

# Overview of the Current State of the Epidemic

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Published online: 12 April 2013

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**Abstract** At the end of 2011, about half of the 34.0 million [31.4–35.9 million] people living with HIV infection knew their HIV status. With large regional variations, an estimated 0.8 % of all adults aged 15 to 49 years have HIV infection and HIV subtype diversity is increasing. Although HIV incidence has declined in 39 countries, it is stable or increasing in others. HIV prevalence continues to rise as antiretroviral treatment scale-up results in fewer HIV-related deaths while new infections continue to occur. Increased treatment uptake is likely reducing HIV transmission in countries with large mortality declines. Key populations, including sex workers, men who have sex with men, transgender people, people who inject drugs and young women in high prevalence settings require effective prevention programs urgently. Correcting mismatches in resource allocation and reducing community viral load will accelerate incidence declines and affect future epidemic trends, if concerted action is taken now.

**Keywords** HIV · AIDS · HIV prevalence · HIV incidence · HIV-related mortality · Global epidemic trends · Country responses · Key populations · Community viral load

## Introduction

More than 30 years have passed since the first cases of what would subsequently be known as acquired immunodeficiency syndrome (AIDS) were diagnosed in New York City and

California [1]. On the scientific front, tremendous progress has been made in identifying a retrovirus, the human immunodeficiency virus (HIV), as the cause of AIDS [2•], devising diagnostic tests [3] and developing effective antiretroviral treatment (ART) regimens [4]. On the public health front, HIV prevention approaches based on awareness raising about the need for behavior change, offers of HIV testing and counselling, and promotion of correct and consistent male and female condom use have led to declines in HIV incidence in many countries. New biomedical HIV prevention modalities, such as voluntary medical male circumcision (VMMC) [5], oral pre-exposure prophylaxis (oral PrEP) [6], topical PrEP (microbicides) [7], and early ART for prevention [8••] purposes are showing promise. At the same time, there is increasing recognition that the structural determinants of HIV risk undermine people's capacity to avoid HIV exposure and acquisition and, if they already have HIV infection, to prevent onward transmission.

On the one hand, there is much to celebrate. The numbers of new cases of HIV infection in both adults and children are falling, fewer people living with HIV are dying from AIDS-related causes, and enabling policy frameworks have been implemented to structure and speed progress against the HIV epidemic. On the other hand, the size and nature of the challenges before us underscore the fact that, despite persistent and intensifying scientific efforts to find a cure [9•] and to create an efficacious vaccine [10], the HIV epidemic will be with us for decades to come. In summarizing the current state of the HIV epidemic, this article will permit readers to determine for themselves whether the glass is optimistically 'half-full' or soberly 'half-empty'.

## Global Figures and Epidemic Trends

Across the globe at the end of 2011, 34.0 million [range of uncertainty: 31.4–35.9 million] people were living with HIV infection [11], of whom about 50 % know their HIV status

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[12]. Globally, 0.8 % of all adults aged 15 to 49 years have HIV infection. The global figures mask large regional differences, with sub-Saharan Africa (SSA) continuing to shoulder the largest burden, with 69 % of all prevalent HIV infections and close to 1 in 20 adults (4.9 %) living with HIV. One-third of all people with HIV globally reside in 9 countries in southern Africa that account for 2 % of the world's population [13]. In terms of numbers of infections, the next most affected region is South and South-East Asia and, when East Asia is added, the overall Asia region is home to almost 5 million people living with HIV. Three other regions follow, each with 1.4 million people living with HIV: Eastern Europe and Central Asia, North America, and Latin America. The remaining 4 regions are home to 1.49 million people in total, completing the ten-region picture of prevalent HIV infections. The ranges around the UNAIDS estimates (Table 1) define the boundaries within which the actual numbers lie, based on the best available information. They remain relatively wide, reflecting the incomplete picture that current data provide.

Every single one of the 10 regions has experienced an increase in HIV prevalence, comparing 2011 with 2001, with the exception of the Caribbean region that had an apparent decline in its point estimate from 240,000 in 2001 to 230,000 in 2011. For South and South East Asia, Latin America, the Caribbean, and North America the 2011-point estimates lie within the 2001 ranges of uncertainty, suggesting that observed increases might not be significant. However, for the other 6 regions, sub-Saharan Africa, Eastern Europe and Central Asia, Western and Central Europe, East Asia, the Middle East, North Africa, and Oceania, the 2011-point estimate is clearly outside the 2001 range, signalling a likely significant increase in the numbers of people living with HIV.

HIV prevalence can rise if people are living longer with HIV as a result of life-prolonging antiretroviral therapy or if increasing numbers of people are newly acquiring HIV

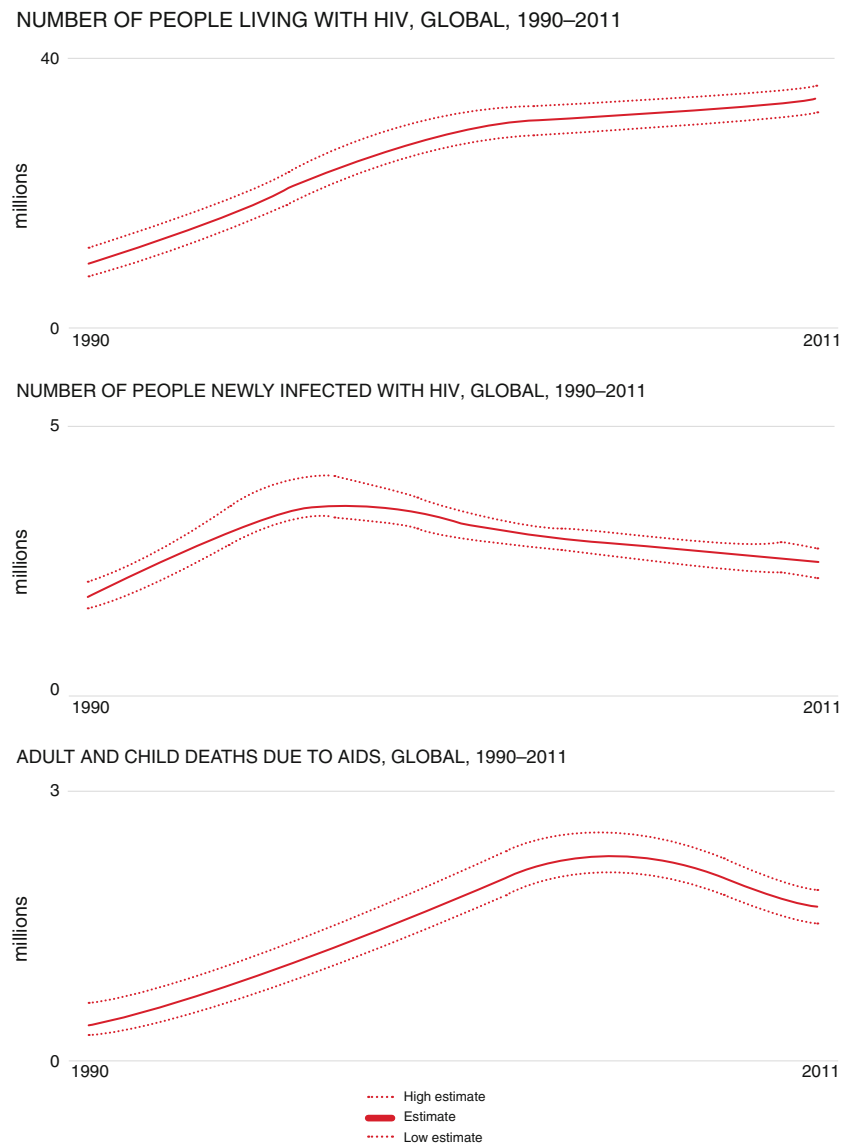
infection. Steadily increasing access to antiretroviral therapy is estimated to have added 14 million life-years in low- and middle-income countries (LMIC) since 1995, with 8 million people on ART at the end of 2011, a 20-fold increase since 2003 [11]. The result has been that from the mid-2000s the number of people dying of AIDS-related causes has fallen steadily. This is reflected in global tuberculosis-related AIDS deaths declining 9 % from 2005 to 2009 and 13 % from 2009 to 2011 [14]. However, age-standardised death rates in the two decades between 1990 and 2010 paint a different picture: the decline of 21.5 % in all cause death rates contrasts starkly to the 258 % increase in the age-standardised death rate for AIDS [15]. Similarly, years lived with disability per 100,000 globally increased only 2.5 % for all causes versus 109.4 % for HIV between 1990 and 2010 [16].

While absolute numbers of deaths due to HIV have been declining, HIV incidence, ie, new HIV infections, has also declined, falling from 3.2 million (2.9–3.4 million) in 2001 to 2.5 million (2.2–2.8 million) in 2011, despite an expanding world population. Two-thirds of the new HIV infections averted in 2010 and 2011 were those that would have occurred among infants. In fact, new infections in children over these 2 years decreased by 24 % [12]. This is primarily due to increasing program coverage for the prevention of mother-to-child transmission (PMTCT). This decline is set to accelerate now as the Global Plan toward elimination of new infections in children by 2015 gathers speed [17].

The overall incidence decline, which began from a peak in 1997, partially counterbalances increasing HIV prevalence due to ART expansion (Fig. 1). Each person with HIV infection will eventually require ART. An estimated 6.8 million people who are currently eligible for ART do not have access to it [11]. The 2015 goal of 15 million people on ART, known as '15 by 15', means that these people who are already eligible, as well as others who will become eligible for treatment, need to be reached with treatment services by

**Table 1** HIV prevalence by region

Region	Adults and children with HIV	Range	Prevalence age 15–49	Range
Sub-Saharan Africa	23.5 million	22.1–24.8 million	4.9	4.6–5.1
South and South-East Asia	4.0 million	3.1–4.6 million	0.3	0.2–0.3
East Asia	830,000	590,000–1.2 million	0.1	<0.1–0.1
Eastern Europe and Central Asia	1.4 million	1.1–1.7 million	0.4	0.3–0.5
North America	1.4 million	1.1–1.8 million	1.0	0.6–1.0
Latin America	1.4 million	1.1–2.0 million	0.6	0.5–1.0
West and Central Europe	900,000	830,000–1.0 million	0.2	0.2–0.3
Middle, East, and North Africa	300,000	250,000–360,000	0.2	0.1–0.2
Caribbean	230,000	200,000–250,000	1.0	0.9–1.1
Oceania	53,000	47,000–60,000	0.3	0.2–0.3

**Fig. 1** Global HIV trends, 1990–2011. Global Report [11]

2015. The 2010 World Health Organization ART guidelines recommend treatment initiation when CD4 cell counts fall to 350 cells/uL [4], however, in high-income countries, increasingly people are starting ART at 500 cells/uL as the benefits of earlier treatment become evident. The definitive answer about individual clinical benefits of early treatment is expected from the START (Strategic Timing of Antiretroviral Therapy) trial underway in 35 countries that will soon complete enrolment of 4000 people with CD4 counts above 500 cells/uL [18]. Participants are being randomized to start treatment immediately or wait until reaching CD4 350 cells, with follow-up planned out to December 2015. Pending the START trial results, there is increasing interest in a ‘test and treat’ approach [19], in which people, particularly those more likely to be lost to follow-up after an HIV diagnosis, may be offered ART at the time of HIV diagnosis regardless of CD4 count.

Thus, growing numbers of people worldwide will be placed on life-saving ART in the coming years, whether treatment eligibility remains at CD4 350 or it increases to 500, as guidelines and practices change. The result will be increasing longevity for people living with HIV and continued growth in the size of the global epidemic, despite the progress being made to stop the constant incoming flow of new HIV infections.

As the number of people living with HIV continues to expand, HIV subtype diversity will likely increase as HIV continues to evolve through mutation and recombination. Although the global HIV epidemic arose from a handful of HIV group M viruses [20] that jumped species in the Congo River basin likely around 1908, the HIV epidemic today is very diverse [21••]. Advances in genomic sequencing methods, such as deep DNA sequencing, have greatly improved our understanding and analysis of HIV genetic diversity and the geographical distribution of subtypes. HIV-1

is now categorized into groups M (main), N (non-M, non-O), O (outlier), and a tentative new group P. Group M has 9 subtypes or clades (A-D, F-H, J, and K), 51 circulating recombinant forms (CRF), and a large number of unique recombinant forms (URFs) [22]. Recombinant forms are created in the presence of simultaneous or sequential infection with 2 or more different HIV-1 subtypes through strand transfer during reverse transcription [23]. Phylodynamic approaches are increasingly being used to obtain estimates of sequence evolution rates and epidemic network parameters [24], with mathematical modelling demonstrating that inter-subtype recombination has clearly been a substantial force in generating HIV-1 group M diversity [25]. Some regions, such as southern Africa, have low viral diversity, whereas others have several subtypes and circulating recombinants. Subtype C accounts for 48 % of infections while subtypes A and B account for 12 % and 11 % of global HIV infections respectively [26].

Subtype specificity may be important for vaccine development but does subtype matter for HIV progression and transmission? Certain subtypes are now known to be associated with faster HIV disease progression. Subtype D is associated with higher viral load set points [27] and has a higher frequency of syncytium formation and CXCR4 receptor use associated with more rapid decreases in CD4 cell count. Similar rapid CD4 declines are seen in infection with multiple subtypes compared with infection with a single subtype [28, 29]. This underscores the importance of the positive dignity, health, and prevention strategy in reducing the risk of superinfection [30]. Subtype C strains use CCR5 receptors and rarely switch to using CXCR4 or both, a switch that is normally associated with more rapid disease progression. This may explain the slower progression seen in people with subtype C compared with subtype D or A [31]. As for whether certain subtypes are more easily transmitted, a study in Uganda found that subtype A was more readily transmitted heterosexually than subtype D [32]. Individuals who have high viral set points and those who maintain high viral loads in the absence of ART are more likely to transmit HIV infection [33], suggesting that they would be priority candidates for early ART. Given the increasing recognition of the powerful prevention benefits of ART through substantially reduced transmission when viral load is suppressed [8•], ART scale-up will have important effects in decreasing HIV incidence globally at the same time that it will increase HIV prevalence.

### National Responses and Trends

Some countries have made striking progress in preventing new HIV infections while others lag behind and a few even have increasing HIV incidence. For example, among 18 sub-Saharan African countries with an HIV prevalence of 3 % or more in 2011, Swaziland, South Africa, and Mozambique

had increasing HIV prevalence over the previous decade but significantly declining HIV incidence (Table 2) while Uganda experienced an increase in HIV prevalence along with a 22 % increase in HIV incidence (Table 3).

In 2012, 186 countries, representing 96 % of United Nations member states, submitted comprehensive reports on their national AIDS responses to UNAIDS. These reports highlight how well a country is performing in meeting the 2015 targets that all countries agreed to when they signed on to the 2011 United Nations Political Declaration on HIV and AIDS: Intensifying our efforts to eliminate HIV and AIDS [34] The combination of these national AIDS response reports, which include ART and prevention program coverage, with country-specific estimates for HIV prevalence, AIDS-related mortality, and HIV incidence, help paint a picture of what responses in which countries are the most effective in addressing HIV. Recent epidemic trends are analyzed by UNAIDS using published peer-reviewed articles or through the use of recommended modelling tools for national HIV estimations [35].

HIV incidence in adults 15–49 years old fell by more than 50 % in the decade from 2001 to 2011 in 25 countries, 12 of which are in sub-Saharan Africa, 6 in the Caribbean, 6 in Asia, and 1 in the Middle East. The sharpest regional declines were in the Caribbean (42 %) and sub-Saharan Africa (25 %) [11]. Over the same period, adult HIV incidence increased by more than 25 % in 9 countries, 4 of which are in Eastern Europe and Central Asia (Georgia, Kazakhstan, Kyrgyzstan, and the Republic of Moldova), 4 are in Asia (Bangladesh, Indonesia, Philippines, and Sri Lanka), and only 1 is in Africa (Guinea Bissau). Of note, the numbers of new HIV infections had been relatively stable in Eastern Europe and Central Asia until the late 2000s when the increase began.

Is ART scale-up playing a role in country HIV incidence declines? A clinical trial among discordant couples in 9 countries found a 96 % reduction in the risk of genetically-linked HIV transmission when early ART at CD4 counts above 350 suppressed viral load in the HIV-infected partner [8•]. In the absence of treatment, infectivity is estimated to be 9 times higher in early HIV infection and 7 times higher in late HIV infection [36]. Further, the utility of mathematical modelling to examine the potential impact of ART on HIV incidence has been explored, with a study of 12 models [37] finding broad agreement regarding the short-term epidemiologic impact of ambitious treatment scale-up, but more variation in longer term projections and in the efficiency with which treatment can reduce new infections [38].

An examination of trends in mortality could allow an assessment of the possible role of ART scale-up in contributing to declining HIV incidence. In fact, of the 14 countries that have experienced a 50 % decline in mortality between 2005 and 2011, 7 of them had achieved 80 % or more coverage of ART for eligible people and 3 had achieved 60 %–79 % coverage. Nine of the 14 countries with these large mortality

**Table 2** African countries with HIV prevalence greater than 10 % in 2011

Countries	2001		2011		2001-2011
	Prevalence	Incidence	Prevalence	Incidence	% Change in Incidence
Swaziland	22.2	4.11	26.0	2.60	- 37%
Botswana	27.0	3.48	23.4	1.00	- 71%
Lesotho	23.4	2.67	23.3	2.47	- 7%
South Africa	15.9	2.42	17.3	1.43	- 41%
Zimbabwe	25.0	2.11	14.9	1.05	- 50%
Zambia	14.4	1.89	12.5	0.80	- 58%
Namibia	15.5	2.39	13.4	0.77	- 68%
Mozambique	9.7	1.63	11.3	1.13	- 31%
Malawi	13.8	1.74	10.0	0.49	- 72%

Source: UNAIDS Report on the Global AIDS Epidemic – 2012. Accessible at: [http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/JC2417\\_GR%202012\\_Annexes\\_en.pdf](http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/JC2417_GR%202012_Annexes_en.pdf) and <http://www.unaids.org/en/dataanalysis/knowyourepidemic/epidemiologicalfactsheets/>

Note: Green shading indicates significant decrease in incidence or prevalence; yellow shading indicates moderate decrease in incidence or prevalence; red shading indicates increase in incidence or prevalence

declines had a greater than 50 % decline in incidence from 2001–2011 [11]. This suggests that ART scale-up is likely influencing HIV transmission; however the extent remains to be determined.

What about the contribution of HIV prevention programming to declining HIV incidence? UN member states have pledged to meet Universal Access Targets [39] and Millennium Development Goals [40] and have committed,

**Table 3** African countries with HIV prevalence between 3 % and 10 % in 2011

Countries	2001		2011		2001-2011
	Prevalence	Incidence	Prevalence	Incidence	% Change in Incidence
Cote d'Ivoire	6.2	0.39	3.0	0.15 <sup>a</sup>	-54%
Uganda	6.9	0.69	7.2	0.84	+22%
Tanzania	7.2	0.62	5.8	0.59	- 5%
Kenya	8.5	0.66	6.2	0.45	- 32%
CAR	8.1	0.67	4.6	0.29	- 57%
Cameroon	5.1	0.63	4.6	0.36	- 43%
Chad	3.7	nd	3.1	0.28	nd
Congo	3.8	0.35	3.3	0.31	- 11%
Nigeria	3.7	0.42	3.7	0.36	- 14%

Source: UNAIDS Report on the Global AIDS Epidemic – 2012. Accessible at: [http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/JC2417\\_GR%202012\\_Annexes\\_en.pdf](http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/JC2417_GR%202012_Annexes_en.pdf) and <http://www.unaids.org/en/dataanalysis/knowyourepidemic/epidemiologicalfactsheets/>

Note: Green shading indicates significant decrease in incidence or prevalence; yellow shading indicates moderate decrease in incidence or prevalence; red shading indicates increase in incidence or prevalence

<sup>a</sup> 2009 data

for example, to 50 % reductions in sexual transmission and 50 % reductions in injecting drug use-related transmission by 2015. To accomplish this, and other prevention goals such as the elimination of new HIV infections in children, countries are strengthening their combination prevention programs. Combination prevention combines behavioral, biomedical, and structural interventions to address both the immediate risks and underlying causes of vulnerability to HIV infection, as well as the pathways that link them [41]. It is evidence-informed, human-rights based, and context-specific. In order to be effective, prevention programs must be tailored to local epidemics, with relevant components delivered at an intensity, quality, and scale necessary to achieve intended effects. Some countries have used the ‘Know Your Epidemic, Know Your Response’ process to discover the extent of disconnects between the dynamics of their epidemic and the resources they have committed to addressing it [42]. Although this process can lead to realignment of resources for improved cost-effectiveness, a recent analysis of HIV prevention spending in 69 low- and middle-income countries with a variety of epidemic types revealed that spending patterns did not consistently reflect either current evidence or the HIV-specific context of each country [43]. Recognition of the culture-specific aspects of microepidemics in a country is an important first step toward development of community-based organizations that can foster locally effective HIV responses [44]. In fact, bold and collaborative leadership in local scale-up of HIV prevention and treatment has been shown to underpin success in countries as varied as Brazil, Botswana, Nigeria, and India [45].

With respect to sexual transmission of HIV, effective HIV prevention programs can contribute to declining incidence trends when they foster changes in sexual behavior toward healthier patterns. Such prevention programming focuses on increasing knowledge, raising awareness, building skills, and creating safer sexual social norms. The agreed indicators being tracked are sex before age 15 years, as reported by young people age 15 to 24 years, and multiple partners in the previous 12 months and condom use at last high-risk sex, as reported by those aged 15–49 years. In 11 countries with adult HIV prevalence greater than 1 %, 5 of which experienced a greater than 50 % decline in HIV incidence, significantly fewer young women are reporting sex before age 15 years [11], suggesting that delayed sexual debut may be contributing to reduced HIV incidence. Changes in the indicators for adult sexual behavior are most striking in 3 countries with 50 % declines (Zambia, Malawi, and Namibia), 2 countries with 26 %–49 % decreases (Kenya and Mozambique), and 1 country with stable incidence but a very large population (Nigeria). However, risky sex is on the increase in some countries (Cote d’Ivoire, Guyana, and Rwanda) and comprehensive and correct knowledge about HIV and its transmission is suboptimal in many countries that

have an adult HIV prevalence over 1 %. For example, less than 50 % of young women in 26 of 31 countries and less than 50 % of young men in 21 of 25 countries conducting surveys had adequate HIV-related knowledge [11].

Progress on increasing access to voluntary medical male circumcision (VMMC) has been slow but steady since WHO/UNAIDS recommended the procedure to reduce the risk of sexual HIV acquisition in young men living in countries with higher HIV prevalence [5]. The potential impact is impressive, with mathematical modelling estimating 16.5 billion USD in cost savings by 2025 in averted HIV infections for a 1.5 billion USD investment to reach 80 % circumcision prevalence by 2015 in the countries with the heaviest HIV burdens [46]. Kenya, Ethiopia, and Swaziland have made the most progress, attaining 20 % of their national targets. In Ethiopia and Swaziland infant male circumcision is now offered to parents routinely. But the promise of male circumcision will not be realized without task shifting and the use of timesaving devices that are currently under evaluation for safety and acceptability [47–49].

## Key Populations

Key populations are defined as those that are key to the dynamics of an epidemic and key to the response to it. Without the explicit and active engagement of a key population in the design, implementation, and evaluation of an HIV prevention program addressing it, the program is likely to fail. Which populations are key will be context-specific but vulnerability, marginalization, and inability to influence the environment within which risk is experienced are hallmarks. Legal and policy barriers in many countries impede HIV prevention programming for sex workers, men who have sex with men, transgendered people, and people who inject drugs. Cultural and economic impediments to education, self-actualization, and financial independence combined with sexual violence heighten HIV risk for young women in southern Africa [50].

Female sex workers were estimated in a systematic review of studies representing almost 100,000 sex workers in 50 countries to have an overall prevalence of 11.8 % and a pooled odds ratio of 13.5 for HIV infection. In 26 countries with medium- and high-background HIV prevalence, HIV prevalence among sex workers rose to 30.7 % with an odds ratio of 11.6 [51]. Almost 75 % of the 59 countries reporting to UNAIDS about sex work indicated that they had implemented comprehensive prevention programs for sex workers, however, most of these appear to be in urban settings and only 11 countries are reaching at least 80 % of sex workers in cities [11]. Where services are provided, 85 countries report that nearly 9 in 10 sex workers used a condom the last time they had sex [12]. Given the disproportionate HIV burden borne by sex workers and the likelihood of onward HIV transmission,

this population should be prioritized for increased access to ART and to antiretroviral-based PrEP. However, this has to go hand in hand with anti-stigma, anti-discrimination, and anti-violence programs, as well as legal and policy changes and engagement/empowerment strategies to change the risk environment in which sex work is occurring [52].

Men who have sex with men (MSM) have a disproportionately high HIV burden, as a result of the high per-act and per-partner transmission probabilities during anal sex, and have higher rates of dual-variant and multiple-variant HIV infection than heterosexual people in the same settings [53]. The global prevalence of HIV among MSM appears to have increased from 2010 to 2012, although data are limited and not readily comparable [11]. Although 146 countries now include MSM in their national strategies, only 104 reported HIV prevalence data in 2012, 62 reported prevention program coverage among MSM, 100 reported HIV testing coverage, and 96 reported on condom use. Median prevention coverage in capital cities was 55 %, a median of 38 % of MSM received an HIV test in the previous 12 months, and 75 % of MSM in only 13 countries reported condom use at last sex [11]. Although funding for HIV prevention among MSM increased between 2006 and 2011, 92 % of all spending on HIV programs for MSM came from international sources [11]. With a high force of infection and clustering of HIV in MSM networks, antiretroviral-based prevention strategies, whether PrEP for HIV-negative men or ART for HIV-positive men, would help control epidemic expansion but would require culturally competent care accompanied by decriminalization and reduction of stigma and discrimination [54••].

Transgender women, estimated at 15 million globally, are at extremely high risk of HIV acquisition compared with other adults, with HIV prevalence as high as 68 % [55] and an odds ratio of being infected of 48.8 (95 % confidence interval 12.2–76.3) without significant differences between high-income and low- and middle-income settings in a recent systematic review and meta-analysis [56•]. Transgender women have a female gender identity but a birth-assigned male sex. Lacking access to information, services, and economic opportunities, up to 44 % of transgender women in high-income countries rely on sex work as their only source of income [57]. A systematic review of studies in 14 countries on 5 continents found that transgender women engaged in sex work are more than 4 times as likely as other female sex workers to be living with HIV [58]. This marginalized highly vulnerable population is below the radar of the majority of national HIV prevention programs, with the result that data on HIV prevalence and program coverage are scarce. Only 43 % of countries report that their national strategies address transgender people and 40 % indicate that government service provision accounts for less than 25 % of the programs and services that are provided [11]. Engaging and empowering transgender women

to have a stronger voice is the only pathway to better surveillance data, representation in HIV prevention research in adequate numbers for analysis, effective prevention programs, and promotion and protection of the rights of this neglected key population.

A striking HIV prevalence, 22 times higher than that of the general population, is found in 49 countries among people who inject drugs (PWID), with 11 countries having 50-fold or more differences [11]. A recent systematic review of studies from 14 countries found a significantly higher HIV prevalence among female compared with male injectors [59], reflecting the increased risks faced by women who inject and who are not reached with HIV prevention services [60]. Although contaminated injecting equipment is the immediate source, augmented by unprotected sexual intercourse, punitive approaches rooted in perceptions of drug injecting as illegal behavior are fuelling expanding epidemics, particularly in Eastern Europe and Central Asia. Globally few countries remain untouched. A systematic review conducted in 2007 found documented injecting drug use in 148 countries, HIV infection associated with injecting in 120 of those countries, and an estimated total of 15.9 million [11.0–21.2 million] PWID, with the largest numbers being in China, the USA, and Russia [61]. Worldwide 3 million (0.8–6 million) PWID may be living with HIV. The HIV prevention evidence base for injecting-related HIV is strong but many countries are neither tracking HIV incidence nor implementing proven effective prevention such as needle-syringe programs (NSP) or opioid substitution treatment (OST). Those that report that they are providing injecting equipment are doing so at a distribution rate of 2 needle-syringes per month, well below the annual minimum threshold of 100 that demarcates low coverage from medium coverage [11]. Among 57 reporting countries, only 39 % of PWID have had an HIV test in the previous 12 months and among 56 reporting countries, only 3 countries reported condom use above 75 % [11]. A global call to action [62] and the 2010 Vienna Declaration [63] emphasize the critical importance of science rather than ideology informing HIV prevention. For example, reducing unmet need among PWID by 60 % for NSP, OST, and ART from 2010 to 2015, would reduce HIV prevalence by 41 %, 43 %, and 30 % in the cities of Odessa, Karachi, and Nairobi, respectively [64•]. With 30 % of new HIV infections outside sub-Saharan Africa attributed to injecting, pragmatic harm reduction approaches, including experimentation with decriminalization of personal drug use, as Portugal has done [65], are needed to slow this expanding epidemic.

Young women constitute a key population in sub-Saharan Africa, with those aged 15–24 years as much as 8 times more likely than young men to be HIV-positive [66]. Although HIV prevalence in young people aged 15 to 24 years fell more than 35 % between 2001 and 2011 [12], young women, particularly in southern Africa, are still experiencing exceptionally high

levels of HIV infection. To achieve greater impact on preventing HIV transmission, an aggressive movement for social transformation is required to address both the immediate practices that lead to HIV acquisition as well as the human rights violations, harmful social norms, weak community and leadership capacities, and disparities that underpin HIV risk for women and for men in southern Africa [67]. The first step is mobilization of communities for HIV prevention, with strong male involvement, to design relevant strategies and messages about the causes, consequences of, and solutions to young women and girls' vulnerability, including 'zero tolerance' for gender-based violence and exploitation.

## Conclusions

As global HIV prevalence stabilizes with increasing ART scale-up and declining HIV incidence in many countries, there is increasing interest in determining the mix of programs and strategies that will be most cost-effective in reducing HIV incidence most quickly in given epidemic settings. In addition to correcting mismatches in resource allocation for HIV prevention, the concept of tracking community viral load (CVL) as a population-level biomarker for HIV burden and potential transmission is compelling [68]. CVL is defined as the mean of the most recent viral load test of all people living with HIV within a specified geographic area over a specified period. Ecological studies have demonstrated correlations between decreases in CVL and reductions in HIV incidence. For example, viral load reductions among PWID in Vancouver were associated with decreased incidence in an HIV-negative PWID cohort [69]. Increased uptake of more effective, potent, and tolerable ART regimens in San Francisco between 2005 and 2008, concomitant with legal changes to facilitate HIV testing, policy initiatives to promote expanded HIV testing, increased acute HIV detection, and partner services, coincided with a significant increase in the population rate of virologic suppression from 46.8 % in 2005 to 78.1 % in 2008. Estimated HIV incidence declined by over one-third between 2006 and 2008 [70•]. New empirical evidence from rural KwaZulu-Natal, South Africa has resoundingly shown that individual HIV acquisition risk significantly declines with increasing community ART coverage [71•]. Finally, CVL could be used to predict the efficacy of early ART for prevention programs [72].

Future trends in the global HIV epidemic will be determined by the actions of individuals, couples, and communities but, ultimately, it will be policy makers, implementers, civil society, and funders that will be held accountable for choosing, implementing, and evaluating tailored prevention packages judged to be optimal in specific circumstances [73], at the same time that they scale up ART with its proven prevention benefits and tangible impact on life expectancy [74]. As the population of people living with HIV continues to age,

increasingly attention will need to turn to the challenges of HIV and aging [75]. The potential for accelerated declines in HIV incidence before the advent of an efficacious HIV vaccine is real. The glass is half full and the time to act is now.

**Acknowledgments** The author thanks Deborah Birx of the Division of Global HIV/AIDS, Center for Global Health, US CDC for data compilation for Tables 2 and 3, and Gabriela Gomez, Marja Nieuwpoort, and Linde Nieuwenhuys of the Amsterdam Institute for Global Health and Development for their assistance with article retrieval and references.

**Conflict of Interest** Catherine Hankins receives consulting fees from Amsterdam Institute for Global Health and Development.

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