for every 1.0 infected woman.[31] HIV risk factors vary across the regions but, in general, most high-income countries report MSM as a major key population at risk. Countries in which MSM account for most PLHIV include the United States, Canada, Spain, the Netherlands, Austria, Czech Republic, Australia, and New Zealand.[31] The incidence of HIV among MSM continues to increase in many countries, including the United States, United Kingdom, Switzerland, Spain, Greece, and France, among others.[31] In the United States, HIV prevalence among MSM has been increasing by approximately 8% per year since 2001.[17] The estimated HIV prevalence among MSM in North America (15%) is higher than in Western Europe (6%) and Oceania (4%).[17] Some counties have a primarily heterosexual epidemic, including Portugal, Norway, Sweden, Switzerland, Finland, and Latvia, although some of these risk categories may have been misclassified.[31] The only 2 countries in Western Europe, North America, and Oceania in which IDU is the most important risk factor for HIV are Estonia and Lithuania.[31]

A unique feature of the HIV epidemic in Western Europe is that approximately 35% of AIDS cases reported through 2006 were among migrants, with most from sub-Saharan Africa.[33] Across high-income nations, a racial and ethnic disparity exists in HIV prevalence, with ethnic minority groups having a higher HIV prevalence compared with the general population. In the United States, African Americans account for a disproportionate number of new HIV and AIDS diagnoses, and the same is true of Aboriginal persons in Canada.[34] Although case surveillance data provide accurate information about reported cases, information on “hidden” populations, such as sex workers and transgender individuals, is limited, because these classifications may not be captured on case report forms.[31]

EASTERN EUROPE AND CENTRAL ASIA

The Eastern Europe and Central Asia (EECA) region has a growing HIV epidemic, resulting in increasing numbers of PLHIV, AIDS deaths, and new infections among children, although overall incidence in the region is decreasing.[4] Approximately 760,000 adults and children were living with HIV in EECA in 2000, and this number increased to 1.3 million in 2012.[1] AIDS-related deaths have increased from approximately 24,000 to 91,000, and new infections have fluctuated over the same period.[1] This region is unusual in that new HIV infections continue to increase notably in Russia, Ukraine, Kazakhstan, and Kyrgyzstan.[1,35] In fact, in 4 countries in EECA (Kazakhstan, Kyrgyzstan, Georgia, Republic of Moldova),

HIV incidence increased more than 25% from 2001 to 2011.[36] The highest estimated HIV prevalence in EECA is in Ukraine (0.9%).[1]

The predominant mode of HIV transmission in EECA is IDU. An estimated 3.1 million PWID live in EECA, and approximately 1 million of these individuals are infected with HIV.[37] Most (approximately 80%) HIV infections in Russia are among PWID.[36] The HIV incidence among PWID in Russia doubled from 2004 to 2009, and many HIV-infected PWID in the EECA region remain undiagnosed.[4] Similar to data on the epidemic in Asia, evidence shows significant overlap between sex work and IDU, which leads to amplified infection risk.[4] Men who have sex with men are thought to constitute less than 1% of the people newly diagnosed with HIV in EECA, but official estimates may underestimate the contribution of this high-risk group.[4] The estimated HIV prevalence among MSM in EECA is approximately 6.6%, which is considerably higher than among the general population.[17]

HIV data in EECA may be incomplete and underestimate the extent of HIV infections in the region because of low access to and uptake of HIV testing.[37] Few targeted approaches to prevention or treatment of HIV have been attempted among PWID in the region, despite the high prevalence of HIV in this subpopulation. Opiate substitution therapy is not available in Russia, Armenia, Tajikistan, Turkmenistan, or Uzbekistan.[36] Needle and syringe exchange programs are available in all countries except Turkmenistan and Kosovo, but evidence from the International Harm Reduction Association indicates that the programs are limited in coverage.[38] In addition, ART coverage among PWID in EECA is low. Data are limited, but estimates show that less than 1% of HIV-positive PWID receive ART in Russia and Uzbekistan, and 5% to 12% in Estonia.[36,39]

Discussion and Program Implications

Most of the regions of the world have increasing HIV prevalence in the context of decreasing new infections and AIDS-related mortality, primarily reflecting the scale-up of ART programs in most regions. Worldwide increase in ART availability increases survival among PLHIV, leading to increased prevalence even as it decreases the likelihood of viral transmission from individuals adherent to ART. This finding was illustrated in the high-prevalence province of KwaZulu-Natal, South Africa, where increasing HIV prevalence in the province was almost completely explained by declining mortality among HIV-positive men and women aged 25 to 49 years as they gained access to ART.[40] This epidemiologic pattern will likely continue in KwaZulu-Natal and elsewhere as more persons are able to access ART. This represents an important change in the global epidemiology of HIV; it is now important to differentiate between persons living with long-term HIV infection and those newly infected. Consequently, the surveillance focus should shift to using HIV incidence to monitor prevention efforts.

In addition to a change in surveillance methodology to prioritize the identification of new infections, the massive HIV treatment scale-up that allowed 1.6 million more people access to ART in 2012 than in 2011 must continue. The number of people on ART in low- and middle-income countries has tripled from 2007 to 2012, but 9.7 million people are currently on treatment and 26.0 million are in need of ART (based on 2013 WHO eligibility guidelines).[41] Continued efforts to expand access to ART require identification of infected

persons and linkage into HIV care. These programs could have increased impact if they more effectively identify key populations of HIV infected individuals and ensure high-quality care, treatment, and supportive services for those in need. Globally, men are less likely to receive ART than women, and PWID, MSM, and transgender individuals are underrepresented in access to HIV treatment relative to their burden of disease.[41] In addition, only 34% of children with HIV receive ART. Addressing this disparity, particularly in sub-Saharan Africa, should remain a high priority.[41]

The increased access to and effective use of ART may contribute to "treatment as prevention," meaning that treatment of HIV-infected individuals will function as a preventive measure by reducing transmission. Mathematical models have shown that 28% of all HIV infections would be prevented if 80% of PLHIV were given ART treatment.[42] Another study in South Africa showed that an individual living in an area with 30% to 40% ART coverage had a 34% decrease in risk of HIV infection compared with an individual living in an area with less than 10% ART coverage.[43] Updated WHO guidelines recommend ART for persons with CD4 counts less than 500 cells/μL. Global adaptation of these guidelines will further increase the number of persons on ART.[44] Another important component of treatment as prevention is provision of ART to HIV-infected pregnant women. Although PMTCT services have expanded dramatically, only 62% of pregnant women had access to PMTCT services in 2012, and only 30% of those who were eligible for treatment began ART.[1,2,4] To eliminate vertical transmission of HIV, PMTCT coverage must be increased. Since 2010, the WHO has recommended starting all HIV-infected pregnant women on lifelong HIV treatment at diagnosis ("Option B+").[45] This approach simplifies the medication regimen, decreases the likelihood of transmission through breastfeeding, decreases horizontal transmission to uninfected partners, and increases the likelihood of treatment during subsequent pregnancies.[46]

Despite the geographic heterogeneity of the HIV epidemic, increased ART coverage will reduce incidence in all regions. Increased access to ART combined with specific prevention interventions relevant to local populations and contexts may decrease incidence further.[47] In Africa, focus on PMTCT services and reduction in heterosexual risk, including VMMC and sexual risk-reduction strategies, should remain a high priority. Increasing HIV testing services and access to HIV care and treatment is important throughout North Africa and the Middle East. In countries where MSM remain at high risk, it is important to increase access to health care services, including testing and treatment. For countries in which PWID are at highest risk for infection, prevention strategies should focus on this high-risk group. Public health organizations should continue to focus on outreach to identify HIV-positive persons, link these persons to comprehensive care, increase quality of care, and retain these persons in treatment, and to provide ongoing education and prevention messages relevant to local communities. Great strides have been made in reducing HIV morbidity and mortality through the first decade of the 2000s, and continued focus on access to HIV treatment in addition to focused, region-appropriate prevention, care, and treatment will continue to reduce the burden of HIV disease going forward.

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KEY POINTS

- HIV prevalence is increasing in nearly every geographic region in the world, mostly because of deaths averted from antiretroviral treatment.
- The main mode of HIV transmission in sub-Saharan Africa is heterosexual contact; mother-to-child transmission rates are decreasing.
- Injection drug use is a major risk factor for HIV acquisition in Eastern Europe, Central Asia, North Africa, and the Middle East.
- Men who have sex with men remain at highest risk for infection in many countries of North America, Western Europe, and Oceania.
- Expanding access to HIV treatment will reduce vertical and horizontal transmission of HIV and decrease HIV morbidity and mortality globally.

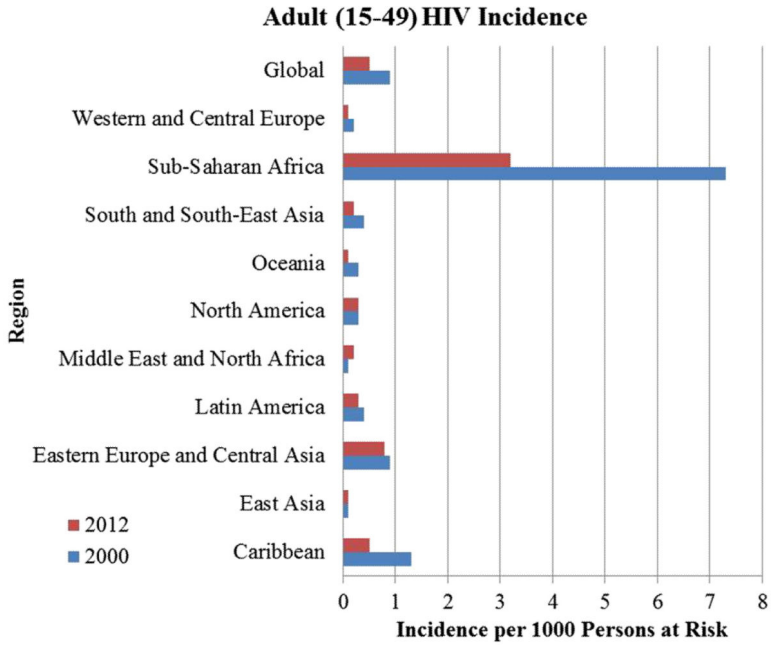

Fig. 1.

Estimated HIV incidence by region in adults 15 to 49 years of age, 2000 and 2012. (*Data from* UNAIDS report on the global AIDS epidemic 2013. UNAIDS 2013. Available at: http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2013/gr2013/UNAIDS_Global_Report_2013_en.pdf. Accessed May 9, 2014.)

Table 1

Estimated adults and children living with HIV, by region

	2000	2003	2006	2009	2012
Sub-Saharan Africa					
Adults & Children	20,800,000	22,800,000	23,500,000	24,200,000	25,000,000
Adults	18,800,000	20,200,000	20,500,000	21,100,000	22,100,000
Women 15+ y of age	10,700,000	11,600,000	11,800,000	12,200,000	12,900,000
Children	2,100,000	2,600,000	3,000,000	3,100,000	2,900,000
Asia					
Adults & Children	3,820,000	4,380,000	4,550,000	4,580,000	4,780,000
Adults	3,820,000	4,280,000	4,340,000	4,470,000	4,580,000
Women 15+ y of age	1,187,000	1,430,000	1,480,000	1,620,000	1,650,000
Children	94,300	143,600	185,300	206,900	208,200
North Africa and Middle East					
Adults & Children	130,000	170,000	200,000	230,000	260,000
Adults 15+ y of age	120,000	150,000	180,000	210,000	250,000
Women 15+ y of age	59,000	69,000	77,000	86,000	100,000
Children	9300	13,000	16,000	18,000	20,000
Latin America and the Caribbean					
Adults & Children	1,580,000	1,570,000	1,560,000	1,650,000	1,750,000
Adults 15+ y of age	1,550,000	1,550,000	1,530,000	1,530,000	1,630,000
Women 15+ y of age	500,000	520,000	520,000	530,000	560,000
Children	65,000	72,000	73,000	67,000	56,000
North America, Western Europe, and Oceania					
Adults & Children	1,544,000	1,682,000	1,866,000	2,049,000	2,211,000
Adults 15+ y of age	1,543,000	1,679,000	1,863,000	2,046,000	2,208,000
Women 15+ y of age	323,000	366,000	408,000	448,000	488,000
Children	6600	6600	6300	6200	6100
Eastern Europe and Central Asia					
Adults & Children	760,000	1,000,000	1,100,000	1,200,000	1,300,000
Adults 15+ y of age	750,000	990,000	1,100,000	1,200,000	1,300,000
Women 15+ y of age	300,000	430,000	460,000	440,000	430,000
Children	8700	16,000	19,000	19,000	19,000
Global					
Adults & Children	28,700,000	31,700,000	32,800,000	34,000,000	35,300,000
Adults 15+ y of age	26,500,000	28,800,000	29,500,000	30,500,000	32,100,000
Women 15+ y of age	13,100,000	14,400,000	14,800,000	15,300,000	16,100,000
Children	2,300,000	2,900,000	3,300,000	3,400,000	3,300,000

From Global report: UNAIDS report on the global AIDS epidemic 2013. Available at: http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2013/gr2013/UNAIDS_Global_Report_2013_en.pdf. Accessed May 9, 2014; with permission.

Table 2

AIDS-related deaths in adults and children, by region

	2000	2003	2006	2009	2012
Sub-Saharan Africa	1,400,000	1,700,000	1,700,000	1,500,000	1,200,000
Asia	205,000	303,000	322,000	300,000	261,000
North Africa and Middle East	7300	10,000	13,000	15,000	17,000
Latin America and the Caribbean	100,000	104,000	92,000	80,000	63,000
North America, Western Europe, and Oceania	28,500	29,000	29,000	27,500	28,800
Eastern Europe and Central Asia	24,000	59,000	83,000	82,000	91,000
Global	1,700,000	2,200,000	2,300,000	2,000,000	1,600,000

From Global report: UNAIDS report on the global AIDS epidemic 2013. Available at: http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2013/gr2013/UNAIDS_Global_Report_2013_en.pdf. Accessed May 9, 2014; with permission.

Table 3

Adults and children newly infected with HIV, by region

	2000	2003	2006	2009	2012
Sub-Saharan Africa	2,600,000	2,400,000	2,100,000	1,900,000	1,600,000
Asia	488,000	422,000	374,000	341,000	351,000
North Africa and Middle East	20,000	23,000	25,000	26,000	32,000
Latin America and the Caribbean	126,000	114,000	107,000	105,000	98,000
North America, Western Europe and Oceania	84,200	81,200	84,200	81,200	79,100
Eastern Europe and Central Asia	140,000	130,000	120,000	120,000	130,000
Global	3,500,000	3,100,000	2,800,000	2,600,000	2,300,000

From Global report: UNAIDS report on the global AIDS epidemic 2013. Available at: http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2013/gr2013/UNAIDS_Global_Report_2013_en.pdf. Accessed May 9, 2014; with permission.