Chapter 1

Epidemiology of HIV/AIDS in Low and Middle Income Countries: Where Global AIDS is and Where it is Going

David D. Celentano , Wendy W. Davis , and Chris Beyrer

Introduction

The Global AIDS Pandemic as of 2007

As of December 2007, UNAIDS estimated that the number of people living with HIV in 2007 was 33.2 million, including some 30.8 million adults, half of whom were women, and 2.5 million children under the age of 15 years (UNAIDS, 2007) (Figures 1.1–1.4).

Of those infected with HIV, 2.5 million (including 420,000 children) were infected that year, and 2.1 million people died of AIDS and its complications, including 330,000 children. While these numbers are staggering, the estimate of the total number of people living with HIV worldwide was 16% lower than the UNAIDS estimate of a year earlier, in December 2006 (UNAIDS/WHO, 2006). What could account for such a marked revision in the world's estimated HIV/AIDS figures? How much of this decline is an artifact of data collection and analysis, and how much represents a "real" decline in the global burden of HIV diseases?

At its simplest, the answer to both sides of this question is "data". The largest component of the downward revision was the more than halving of the estimates of the state of the epidemic in India, where a massive household survey that included anonymous HIV testing was conducted in over 100,000 households across the country. This study demonstrated that the oversampling of urban populations and of those at higher risk had likely skewed the estimate for Indian adults ot reproductive age too high. Because of India's

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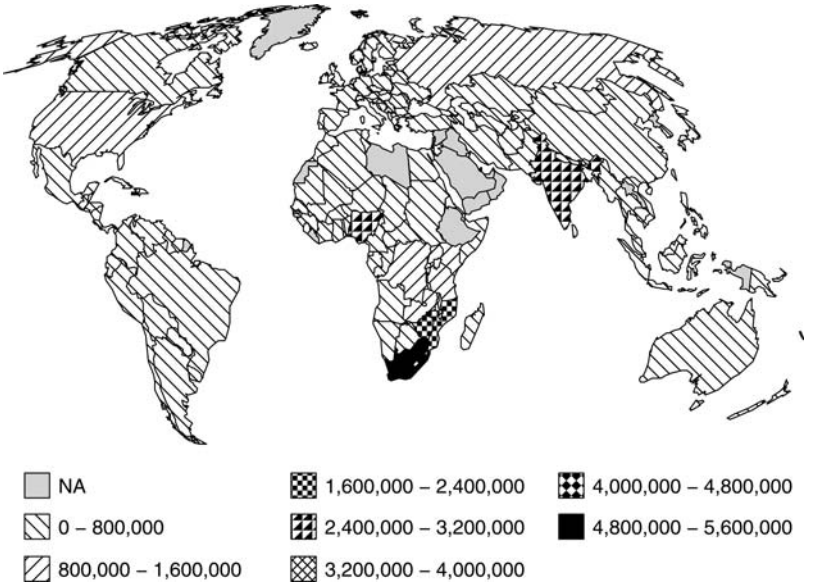

Figure 1.1 People living with HIV/AIDS (adults and children), 2005.
Source: Adapted from The Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: UNAIDS, *2006 Report on the Global AIDS Epidemic*, May 2006. Source for India: NACO/UNAIDS/WHO, "2.5 million people in India living with HIV, according to new estimates," Press Release, July 2007.
Note: Countries for which no data were available or where estimates were given as a range and that range can not be incorporated into ranges already designated in the figure are marked NA.

massive population, even a modest over estimate of prevalence yielded several million excess estimated HIV infections. But some of the reduction in the size of the international epidemic now being seen is likely to be due to real declines in numbers of new infections, as well as deaths due to AIDS. These declines are almost certainly due to behavioral risk reduction, such as has been seen in Kenya and Zimbabwe, and in Southeast Asia, most notably in Thailand and Cambodia. These changes, along with improved sentinel surveillance, and more reliable data from large national population-based health surveys, where the estimates showed that the prior figures exaggerated the current state of the epidemic, have all impacted the overall picture of AIDS as we now understand it in 2007 (UNAIDS, 2007).

Despite these gains, the HIV pandemic remains the highest priority infectious disease challenge to the world's health. New regions, including Central Asia and the Former Soviet Union, are in relatively early stages of their epidemics, and could face expanding epidemics if prevention programs are not implemented much more quickly than they now are. Each day, 6,800 new HIV infections occur, accompanied by over 5,700 deaths, two extraordinary numbers. Why are these numbers continuing to mount at a time when we have evidence-based prevention successes and proven therapies to lead to remarkable physical recovery from HIV infection? First, only a small percentage of the world's population has access to effective HIV prevention services (or, are willing to access them, for fear of stigma or discrimination if they are found

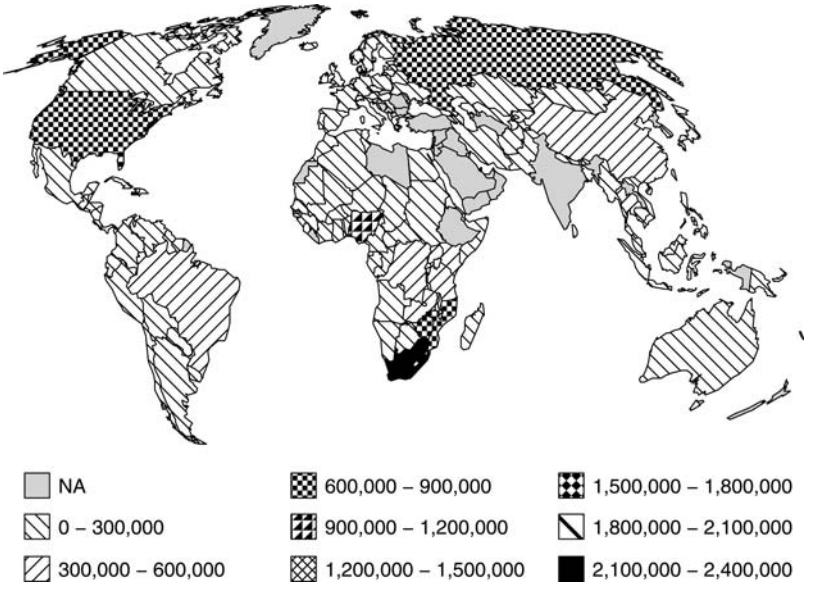

Figure 1.2 Men living with HIV/AIDS (aged 15 and over), 2005.
Source: Adapted from The Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: UNAIDS, *2006 Report on the Global AIDS Epidemic*, May 2006.
Note: Estimates for men were derived from estimates of HIV/AIDS among adults (aged 15 and over) and women (aged 15 and over). Countries for which no data were available or where estimates were given as a range and that range can not be incorporated into ranges already designated in the figure are marked NA.

to be HIV infected). Second, only a modest percentage of HIV infected persons indicated for treatment are able to get on effective therapy. While some remarkable scale-up programs have been reported, overall, most persons who need antiretroviral (ART) treatment cannot obtain it—it is either not available or it is economically out of the reach of the world's poor, who bear the brunt of the HIV/AIDS epidemic (Figures 1.5–1.7).

Where ART is available, it is often limited to one or two regimens only, not the many options for treatment open to patients and providers in the best-resourced settings—this limits the benefits of treatment considerably, and remains a challenge across the low and middle income countries affected by AIDS.

Globally, HIV incidence (the rate of new infections) is slowing in many regions of the world (with some marked exceptions, detailed below), yet HIV prevalence (the overall rate of infection in a population, including old and new infections) in many settings is growing. This paradoxical finding has a simple explanation: people with HIV infection live longer than they did in the past. This has occurred for two reasons: large segments of people living with HIV/AIDS (PLWHAs) have access to ART, and respond favorably to it; at the same time, older estimates of the time between HIV infection and the onset of clinical AIDS were grossly underestimated (the recent modeling of HIV disease shows that in Africa, the median time between becoming infected and the onset

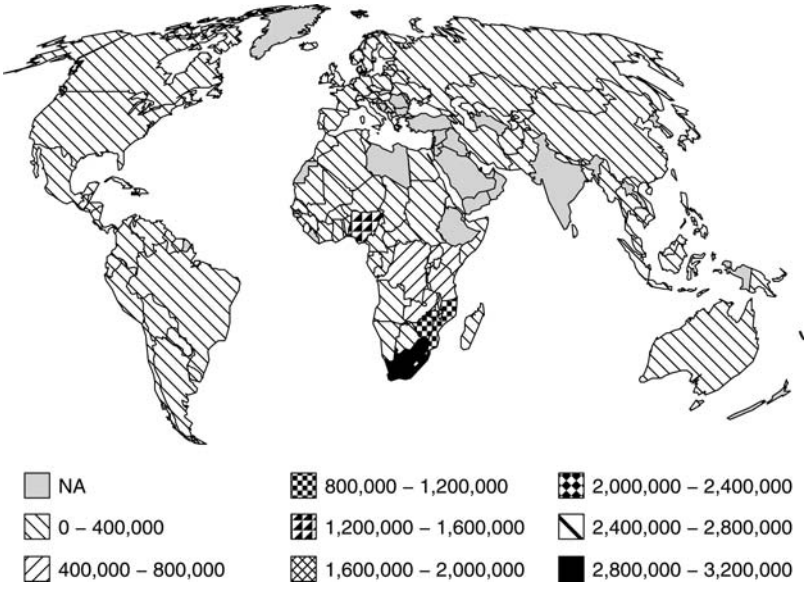

Figure 1.3 Women living with HIV/AIDS (aged 15 and over), 2005.
Source: Adapted from The Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: UNAIDS, *2006 Report on the Global AIDS Epidemic*, May 2006.
Note: Countries for which no data were available or where estimates were given as a range and that range can not be incorporated into ranges already designated in the figure are marked NA.

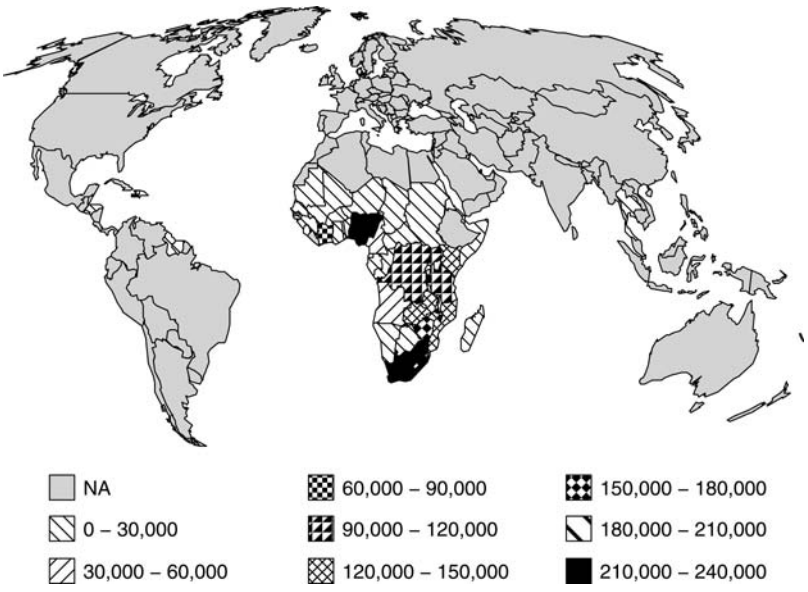

Figure 1.4 Children (less than 15 years old) living with HIV/AIDS, 2005.
Source: Adapted from The Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: UNAIDS, *2006 Report on the Global AIDS Epidemic*, May 2006.
Note: Countries for which no data were available or where estimates were given as a range and that range can not be incorporated into ranges already designated in the figure are marked NA.

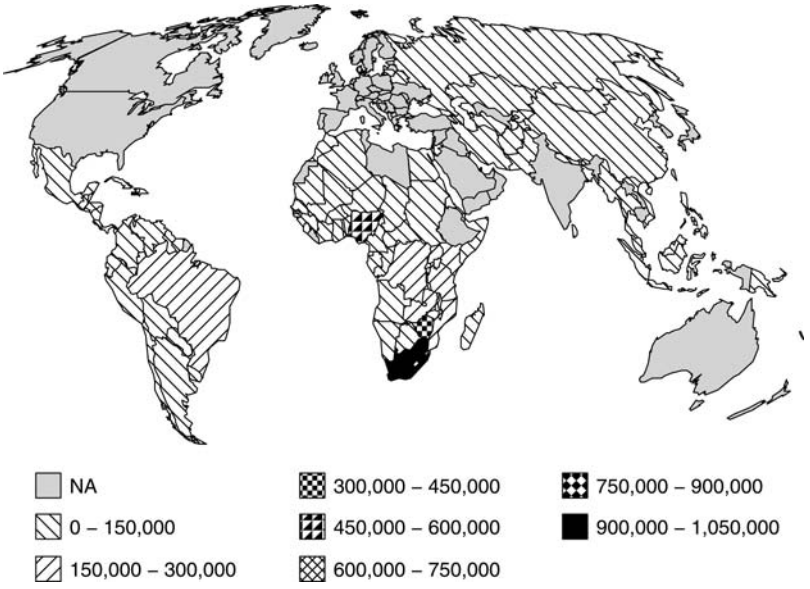

Figure 1.5 Estimated number of people needing antiretroviral therapy, 2006.
Source: Adapted from The Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: WHO/UNAIDS/UNICEF, *Towards Universal Access: Scaling Up Priority HIV/AIDS Interventions in the Health Sector, Progress Report*, April 2007.
Note: The estimated number of people with HIV/AIDS in need of antiretroviral treatment includes both those who are currently receiving treatment as well as those who are not receiving treatment, but who meet WHO treatment recommendation guidelines. Countries which are not considered to be low or middle income, or for which no data were available or where estimates were given as a range and that range can not be incorporated into ranges already designated in the figure are marked NA.

of AIDS is now estimated at 11 years, not the 9 years formerly used) (UNAIDS, 2007).

UNAIDS/WHO refer to national or regional HIV epidemics as conforming to two broad categories: *generalized epidemics* occur when HIV infection is estimated at 1% or greater in the general population of reproductive age adults (generally adults aged 15–49), while *concentrated epidemics* occur when the population prevalence is below 1% in the general population, but where specific subpopulations (such as injection drug users [IDU], men who have sex with men [MSM], or female sex workers) are found to have prevalence rates of 5% or higher—and generally they are much higher. Overall, based on the most recent estimates derived from sophisticated statistical models, it appears that the HIV pandemic peaked in 2000, with stabilization overall, but a marked decline in prevalence in Sub-Saharan Africa that continued its downward trajectory from 2000 to the present day (UNAIDS, 2007). This reflects both a reduction in new infections (now estimated to have occurred in the late 1990s), attributed to both epidemiological factors and to the uptake of HIV prevention strategies and a decrease in the AIDS death rate due to the scale-up of ART treatments (since 2005). Globally, in 1990, 45% of the world's AIDS cases were among women, which gradually rose to parity in 1995, where the sex ratio has remained to this day.

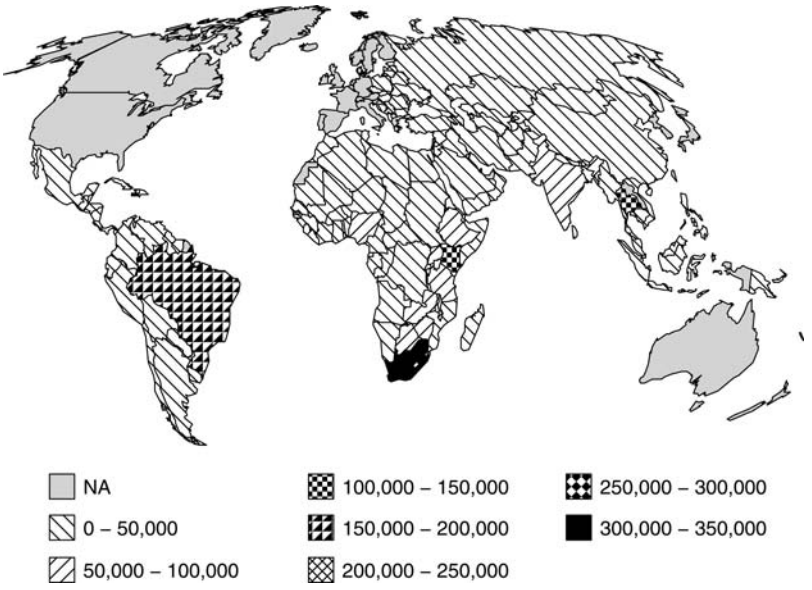

Figure 1.6 Estimated Number of People Receiving Antiretroviral Therapy, 2006.
Source: Adapted from The Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: WHO/UNAIDS/UNICEF, *Towards Universal Access: Scaling Up Priority HIV/AIDS Interventions in the Health Sector, Progress Report*, April 2007.
Note: The current estimates of the numbers of people receiving ARV therapy are based on the most recent reports received from the local ministries of health, WHO or UNAIDS country offices, or from reliable sources in the countries concerned, such as bilateral partners, foundations and nongovernmental agencies that are major providers of treatment services. Countries which are not considered to be low or middle income, or for which no data were available or where estimates were given as a range and that range can not be incorporated into ranges already designated in the figure are marked NA.

While Sub-Saharan Africa remains the region hardest hit by the HIV/AIDS pandemic (home to two-thirds of adults and 90% of children infected with HIV, and the region accounting for 76% of the AIDS deaths in 2007), the adult prevalence is now estimated at 5% (with a range of 4.6–5.5%). However, this masks the significant sub-regional pandemics, which range from <2% in countries of the Sahel, to above 15% in southern Africa (where South Africa alone accounts for one-third of the incident infections and deaths in 2007). Other important regions include South and Southeast Asia (340,000 new infections) and Eastern Europe (150,000 incident cases), fueled by epidemics among IDUs and erosion of the health care system. Stable (and much lower) numbers are reported for the Latin America and Caribbean regions, America and Western Europe where the epidemics have shifted from predominately MSM to poor and minority populations and where MSM HIV rates, nevertheless, remain high. In particular countries, for example, Vietnam and Indonesia, the number of cases are mounting (Figure 1.8).

Of particular concern to the public health community is the course of the AIDS pandemic among young people, aged 15–24, as this particularly hard hit age group represents the economic future of the world and the most reproductively active segment of the population. The United Nations' 2001

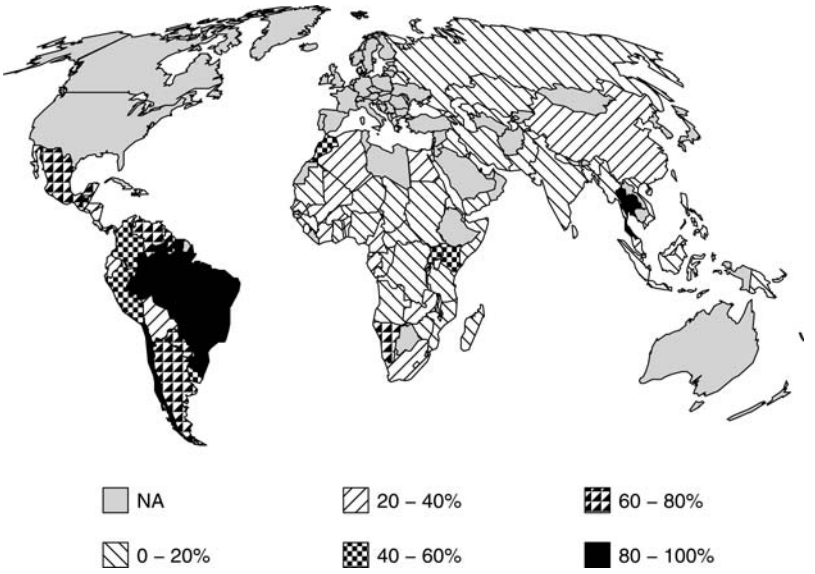

Figure 1.7 Antiretroviral therapy coverage rate in low- and middle- income countries, December 2006.
Source: Adapted from the Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: WHO/UNAIDS/UNICEF, *Towards Universal Access: Scaling up Priority HIV/AIDS Interventions in the Health Sector, Progress Report*, April, 2007.
Note: The coverage rate is a measure of the number of people estimated to be receiving antiretroviral therapy divided by the total number of people estimated to need treatment. Countries which are not considered to be low or middle income, or for which no data were available or where estimates were given as a range and that range can not be incorporated into ranges already designated in the figure are marked NA.

Declaration of Commitment on HIV/AIDS (the first UN Assembly devoted to the AIDS pandemic) made a goal of reducing HIV by 25% in young people. The WHO/UNAIDS Working Group on Global HIV/AIDS and STI Surveillance undertook an analysis of HIV prevalence in 35 countries whose national HIV prevalence exceeded 3%. Data from the 2007 UNAIDS report showed a decline in 11 of 15 countries where prevalence data from at least three years had declined since the turn of the millennium, significantly in five cases (Kenya, Botswana, Cote d'Ivoire, Malawi and Zimbabwe). No change was seen in post-conflict Mozambique, or in South Africa or Zambia. In 9 of the countries assessed, sufficient data on sexual behavior existed to address progress in meeting the UNGASS goals. In two countries, (Haiti and Kenya), significant risk reduction was noted, with mixed results (for one gender, for example) seen for other countries for specific behaviors (sex with a non-regular partner and condom use with a non-regular partner). The paucity of data and the meager results reported suggest that prevention programs have a long way to go to meet international goals.

The HIV pandemic has also been accompanied by a resurgence in the tuberculosis pandemic globally. Particularly in Sub-Saharan Africa, AIDS has undone the impressive gains shown in child survival. In addition, life expectancy has declined most dramatically in countries most affected by the HIV

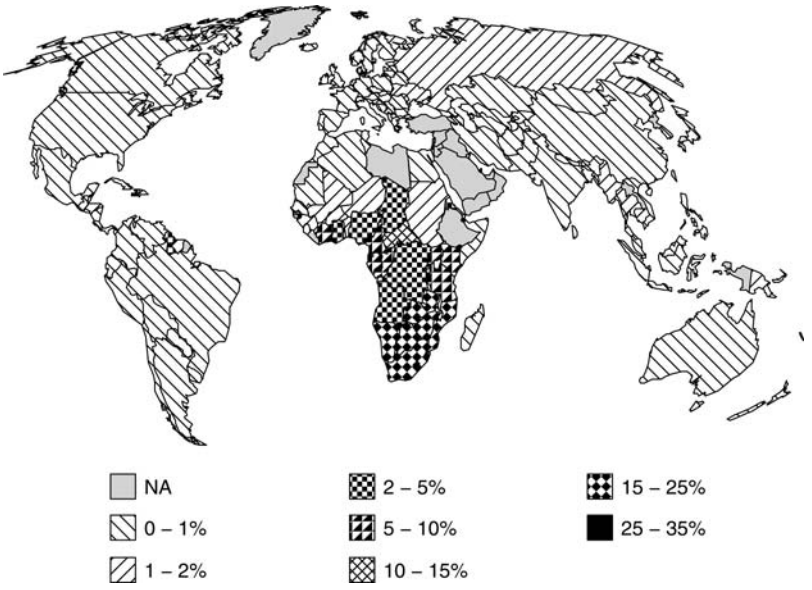

Figure 1.8 Adult HIV/AIDS prevalence rate (aged 15–49), 2005.
Source: Adapted from The Kaiser Family Foundation, GlobalHealthFacts.org.
Data Source: UNAIDS, *2006 Report on the Global AIDS Epidemic*, May 2006. Source for India: NACO/UNAIDS/WHO, "2.5 million people in India living with HIV, according to new estimates," Press Release, July 2007.
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pandemic, distorting demographic profiles (Lamptey, Johnson, & Khan, 2006). Clearly, no segment of the world's population seems to have been spared the consequences of AIDS, including social and economic impacts, where HIV has exceeded the capacity of public health authorities and budgets to provide care in an equitable manner. Further, funds spent on HIV/AIDS poaches on the funds needed to treat other important and priority health problems, and the losses of significant medical personnel to death, overwork, and migration cannot be minimized. Finally, the political nature of health and governmental response have shaped both the response to the AIDS pandemic and its consequences in terms of morbidity and mortality.

Sub-Saharan Africa

The devastation caused by AIDS in Sub-Saharan Africa, while commonly acknowledged globally, is hard to appreciate. It swamps the deaths caused by the great plague of 14th Century Europe and all of the war dead in the world in the 20th Century. It has torn apart economic gains from international aid programs from post-World War II to the present day despite trillions of dollars invested in the continent. The economic impact of reduced manpower will have long-lasting effects. Nevertheless, some gains over HIV have been made, and an international response to the pandemic is showing some hopeful signs.

National adult HIV prevalence in Southern Africa exceeded 15% in eight countries in 2007—Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. Most of the remaining countries in Southern Africa, however, have recently shown a stabilization in HIV prevalence (Asamoah-Odei, Carcia-Calleja & Boerma, 2004). The declining prevalence in Zimbabwe is a function of a very high death rate and a decline in HIV incidence, which is in part due to behavior change (Hallet et al., 2006), and of the massive out-migration of young Zimbabweans in the wake of that countries' economic collapse and political repression. Consistent condom use with non-regular partners has increased significantly in women in Manicaland, but not in men (Gregson et al., 2006), leading to a shift in HIV incidence.

While South Africa is home to the greatest number of HIV cases in the world, recent data suggest that the epidemic may have plateaued recently (Department of Health South Africa, 2007), as evidenced by antenatal clinic data, although significant regional differences continue to exist. However, rates in pregnant women may reflect behavior change (increased condom use with non-regular partners and partner reduction), deaths of spouses, or reduced fertility among HIV-infected women (thereby reducing the rate at which HIV infected women require antenatal care, biasing the numerator downwards).

East Africa

The HIV epidemic in Uganda peaked in the early 1990 s and declined until early 2000 (UNAIDS, 2007). This is attributed to behavior change associated with an intensive national health education campaign with the strong backing of President Museveni (Asamoah-Odei et al., 2004). However, given the total fertility rate in excess of 6, this may indicate a growing incidence in the overall population. Recent data provide a worrisome picture for the future, where rises in risk behaviors have been reported in national surveys, suggesting caution (Kirungi et al., 2006).

Kenya has shown a remarkable shift in its HIV prevalence, declining from nearly 14% in the mid-1990 s to 5% in 2006 (UNAIDS, 2007). Hallett et al. (2006) reported a dramatic decline in the antenatal clinics from 28% in 1999 to 9% in 2003 among women 15–49 years of age. Declining trends have been reported in virtually all areas of this region (UNAIDS, 2007).

West and Central Africa

The epidemics in West and Central Africa are smaller than those seen in other sectors in Sub-Saharan Africa, and national HIV prevalence rates appear to have reached a plateau. Nigeria has the most extensive epidemic in this subregion, although the epidemic is widely varying geographically across this large country—Africa's most populous. A Demographic and Health Survey conducted in Mai in 2006 suggests a decline in the national epidemic, where the HIV prevalence is estimated at 1.2%. The Central African Republic has the highest adult prevalence in this region, with women vastly outnumbering men, and again, showing wide regional variation.

South and Southeast Asia

The Southeast Asian region has higher HIV prevalence than the rest of Asia and demonstrates wide divergence in its epidemics. Over the past several years, declines in prevalence have been reported in Cambodia, Thailand and Burma, although the data on the latter situation can be considered unstable and perhaps not valid. HIV has been reported in all Chinese provinces and autonomous regions, with about half of all infections attributed to IDU. MSM are viewed as an emerging epidemic risk group (Choi, Liu, Guo, Mandel, & Rutherford, 2003), and concern has been noted that female sex workers often have substance abuse problems. In 2007, India estimated that it has 2.5 million persons living with HIV, substantially less than the 2006 UNAIDS estimate of 5.7 million. The lower India rate is based on recent data—from the 2005–2006 National Family Health Survey, and an expanded national surveillance system. Virtually all the Indian states report concentrated epidemics in specific districts or risk groups, and the epidemic is not thought to have reached the general population as of yet. The Northeast Indian States of Manipur and Nagaland, both on the border with Burma, have distinct epidemics with high rates of HIV infection in IDUs, and the highest ANC rates reported in India.

In Vietnam and Pakistan, there are concerns with rising HIV infection rates associated with injection drug use. Increasingly, women are being counted among the epidemic numbers, a reflection of their male partners' risk. Indonesia, the most populous Southeast Asian country, has seen a major rise in HIV rates, attributed to shared injection equipment among IDUs and unprotected sex with sex workers. Thailand has shown a remarkable downturn in its HIV epidemic, from a peak in 1993–1994, as a result of a vigorous campaign against unprotected sex in commercial sex establishments. So too has been its response to the medical care needs of the HIV infected, where over 80% of adults in need of ART have access, and almost 90% of pregnant women at risk of transmitting HIV to their unborn children receive treatment during labor and delivery.

Eastern Europe and Central Asia

Approximately 1.6 million inhabitants of Eastern Europe and Central Asia have HIV, with 150,000 new cases in 2007, and 90% of new cases occurring in the Russian Federation and Ukraine. Among the Central Asian epidemics, which are small in comparison to other affected regions, the epidemic in Uzbekistan is increasing at the fastest rate. While the Russian Federation epidemic appears to have reached a peak in 2000, cases continue to mount, particularly among IDUs. Heterosexual intercourse is also of growing importance. Meanwhile MSM in Ukraine appear to be a particularly hard-hit population. Remaining countries in this region demonstrate rather early epidemics which have the opportunity to be contained if prevention programs are rapidly put into place. The injection drug use driven epidemics of this region are of particular concern because one of the key drivers of HIV spread, heroin availability, has markedly increased, due almost entirely to enormous increases in heroin production and distribution from Afghanistan. The 2006 production of over 6,400 metric tons of opium base from Afghanistan is the largest the world has seen, and suggests the Central Asian States are likely to see cheap and widely available heroin flows for the foreseeable future.

Latin America and the Caribbean

Two nations in the Caribbean dominate their neighbors in terms of HIV prevalence—the Dominican Republic and Haiti. Gaillard et al. (2006) suggest that behavior change in Haiti accounts for some of the declines recently seen in HIV prevalence among reproductive aged women (although mortality no doubt plays an important role as well). Recent prophylactic vaccine trials conducted in the Dominican Republic among female sex workers have seen few HIV seroconversions, suggestive of adoption of condom use with clients (Kerrigan et al., 2006). In other island nations, HIV has been stable over the past several years.

In Latin America, Brazil is home to about a third of HIV infections in this sub-region. As was seen in Asia, while the epidemic originated among MSM, it shifted to IDUs and then to their heterosexual partners. The recent leveling of the Brazilian urban epidemic is attributable to harm reduction, adoption of prevention strategies and mortality, especially among IDUs (UNAIDS, 2006). Other important epidemics are found in Mexico and Colombia, attributable to MSM and IDUs. In Peru, MSM infections predominate, as they do in several other low prevalence states in the region.

Principal Themes in HIV and the Organization of This Book

The fields of investigation underlying HIV research on prevention and care have been quite interdisciplinary, each bringing their own scholarly approach and methods to the table. We can broadly characterize these three primary groups as epidemiology, prevention, and AIDS treatment. This book covers a number of key themes related to prevention and treatment first, which we acknowledge can be somewhat difficult to summarize, as the field is rapidly changing, with trial results sending researchers off on a number of new avenues. The first section of the book presents the current state of evidence from research and practice on the basic building blocks of HIV prevention and care. First, Tarakeshwar, Kalichman, Simbayi and Sikkema, prevention scientists, review what we know about primary and secondary prevention, and what obstacles exist in the application of known prevention strategies that have proven efficacy. Hoffmann, Mills and Gallant, who are well versed in the clinical management of HIV disease, review the basic package of HIV care. Mukherjee, from Partners in Health, reflects on the scale-up of HIV care in Haiti, Rwanda, Lesotho and Malawi, where a particular model of AIDS care has been developed, and speaks from vast experience at the challenges in developing a system of care in impoverished settings.

Next, Barnabas, Duerr, and Wasserheit from the HIV Vaccine Trials Network, summarize the current state of the AIDS prophylactic vaccine research effort, and review many of the obstacles and experiences we have had in the over 20 year effort to develop an AIDS vaccine. McGowan, a leader in the field of microbicide development, traces the early roots of microbicide work, reviews the mechanisms by which proposed microbicides might have their action, and comments on the recent trials that have been stopped early due to futility analyses (or, an inability to detect a difference in trial arms over a prolonged period

of time). Galvao and colleagues from Brazil present a compelling case study of how the unfolding AIDS epidemic in Brazil shaped the public's response, from initial government denial, to the emergence of civil society and interested insiders, to the concerted efforts to provide access to antiretroviral drugs to all in need at no cost. Bass, Gonsalves and Katana next take on the issues of advocacy, activism and community—key factors in many responses (and in some cases, the only effective voice) to local HIV epidemics. As they point out, vocal calls for equality, for awareness and against discrimination were needed to allow the AIDS issue to become noticed and given credence as a significant public health concern. Finally, Auerbach and Mulhern-Pearson, both from the San Francisco AIDS Foundation, take on the issues of outlining the political challenges and processes that impede or promote HIV prevention and care needs in the developing world. It has been clearly shown that political will is one of the most potent ingredients for a nationally effective HIV response, and political opposition can be the major brake in many countries. Witness the difference between the statements and policies of President Musuveni in Uganda and President Mbeki in South Africa.

The second section of the book presents regional reviews of these themes, either by sub-region or by individual country. Laga, Matendo and Buve from the Antwerp Institute of Tropical Medicine, consider Congo and Central Africa, widely believed to be the "birthplace of HIV". They review the epidemiology, prevention and care issues, and the local political processes important in forming a response to the epidemics by governments. Blattner and his colleagues from Nigeria and the University of Maryland, take on Nigeria and West Africa, while Weiss, Merle, Serwadda and Kapiga review the evidence from East Africa (comprising primarily Kenya, Tanzania and Uganda). McIntyre, De Bruyn and Gray from the University of Witwatersrand, review the complicated stories in Southern Africa, commenting upon the similarities and differences in epidemiology, prevention and care, and governmental response in the region most heavily affected by the AIDS epidemic. Finally, Simmons and colleagues from Ethiopia provide a picture of the HIV/AIDS situation in the Horn of Africa, with a focus on Ethiopia, but with reference to Somalia, Djibouti, Eritrea and Sudan. In each of these regional reviews, similarities and differences in the epidemiology, in governmental and civil society response to the epidemic and response are presented and discussed, to illustrate the diversity in experiences and to provide the backdrop to understand why the HIV epidemics in Africa are so varied.

Next we move to South and Southeast Asia. Each of the countries included in this volume have had quite different experiences with HIV. Zunyou Wu and his collaborators discuss the unfolding of the HIV epidemic in China, its roots in the blood scandals of the 1990s and the rapid rise of HIV among IDUs, and how Chinese society has rapidly changed its political stance towards HIV in recent years, rolling out a major HIV program based on harm reduction and contemporary drug abuse treatment, while also coping with a mounting population requiring HIV medical care. While some have feared that China could "explode" like Africa, it seems unlikely today that this will happen. Chariyalertsak, Aramrattana and Celentano review the history and response to HIV in Thailand, and provide the background to the widely acclaimed 1991–1995 "100% Condom Campaign" and the more recent disastrous "War on Drugs" of 2003, each of

which shaped government and societal views on HIV prevention and care. The rationale for the compassionate response to the heterosexual epidemic and the antipathy held for IDUs and MSM is also addressed.

Next, Beyrer and colleagues from the U.S. and Burma review the very different response to the HIV/AIDS epidemic by Burma, a neighbor of Thailand. The political oppression of the military junta in power in Burma for the past 40 years is the major theme of this epidemic of avoidance. While the UNAIDS reports reductions in prevalence among antenatal clinic patients, the data on which these statistics are based are suspect. Quan, Hien and Go review the situation in Vietnam, which is one of the few Southeast Asia countries experiencing a current rapidly escalating epidemic. Providing primary analysis of national sentinel surveillance data, the authors demonstrate that HIV among IDUs is the engine behind this epidemic. Nevertheless, with strong multinational financial assistance, Vietnam is rolling out a national response to HIV that may be in sufficient time to control their epidemic. In stark contrast to the experience in Vietnam, the recent political shift towards injection drug use and HIV/AIDS in Malaysia, as outlined by Kamarulzaman and Razali, is incredible. In this largely Muslim country with a long anti-drug stance, a shift in political will has allowed the widespread roll-out of harm reduction approaches to the IDU-associated HIV epidemic. The context for these changes forms the basis for this chapter. Finally, Solomon, Sivaram and Solomon, students of the India HIV epidemic, provide a summary of the widely varying HIV epidemics encountered in India, from the drug-fuelled epidemics of the Northeast, to the Hindi epidemics related to unprotected sex. The recent focus on evidence-based data on the HIV epidemic led Indian government officials to officially cut the HIV prevalence estimate 60%, which of course clearly demonstrates the power of data in statistical estimation.

Sharma, Lioznov and DeHovitz present data from the Russian Federation in the next section on Eastern Europe and Central Asia. The Russian epidemic took off following the breakup of the Soviet Union, and was primarily a function of injection drug use and unprotected sex. However, the response by the government can be considered to be behind the times, demonstrating how fiscal conservatism influences response. The experience in Tajikistan, Uzbekistan and Kyrgyzstan are carefully contrasted by Wolfe and colleagues. They demonstrate how lack of financial resources can be overcome by sectors of society outside of the government, and that an active response may be in part claimed as preventing the further development of this epidemic. Finally, Schottenfeld and Mokri carefully describe the recent epidemic of HIV in Iran, which is primarily associated with IDU. In a similar fashion as in Malaysia, the conservative government of Iran embraced the principals of harm reduction, which allowed for a compassionate response to the HIV prevention needs of IDUs. This experience is exceptionally limited in the world.

Finally, we end with a review of country responses to HIV epidemics in Latin American and the Caribbean. Konda, Caceres and Coates consider the evidence from Peru, which is a largely MSM epidemic. They describe the central role that bisexuality plays in this epidemic, and how advocacy and civil society played an important role in prodding a hesitant government (and religious institutions) to respond. This is contrasted with the situation in Brazil, where Bastos and colleagues address the key role of activism and advocacy taking the country

down a very different path—one where universal treatment was the goal in a society where HIV was affecting many segments of society. Rather than breaking patent laws, as is often asserted, Brazil worked to convince pharmaceutical manufacturers to lower costs to an affordable level. In the Dominican Republic, Kerrigan, Barrington and Moreno Montalvo describe the important epidemiologic factors underlying this island nation's epidemiology and its response to sex work. In a situation of extreme poverty, high-end international resorts, and low levels of education and knowledge about HIV, the epidemic took off—yet, it never reached the situation seen in Southern Africa. Finally, Koenig and colleagues describe their experiences with HIV in Haiti, describing the initial unveiling of the epidemic seen and reported by Pape and Farmer, the impact of the rapidly escalating epidemic of tuberculosis and the sheer will to provide access to treatment for the scores of patients with AIDS. Much has been learned about the approaches taken by educators and providers of HIV care in Haiti which has been replicated throughout the world.

We close this volume with a review of the experiences that low and middle income countries have had in responding to the AIDS epidemic. We consider the features that lead to a progressive, proactive response to HIV, and the necessary components of a successful program. We also highlight the immense gaps that remain if we are truly to have an important impact on further slowing this greatest of viral epidemics. It is certainly within our grasp, and the necessary elements exist; what has held us back as a global community are the many challenges raised by an epidemic spread through human sexual and drug using behaviors, affecting countries with limited public health systems, and by the very tenacious and difficult nature of our enemy—the HIV virus. Despite these challenges, the public health response to HIV/AIDS has been remarkable—and the authors you are about to read have all played significant roles in that response. HIV/AIDS is an unfolding story, and one that will likely be with us for decades to come at best, but it is also of story of remarkable scientific and human achievement.

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