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The Demographic Impact of HIV/AIDS

BRYNN G. EPSTEIN

It is now 20 years since the first cases of acquired immune deficiency syndrome (AIDS) were discovered in sub-Saharan Africa. At the beginning of the third decade of the global pandemic, AIDS has reversed gains in life expectancy and improvements in child mortality in many countries; mortality among the population aged 15–49 has increased manyfold, even in countries with modest epidemics.¹ AIDS is the leading cause of mortality among adults (WHO, 2004). According to estimates by the Joint United Nations Programme on AIDS (UNAIDS), as of the end of 2003, over 20 million people had died of AIDS. Some 38 million people are estimated to be living with the human immunodeficiency virus (HIV), the virus that causes AIDS, the overwhelming majority of whom—over 90 percent—are in the developing world.

In the absence of drug therapy, survival with HIV/AIDS is estimated to be around 10 years. Because of this lag between infection and death, the deaths of those who were infected with HIV in the early 1990s are amplifying mortality rates today. In sub-Saharan Africa the increase in mortal-

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¹World Health Organization (WHO, 2004). For Thailand, a country with an estimated adult HIV prevalence rate of “only” 1.5 percent (Joint United Nations Programme on HIV/AIDS, 2004a), the WHO estimates that the “crude mortality rate for those aged 15–49 years almost doubled from 2.8 to 5.4 per thousand between 1987 and 1996” (WHO, 2004, p. 6).

ity due to AIDS is already a significant demographic event, effectively negating earlier progress made in such key human development indicators as infant mortality and life expectancy. The spread of HIV/AIDS is also affecting the attainment of almost all of the Millennium Development Goals adopted by the United Nations in 2000. In the absence of broad access to treatment, HIV/AIDS will result in radical changes in the size and structure of the population in many of the world's poorest countries.

HIV serosurveillance studies (studies based on blood tests, mainly from antenatal clinics) compiled by the U.S. Census Bureau in the HIV/AIDS Surveillance Data Base since 1987 provide some picture of the state of the epidemics in Africa, Asia, Latin America, the Caribbean, and Eastern Europe. The Census Bureau conducts further analysis of the demographic effects through estimates of AIDS mortality for countries in the developing world where the epidemics have reached a significant level. These estimates are incorporated into population projections for 56 countries to give a picture of the effect of AIDS mortality on population characteristics (see Box 1.1 for a description of this methodology). This chapter outlines the state of the various epidemics in those regions most seriously affected. It also assesses the current and future impact of HIV/AIDS on several demographic indicators for 15 countries in Africa, Asia, Latin America, and the Caribbean that are representative of the diverse global epidemics.

In addition, this chapter elaborates on certain demographic events specific to the HIV/AIDS pandemic. The mortality and morbidity associated with AIDS make it unlike most other types of sickness and disease. Whereas most diseases prey largely on the very young, the old, or the weak, the way in which HIV is contracted and spread makes young adults, and especially young women, the most vulnerable. As a result, in countries with high HIV prevalence, the socioeconomic consequences of high mortality among adults can be far-reaching, devastating households, families, and communities and eroding formal and informal mechanisms of social support.

History and State of the Pandemic

The global HIV/AIDS pandemic consists of many separate epidemics, each with its own distinct origin in terms of geography and population groups affected, and each involving different types and frequencies of risky behaviors and practices. Sub-Saharan Africa is the region of the world most severely affected by AIDS. Despite being home to just over 10 percent of the world's population, it has two-thirds of the world's HIV-positive people

Box 1.1. Methodology for Estimating AIDS Mortality

The U.S. Census Bureau compiles HIV prevalence information for developing countries in its HIV/AIDS Surveillance Data Base. This database contains over 75,000 records from various publications and surveillance reports. HIV prevalence points taken from this database are the basis for projecting HIV prevalence, estimating AIDS mortality, and estimating and projecting the impact of AIDS on the number of orphaned children.

To obtain estimates of AIDS-related mortality, a new application developed at the Census Bureau incorporates estimates of HIV prevalence from the Estimation and Projection Package (EPP), an epidemiologically realistic model developed and used by the World Health Organization (WHO) and the Joint United Nations Programme on AIDS (UNAIDS). EPP produces a national “best fit” curve of adult HIV prevalence using sentinel surveillance data pertaining to pregnant women. We use country-specific adult HIV prevalence estimates from EPP for years from the beginning of the epidemic to 2010.

The Census Bureau application applies assumptions from the WHO/UNAIDS Epidemiological Reference Group about the age and sex distribution of HIV incidence, sex ratios of new infections, the mother-to-child transmission rate, and disease progression. The model allows for competing risk of death and projects HIV incidence implied by the EPP estimates of HIV prevalence through 2010, assuming a decline in HIV incidence of 50 percent by 2050. The model can include the impact of antiretroviral therapy, but the current projections assume that no one will receive treatment.

This methodology works in conjunction with the Census Bureau’s cohort component Rural-Urban Projection (RUP) program, which is used to prepare population estimates and projections. RUP is used to produce the with-AIDS and without-AIDS scenarios.

A with-AIDS series is generated, showing what has happened and what is projected to happen in a country as a result of AIDS mortality and its demographic consequences. Next, a hypothetical without-AIDS scenario shows what the Census Bureau’s modeling work indicates would have happened if the country had not been affected by the HIV/AIDS epidemic. This modeling takes into account not only lower death rates but also associated changes to a country’s age and sex profile and, indirectly, the combined effects of lower mortality and changing population composition on demographic indicators. The without-AIDS scenario currently assumes the same fertility rates (based on observed data) as the with-AIDS series and thus underestimates what fertility might have been in the absence of AIDS. In the with-AIDS series the number of births decreases as a result of mortality-induced reductions in the number of women of reproductive age.

Table 1.1. Key Demographic Indicators of the HIV/AIDS Epidemic by Developing Region and for Selected Countries, End-2003
(Thousands of persons except where stated otherwise)

Region and Country	People Living with HIV/AIDS		HIV Prevalence Among Adults (percent)	AIDS Deaths Among Adults and Children in 2003
	Adults ¹ and children	Adults		
Global total	37,800	35,700	1.1	2,900
Sub-Saharan Africa	25,000	23,100	7.5	2,200
Botswana	350	330	37.3	33
Côte d'Ivoire	570	530	7.0	47
Ethiopia	1,500	1,400	4.4	120
Kenya	1,200	1,100	6.7	150
Malawi	900	810	14.2	84
Mozambique	1,300	1,200	12.2	110
Namibia	210	200	21.3	16
Nigeria	3,600	3,300	5.4	310
Rwanda	250	230	5.1	22
South Africa	5,300	5,100	21.5	370
Tanzania	1,600	1,500	8.8	160
Uganda	530	450	4.1	78
Zambia	920	830	16.5	89
Zimbabwe	1,800	1,600	24.6	170
Asia ²	6,500	6,300	0.6	460
Cambodia	170	170	2.6	15
Thailand	570	560	1.5	58
Vietnam	220	200	0.4	9
Latin America	1,600	1,600	0.6	84
Brazil	660	650	0.7	15
Guyana	11	11	2.5	1
Caribbean	430	410	2.3	35
Haiti	280	260	5.6	24
Eastern Europe	1,300	1,300	0.6	49

Source: UNAIDS (2004a).

¹Adults are defined as persons aged 15–49.

²Excluding the former Soviet Union.

(UNAIDS, 2004a). About 7.5 percent of adults (defined here as persons 15–49 years of age) in the region were HIV-positive at the end of 2003, compared with a global prevalence rate of 1.1 percent and a prevalence rate of 0.4 percent for the world excluding sub-Saharan Africa. (Table 1.1 summarizes the latest available estimates from UNAIDS of the numbers of people living with HIV/AIDS and of AIDS-related deaths in selected regions and for specific countries.) In six countries in southern Africa—Botswana, Lesotho, Namibia, South Africa, Swaziland, and Zimbabwe—it is estimated that at least one in five adults is living with HIV. Another four countries—

the Central African Republic, Malawi, Mozambique, and Zambia—have estimated adult prevalence rates above 10 percent, and another eight countries have rates exceeding 5 percent.²

In Asia, by contrast, estimated adult HIV prevalence exceeded 1 percent in only three countries: Cambodia, Myanmar, and Thailand. Nevertheless, the enormous size of the Asian population means that the Asia-Pacific region could account for a very substantial share of new infections in the coming years.³ In India and China, the world's two most populous countries, prevalence rates are relatively low at present (between 0.4 and 1.3 percent in India, and about 0.1 percent in China). These country averages, however, mask concentrated epidemics in some local areas or among groups engaging in high-risk behaviors such as injecting drugs and sex work, and the experience from other countries has shown that the epidemic can spread from these groups to the general population in just a few years.

In Latin America and the Caribbean, epidemics that seem mostly driven by heterosexual transmission are found in The Bahamas, Guyana, Haiti, and Honduras, all of which are among the countries with the highest adult HIV prevalence in the region. But the nature of the epidemic varies in this region: in some countries, such as Argentina and Uruguay, HIV/AIDS is concentrated among injecting drug users, whereas in others, such as Mexico and Peru, it is concentrated among men who have sex with men.

HIV/AIDS began to spread quickly in Eastern Europe and Central Asia in the mid-1990s, fueled largely by injecting drug use. The pattern here is mainly one of locally concentrated epidemics; reported HIV prevalence rates are low among the general population, and therefore previous rounds of AIDS mortality estimates prepared by the Census Bureau do not include countries in this region. However, this may soon change, as there is evidence that the epidemic is growing through heterosexual transmission.

In all of these regions HIV-1 is the primary type of virus. This type is driving the greater part of the demographic impact. Another type, HIV-2, is found predominantly in West Africa. HIV-2 differs from HIV-1 in that the progression from HIV to AIDS and from AIDS to death is much slower.

²All estimates of adult HIV prevalence rates are from UNAIDS (2004a). In the literature, adult prevalence rates generally refer to the 15–49 age range; this chapter follows that convention.

³Schuettler (2003) suggests that the region could account for 40 percent of new global infections by 2010 if prevention efforts are not stepped up.

Therefore, for the purposes of assessing the demographic impact of AIDS mortality, the Census Bureau utilizes HIV-1 prevalence data for analysis in selected countries.

In taking a closer look at epidemics within regions and within countries, a good place to start is the percentage of pregnant women attending antenatal clinics (ANCs) who test HIV-positive. Several studies that have compared HIV prevalence among pregnant women with that among adult men and women from other, community-based studies have shown that antenatal clinic seroprevalence gives a reasonable estimate of HIV prevalence in the general adult population.⁴ Also, for many countries antenatal clinic data are the primary source of information on prevalence trends among the population and form the basis of estimates of the demographic effects of HIV/AIDS.⁵ Figure 1.1 shows trends in HIV prevalence for selected urban areas in sub-Saharan Africa, Asia, Latin America, and the Caribbean during the past two decades. Variations in trends are apparent, and the rest of this section discusses each region in greater detail.

Sub-Saharan Africa

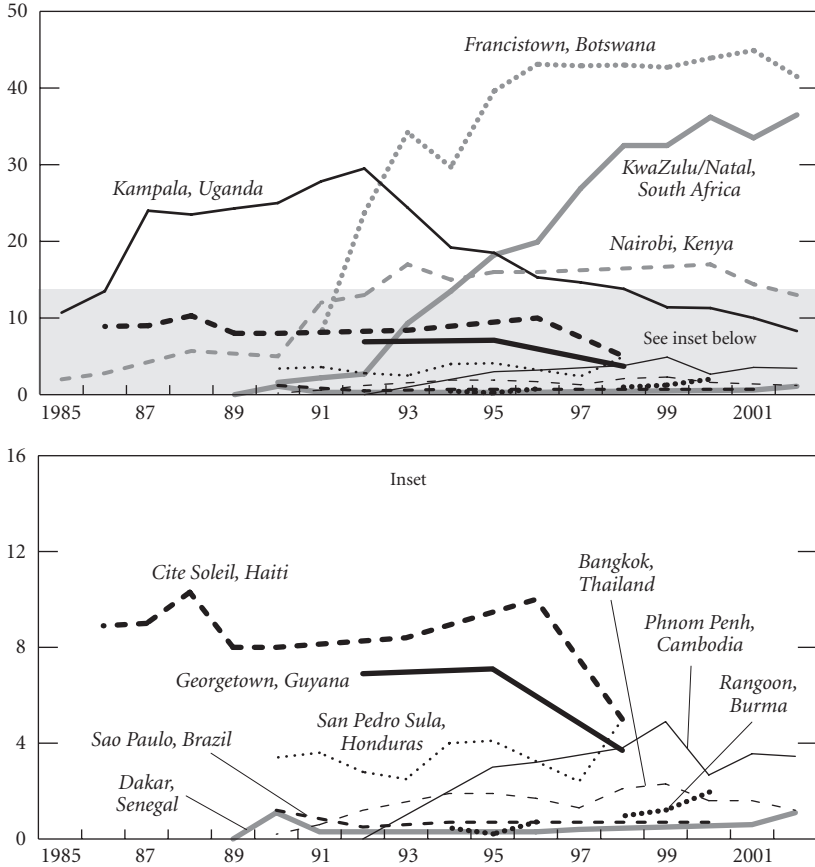
The Census Bureau first started to incorporate estimates of AIDS mortality in its population projections in 1994. At that point a total of 14 countries had 5 percent or higher prevalence among their low-risk urban populations (the criterion then applied by the Census Bureau for explicitly including AIDS mortality in demographic estimates and projections).⁶ Thirteen of these countries are located in sub-Saharan Africa, where HIV/AIDS is largely spread through heterosexual sex. In many cities of sub-Saharan Africa, HIV prevalence among sex workers approached 50 percent from the mid-1980s to the early 1990s, and in several, seroprevalence among sex workers ranged from 50 percent to over 80 percent (Way and Stanekki, 1994). During the 1990s the epidemic quickly expanded throughout the population in many countries in this region, and the cur-

⁴HIV prevalence among pregnant women tends to underestimate prevalence among all women but to overestimate it among men.

⁵Antenatal clinic data and HIV prevalence levels from other population groups are compiled in the U.S. Census Bureau's HIV/AIDS Surveillance Data Base, 2004 release.

⁶The 14 countries are Burkina Faso, Burundi, the Central African Republic, Congo, Côte d'Ivoire, Haiti, Kenya, Malawi, Rwanda, Tanzania, Uganda, the Democratic Republic of Congo (formerly Zaïre), Zambia, and Zimbabwe. Because previous modeling work had already been undertaken in Brazil and Thailand, those countries also had estimated AIDS mortality incorporated into their population projections.

Figure 1.1. HIV Seroprevalence in Selected Urban Areas in Africa, Asia, and Latin America and the Caribbean
(Percent)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004).

rent round of population estimates and projections incorporates estimated AIDS mortality into the projections for 37 sub-Saharan African countries.

Many of the countries where HIV epidemics first erupted are located in East Africa, along the Great Rift Valley from Ethiopia to central Mozambique. From 1985 to 1992 there was a consistent and rapid increase in seroprevalence among pregnant women in the capital cities of Malawi, Uganda, and Zambia. In just five years these rates more than doubled, and in Malawi

seroprevalence rose from under 5 percent to over 20 percent. In contrast, during the same period, moderate increases were documented in the Central African Republic and Kenya, with rates reaching 15 percent by 1992 (Way and Stanecki, 1994).

Many areas of Zimbabwe reported a rapid increase in HIV prevalence among pregnant women in the early 1990s. Prevalence there has since stabilized, albeit at a high rate. In 2001, in the capital city of Harare, 30 percent of pregnant women tested were HIV-positive. Zimbabwe also has high prevalence rates among such high-risk groups as sex workers and patients with other sexually transmitted infections. Both urban and rural areas appear equally affected. In the Democratic Republic of Congo, where the first cases of AIDS were discovered, prevalence rates among pregnant women attending antenatal clinics rose sharply in the early 1990s but have since declined and stabilized at a lower rate. Prevalence rates for pregnant women in Kinshasa remained below 5 percent during the last decade.

The epidemic also began in the early 1980s in Kenya and Tanzania. Prevalence tends to be higher in urban areas in Tanzania. In Kenya, however, by 1997 some rural and urban areas had prevalence rates higher than in the capital city of Nairobi. Recent data show rates stabilizing or decreasing in some urban and rural sites. In the capital cities of these two countries, prevalence rates among pregnant women remained around 15 percent in the early 1990s, and median antenatal clinic prevalence in major urban areas has stayed between 10 and 15 percent for the past 10 years. Although the apparent stabilizing of prevalence rates may seem encouraging, the reality is that HIV prevalence is a function of AIDS mortality and new infections. Because mortality among HIV-positive people is high, a prevalence rate that stabilizes at a high level can mean that a large number of new infections are replacing a roughly equal number who are dying of HIV/AIDS or related causes.

HIV prevalence among pregnant women is generally lower in western Africa. By 1994 only Burkina Faso and Côte d'Ivoire met the Census Bureau criteria for including estimated AIDS mortality in their population projections. Rates among pregnant women in several sentinel sites in Burkina Faso remained stable at or below 10 percent through the 1990s, and they remained low, at around 5 percent both in and outside major urban areas, in 2002. Côte d'Ivoire reported a rapid increase in seroprevalence in the mid-1980s but a slower increase throughout the 1990s, and current rates seem to have stabilized at around 10 percent in some urban sentinel sites.

By 1996, Cameroon and Nigeria in the west, Ethiopia in the east, and Botswana, Lesotho, and South Africa, south of the Great Rift Valley, had

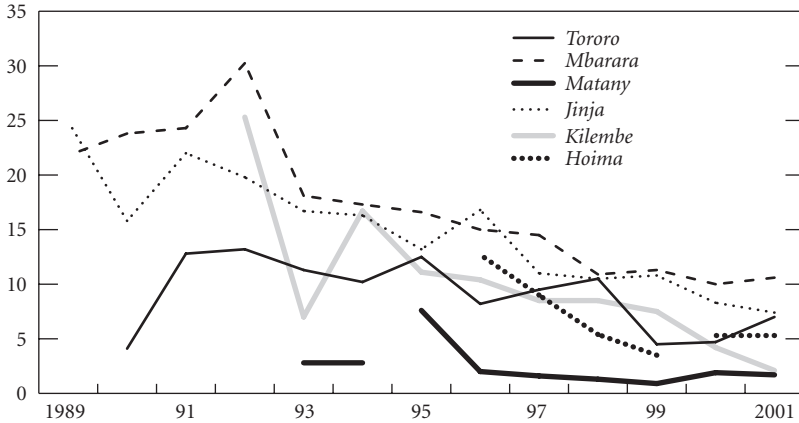
seen prevalence among their low-risk urban populations rise to 5 percent. And just two years later, as the epidemics continued to spread through southern Africa, Namibia and Swaziland met the criteria for including estimated AIDS mortality in population projections.

In Ethiopia estimated adult HIV prevalence remained around 4 percent from 2001 to 2003. Prevalence among pregnant women attending antenatal clinics rose sharply in the early 1990s, but levels have since declined and stabilized at a lower rate. Median antenatal clinic prevalence in major urban areas in Ethiopia declined from 20 percent in 1995 to 15 percent in 2000.

Seven countries clustered in the Southern Cone of Africa have extraordinarily high estimated adult prevalence rates. Although the HIV/AIDS epidemics in this area started later, they quickly exploded. As seen in Figure 1.1, seroprevalence among pregnant women in Francistown, Botswana, increased from 7 percent in 1991 to 44 percent in 2000. Both rural and urban areas seem to be affected to the same extent in this region. The dramatic rise in HIV prevalence among pregnant women in the mid-1990s is echoed in the neighboring countries of Namibia, where seroprevalence in this group had reached nearly 30 percent by 2002, and South Africa, where it had reached 25 percent by 2001. In Swaziland and Lesotho, two small countries surrounded by South Africa, seroprevalence among pregnant women reached nearly 40 percent in 2002 and 30 percent in 2003, respectively.

The most recent estimates, completed in 2002, include more countries in coastal West Africa and in the Sahel region, a stretch of countries lying between the Sahara to the north and the rain forest to the south, from the Atlantic Ocean in the west to the Horn of Africa in the east. Although very few data are available for these countries, UNAIDS estimates that adult prevalence levels are 2.7 percent in Eritrea and 4.8 percent in Chad. As already discussed, variations in the estimated starting dates of a generalized epidemic are a misleading indicator of its strength and severity. Many of the countries with older epidemics are now showing modest declines or stabilizing prevalence rates. On the other hand, epidemics have escalated in some of the worst-affected countries, with prevalence rising from less than 5 percent to more than 30 percent in only about 10 years. In general, there are many reasons for the variation in seroprevalence across countries. Poverty and political instability have major consequences for the spread of HIV. A large number of people migrating to specific areas to find jobs, or mass population movements such as those that followed the genocide in Rwanda and war in Angola and Mozambique, can be expected to result in an increase in prevalence rates in semiurban areas that have large numbers of migrants.

Figure 1.2. HIV Seroprevalence in Selected Cities in Uganda
(Percent)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004).

Two countries in sub-Saharan Africa, Uganda and Senegal, remain notable success stories. In Uganda, after a dramatic rise in the early 1990s, prevalence among pregnant women began to decline at most sentinel surveillance sites. In Kampala, the capital, HIV prevalence declined from its peak of 30 percent in 1993 to 11 percent in 2000 (Figure 1.1). Figure 1.2 shows that, in other urban areas throughout Uganda, HIV prevalence rates from sentinel surveillance reporting indicate a decline or leveling off of infection levels. In Senegal, AIDS control programs are credited with keeping HIV prevalence at very low levels, currently estimated at less than 1 percent.

Asia

HIV prevalence rates in Asia are lower, and the epidemics there started later, first spreading during the 1990s, mostly among injecting drug users. Today HIV transmission is occurring more through sexual contact, although it is still concentrated among sex workers and injecting drug users. High prevalence is also recorded among men who have sex with men. But concentrated epidemics do not confine HIV to particular risk groups. HIV spreads from high-risk behavior such as sharing dirty needles and unprotected sex; those who engage in risky behavior may be a part of more than one risk group. For example, many sex workers often use

injecting drugs, and many men who have unprotected sex with men also have sex with women. These populations serve as bridging populations and aid in the spread of HIV to the general population (MAP Network, 2001).

Thailand was one of the first countries in which the Census Bureau undertook modeling work, and estimated AIDS mortality was included for Myanmar and Cambodia by the 1998 round of Census Bureau population projections. Currently, a generalized HIV epidemic is found in just these three countries.

Cambodia has the most serious epidemic in the region. Sentinel surveillance among pregnant women in Phnom Penh show a rise in prevalence from no evidence of infection in 1992 to 5 percent by 1999. In 2002 HIV prevalence among pregnant women was 3.5 percent. Rates are similar for rural and urban areas: sentinel surveillance sites in 18 provinces reported prevalence rates ranging from 2 to 6 percent for 2002.

Located between Myanmar and Cambodia, Thailand has one of the oldest epidemics in the region but is considered a success for its ability to curtail the epidemic and keep HIV prevalence low. Throughout the latter half of the 1990s, declining or stable prevalence rates were evident among sex workers in four regions of the country (north, northeast, central, and south), ranging from 5 to 15 percent in 1990 and from 5 to 9 percent in 2002. In Bangkok rates declined from 10 percent in 1990 to 3 percent in 2002. Rates for injecting drug users have mostly remained around 40 percent in all four regions and in Bangkok since the early 1990s.

In Myanmar HIV seroprevalence rose dramatically in the 1990s among sex workers in Yangon and Mandalay, from 2 percent and 5 percent, respectively, in 1992 to 26 percent and 50 percent by 2000. In 1992 seroprevalence levels for injecting drug users was already at 50 percent or higher in both these cities and in the smaller cities of Myitkyina and Taunggyi. By 2000 the highest rates were in Mandalay (58 percent) and in two cities near the border with China, Myitkyina (90 percent) and Lashio (76 percent).

Throughout the 1990s in Myanmar, HIV prevalence among pregnant women remained stable at a low rate, and in 2000 most sentinel surveillance sites reported HIV prevalence below 3 percent in this group. However, the centrally located city of Mandalay as well as several sentinel sites within towns on or near the Chinese and Thai borders—Muse, Tachileik, Dawei, Myitkyina, and Lashio—had higher prevalence rates, ranging from 3.5 to over 5 percent.

Also, although such countries as India and China have low aggregate prevalence rates, these rates mask high prevalence rates in some popula-

tions at risk; HIV prevalence rates are also high in some regions in China where people were selling blood plasma to supplement their incomes (UNAIDS, 2004a). Given the very large populations of these two countries, a further increase in their prevalence rates could mean that most HIV-positive people in the world will be living in these countries. According to UNAIDS (2004a), India may already have the world's largest population living with HIV/AIDS,⁷ and the number of people infected in China could reach 10 million by 2010.

The epidemic in India varies in scope from state to state and is concentrated among commercial sex workers and injecting drug users. HIV prevalence increased dramatically among sex workers in Mumbai, where prevalence was 1 percent in 1987, peaked at 64 percent in 1999, and then declined slightly to 52 percent in 2001. However, recent data from 2001 show 31 serosurveillance sites throughout the country reporting HIV prevalence above 1 percent among pregnant women. At four sentinel sites in Mumbai in 2001, HIV prevalence among pregnant women ranged from 2 percent to nearly 8 percent. Eight other sentinel sites in Maharashtra state reported HIV prevalence above 1 percent in pregnant women. Seven sites in Andhra Pradesh state and five sites in Tamil Nadu state also reported HIV prevalence above 1 percent.

There is recent evidence of rapidly growing epidemics in at-risk population groups in China, Indonesia, and Vietnam. In selected areas of China's Yunnan province, which borders Myanmar, Thailand, Lao PDR, and Vietnam, HIV prevalence rates among these groups ranged from 20 percent in Luxi to 70 percent in Kaiyuan in 1997. HIV prevalence rose from no evidence of infection in 1995 to 21 percent and 17 percent, respectively, for Guangdong province (where Hong Kong SAR is located) and Guangxi province in only five years. Yining, a site in Xinjiang province that borders Kazakhstan, had prevalence rates among the high-risk population of 80 percent or more from 1998 to 2000. Another group with relatively high HIV prevalence rates in this region is men who have sex with men. For example, although Indonesia records low seroprevalence among sex workers (below 1 percent), seroprevalence among transgendered persons, or *waria*, rose from no evidence of infection in 1992 to 6 percent in 1997.

⁷UNAIDS (2004a) provides a point estimate of 5.3 million people living with HIV/AIDS in South Africa, with a low estimate of 4.5 million and a high estimate of 6.2 million. Reflecting the lack of data, UNAIDS (2004a) does not provide a point estimate for India, but only a low and a high estimate of 2.2 million and 7.3 million, respectively.

Recent data suggest that Vietnam has an epidemic that is moving from concentrated to general. Although still at low levels, seroprevalence among sex workers steadily increased in three cities of Vietnam during the 1990s. In 1999, 6 percent of sex workers were infected in Hanoi, 5 percent in Ho Chi Minh City, and 3 percent in Haiphong, a major port and industrial city in the north of the country. Sentinel surveillance in 2002 found that more than 20 percent of injecting drug users in most provinces were HIV-positive.

Although no signs have yet emerged of a generalized epidemic in many of the countries in Asia, the conditions are ripe for a rapid spread of HIV. Serious concentrated epidemics are found in injecting drug users and sex workers in various parts of some countries. Injecting drug use is on the rise in this region (MAP Network, 2001); the spread of this behavior, coupled with low condom use rates and sharing of dirty needles, means that these epidemics could very easily spread throughout a country.

Latin America and the Caribbean

In Latin America and the Caribbean, epidemics occurred initially among men who have sex with men, but by the early 1990s there were large increases among injecting drug users and sex workers. Initially, Brazil and Haiti were the only countries to have estimated AIDS mortality explicitly included in the Census Bureau's population projections. Estimated AIDS mortality was included for Guyana in 1996, Honduras in 1998, and The Bahamas, Barbados, Belize, the Dominican Republic, Guatemala, Panama, Trinidad and Tobago, and Suriname by 2002.

UNAIDS (2004a) estimates that adult prevalence among the countries of this region ranged from less than 1 percent to nearly 6 percent. Injecting drug use and sex between men are driving the epidemic in most South American countries, whereas in Central America and in the Caribbean both sex between men and heterosexual sex are spreading HIV (UNAIDS, 2004a).

Haiti, with an estimated adult prevalence of 5.6 percent, has the most serious epidemic in this region. Seroprevalence among pregnant women in the capital, Port-au-Prince, was 10 percent in 1996 but thereafter declined to 4 percent by 1999–2000. Sentinel surveillance sites from various cities in Haiti report similar declines in rates by 1999–2000, ranging from 2 percent in Fond des Nègres to 5 percent in Jérémie.

In Rio de Janeiro, Brazil, HIV prevalence among men who have sex with men declined during the mid-1990s. In 1994, 25 percent of men in this group were HIV-positive; by 1996, only 9 percent tested positive for the

virus. Seroprevalence among sex workers in various cities of Brazil during the 1990s ranged from 2 percent in 1993–94 in Fortaleza, a coastal city in Ceara state in the northeast, to 18 percent in 1998 in São Paulo, Brazil's largest city. Higher prevalences are found among injecting drug users, although there was wide variation in infection levels in various Brazilian cities during the mid-1990s. Twenty-eight percent of injecting drug users tested in Rio de Janeiro in 1995–96 were HIV-positive, and 71 percent of users in Itajai, a coastal city in Santa Catarina state in southern Brazil, tested positive in 1995–96. In a study of injecting drug users seen at the blood transfusion service at Eva Peron Teaching Hospital in the town of Granadero Baigorria, Argentina, HIV prevalence was 29 percent among male drug users and 17 percent among female users in 1995.

In 1990, 1 percent of pregnant women in São Paulo tested positive for HIV. As more sentinel sites began reporting, the median HIV prevalence rate among antenatal clinic attendees varied around 1 percent of women tested. In 1995 nearly 3 percent of pregnant women tested in Porto Alegre and Rio de Janeiro were positive for HIV, and in 1996, 5 percent of pregnant women in the port city of Santos tested positive for HIV. In 1996 federal law in Brazil mandated the free provision of antiretroviral therapy through the public health system, thus drastically reducing mortality from AIDS and extending life with HIV.

In Honduras HIV seroprevalence among sex workers in San Pedro Sula fluctuated between 12 and 21 percent during the 1990s. In 2001–02 HIV prevalence was 13 percent. Prevalence among pregnant women reached 5 percent in 1998. In Tegucigalpa, the capital, seroprevalence among pregnant women did not rise above 1 percent during the 1990s, yet the percentage of sex workers testing positive rose steadily to 13 percent in 1997; it has since declined to 8 percent. In the Dominican Republic HIV prevalence rates among sex workers in the capital, Santo Domingo, declined from a peak of 9 percent in 1993 to 5 percent in 1999. La Romana reports a similar decline, but rates from Bani fluctuated between 6 and 11 percent during the same period. Sentinel surveillance among pregnant women did not rise above 2 percent throughout the 1990s in Santo Domingo, and by 1999 rates had declined or stabilized below 2 percent for other urban areas.

Eastern Europe and Central Asia

Very few data on HIV/AIDS prevalence are available from Eastern Europe and Central Asia. UNAIDS (2004a) estimates that the total number of people living with HIV in the region is 1.3 million. In 2003, 360,000 peo-

ple in the region became newly infected, and AIDS claimed 49,000 lives. The epidemics in this region are considered to be concentrated among injecting drug users, although at the same time there is evidence of a growing heterosexual epidemic. As of the most recent round of estimates, the Census Bureau will include estimated AIDS mortality in the population projections for the Russian Federation.

The worst-affected countries are the Russian Federation, Ukraine, and the Baltic states, but HIV continues to spread in Belarus, Moldova, Kazakhstan, the Kyrgyz Republic, and Uzbekistan. Injecting drug use and unsafe sex are the predominant modes of transmission in this region, especially among young people. According to the European Centre for the Epidemiological Monitoring of AIDS (2003), 41 percent of new infections in 2002 were among injecting drug users, and 10 percent were through heterosexual transmission, although the number of new infections attributed to heterosexual transmission continues to rise. In the countries first affected, the proportion of injecting drug users who were HIV-positive peaked in 1996–98, whereas cases from heterosexual contact continued to rise, accounting for 28 percent of all cases in Moldova, 29 percent in Ukraine, and 35 percent in Belarus in 2002. New infections peaked in Estonia, Latvia, and the Russian Federation in 2001, also marked by declines in injecting drug users and increases among heterosexuals.

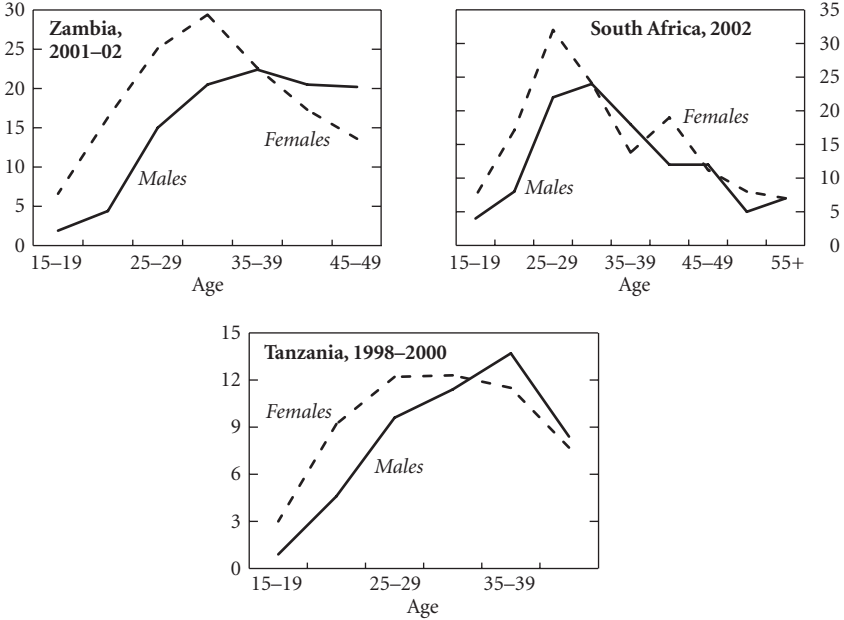
There are more than 600,000 injecting drug users in Ukraine and up to 200,000 in Kazakhstan. Injecting drug use is on the rise—in Estonia and Latvia it is estimated that up to 1 percent of the adult population inject drugs, and in the Kyrgyz Republic it could be as many as 2 percent. The five Central Asian republics straddle major drug trafficking routes into the Russian Federation and Europe. On the whole, more than 80 percent of people who are HIV-positive in this region are not yet 30 years of age (UNAIDS, 2003).

In the Russian Federation, condom use is very low among teenagers, sex workers, and injecting drug users, making the sexual spread of HIV a more prominent feature, since most injecting drug users are young and sexually active. Four studies have revealed high prevalence levels among female sex workers who were also injecting drug users (European Centre for the Epidemiological Monitoring of AIDS, 2003).

Differences by Sex

As the global HIV pandemic is increasingly driven by heterosexual sex, women are becoming infected at faster rates. Women, and especially young women, have multiple vulnerabilities to HIV transmission: biological, cul-

Figure 1.3. Adult HIV Prevalence by Age and Sex in Three Sub-Saharan African Countries
(Percent)



Sources: Zambia Central Statistical Office and Central Board of Health (2002); Shisana, Simbayi, and Phil (2002) for South Africa; and Urassa and others (2002) for Tanzania.

tural, social, and economic. The nature of sexual intercourse alone makes it easier for women to contract HIV, and male-to-female transmission is estimated to be twice as likely as female-to-male transmission. In addition, the immaturity of the reproductive tract in young women makes them more susceptible. Economic dependency on men, a cultural preference for high fertility, lack of power to negotiate safe sex practices, and lack of access to information and health care all combine to make it difficult and undesirable for women to be proactive in safe sex negotiation.

UNAIDS estimates that about 57 percent of adults living with HIV in sub-Saharan Africa are women and that new infections among women are increasing, especially among adolescents. Peak HIV prevalence among women occurs at younger ages and generally at a higher rate than among men, as Figure 1.3 shows for three countries in the region. This may be evidence of younger women having sexual relations with older men. Many studies from this region show that younger women from poor communi-

ties often resort to selling sex in an effort to support their family or pay their school fees.

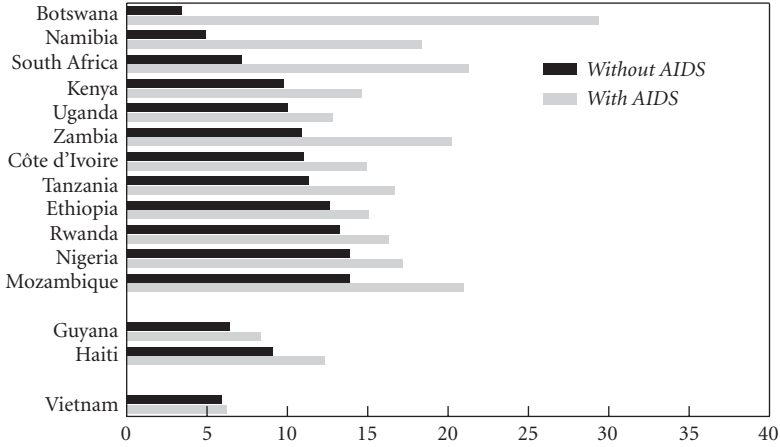
The data in Figure 1.3 are from population-based serosurveillance. Data from this type of survey provide a clearer picture of the spread of the epidemic in the population at large. The Demographic and Health Surveys (DHS) recently incorporated an HIV surveillance module into several of their population-based surveys, and data from Zambia for 2001–02 show that prevalence among adult women is peaking at younger ages and at a higher rate than among adult men: prevalence peaks at 29 percent among 30- to 35-year-old women and at 22 percent among men 5 to 10 years older. Higher HIV prevalence among adult women is reported from both rural and urban areas: in Zambia, for example, rates of 12 percent and 9 percent, respectively, are reported for women and men from rural areas, and of 26 percent and 19 percent from urban areas (Zambia Central Statistical Office and Central Board of Health, 2002). Data from the Nelson Mandela/HSRC Study of HIV/AIDS conducted in South Africa show that HIV prevalence for 2002 peaked at 32 percent among 25- to 29-year-old women, versus 24 percent among 30- to 35-year-old men (Shisana, Simbayi, and Phil, 2002). In a rural region in Tanzania, prevalence during 1998–2000 was higher among women in each of the five-year age groups from 15 to 34 years (Urassa and others, 2002).

In other regions of the world, men still make up the majority of the HIV-positive population. In Asia, however, recent data show that seroprevalence among women is rising rapidly. In the Mekong region women are becoming infected at faster rates than men. And in Papua New Guinea infections in women 15 to 29 years old already outnumber those in men of the same age (UNAIDS, 2004b). In the Russian Federation as well, women account for an increasing share of newly diagnosed infections: 33 percent in 2002, up from 24 percent the year before (European Centre for the Epidemiological Monitoring of AIDS, 2003). One consequence of a rise in prevalence among women is a corresponding rise in the spread of HIV through mother-to-child transmission.

Mortality

The impact of AIDS mortality on demographic characteristics is detailed in Appendix Tables 1.A1 and 1.A2. Through the procedures described in Box 1.1, the Census Bureau provides estimates and projections for the analysis of how a population is affected by increased AIDS mortality. The adult crude death rate, the infant mortality rate, the under-5 mor-

Figure 1.4. Crude Death Rates With and Without AIDS in Selected Countries, 2005
(Deaths per 1,000 population)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

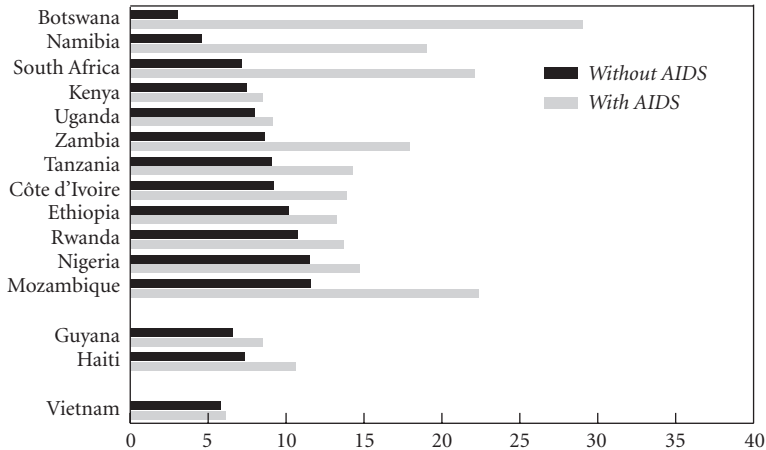
tality rate, life expectancy, and the population growth rate in the presence of AIDS are compared with those in a without-AIDS scenario for the 15 focus countries of the President’s Emergency Plan for AIDS Relief (for which the most current demographic estimates and projections are available at this time): Botswana, Côte d’Ivoire, Ethiopia, Guyana, Haiti, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Vietnam, and Zambia. Indicators are estimated for 2005 and 2015 in Appendix Tables 1.A1 and 1.A2.

Crude Death Rates

The most direct impact of AIDS is an increase in the number of deaths in the affected populations. As seen in Figure 1.4, because of high HIV prevalence in sub-Saharan Africa, estimated crude death rates—the number of people dying per 1,000 of the population—for 2005 is already considerably higher for most countries because of AIDS. In Botswana, Kenya, Namibia, South Africa, and Haiti, crude death rates would be expected to be in the single digits without AIDS but are in double digits with AIDS. In South Africa, for example, the crude death rate in 2005 is estimated to be 21 per 1,000 with AIDS versus 7 per 1,000 without AIDS; in Botswana the

Figure 1.5. Crude Death Rates With and Without AIDS in Selected Countries, 2015

(Deaths per 1,000 population)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

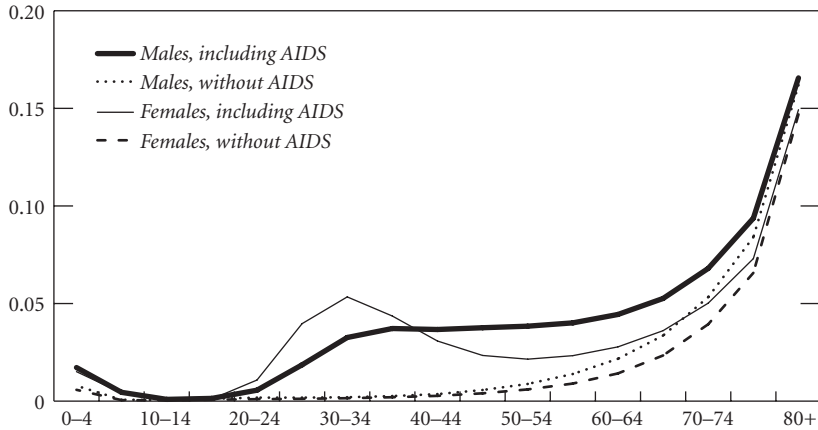
crude death rate is estimated to be 29 per 1,000 with AIDS versus 3.5 per 1,000 without AIDS (Figure 1.4).

With the HIV epidemic still growing in many countries, and in light of the long time lag between infection and death, HIV-related mortality is projected to continue to increase in many countries over the coming years. This means that the adverse impact of HIV/AIDS on society and the economy is likely to worsen.

By 2015 estimated crude death rates may stabilize or decline for some countries, although they will still be higher because of AIDS than they would be otherwise. Other countries, especially those with younger epidemics, are likely to continue to experience a rise in crude death rates by 2015 even though mortality due to non-AIDS causes is projected to decline. Rates are estimated to increase by 2, 3, 5, or even 10 times as a result of AIDS in Botswana, Mozambique, Namibia, South Africa, and Zambia.

Estimated HIV prevalence is declining in Kenya and Uganda, and as a result the increase in crude death rates due to AIDS mortality will be considerably reduced in the next decade. Crude death rates are projected to decline from 15 per 1,000 to 8.5 per 1,000 for Kenya and 13 per 1,000 to 9 per 1,000 for Uganda by 2015 (Figure 1.5).

Figure 1.6. Mortality Rates With and Without AIDS by Age and Sex in Namibia, 2005
(Percent)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

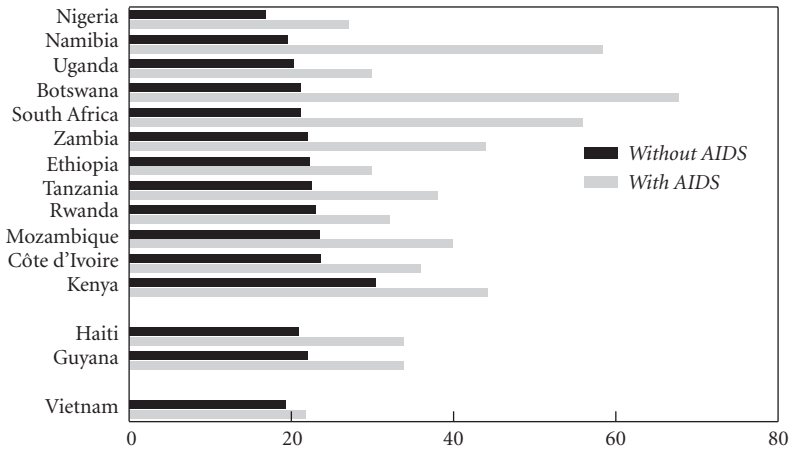
Adult Mortality

Moving beyond aggregate mortality rates, one variable that is particularly relevant for the analysis of the social and economic consequences of HIV/AIDS is the mortality rate for the adult population. People between the ages of 15 and 49 years are considered to be at their most productive and reproductive age. It is this population that is involved in at least one and usually all of the following activities: working, raising a family, and taking care of the elderly population.

In a population not affected by HIV/AIDS, an expected pattern of mortality rates by age and sex under “normal” conditions takes a “J” shape. Mortality is slightly higher among infants under a year old, declines to very low levels throughout adolescence and into adulthood, and then increases steadily after middle age. However, in many countries with serious HIV/AIDS epidemics, mortality is highest at those ages when it should be the lowest, forming a hump in the middle of the J-curve. Figure 1.6 shows mortality rates by age and sex for Namibia in 2005; the increased mortality among the adult population is evident.

For 2005, with the higher AIDS mortality among adults, the estimated adult percentage of deaths already shows a measurable increase in most of the 15 countries selected for analysis. As Figure 1.7 shows, as a result of AIDS this percentage is doubled or more in many countries with high

Figure 1.7. Adult Deaths as a Share of All Deaths With and Without AIDS in Selected Countries, 2005¹
(Percent)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

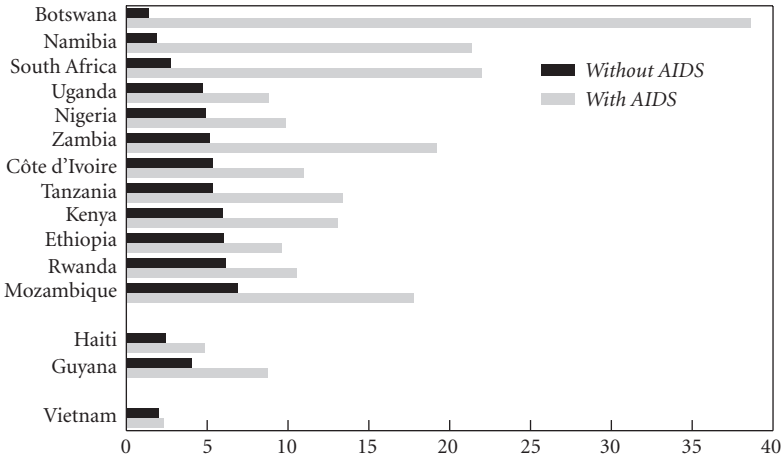
¹Adults are defined as persons aged 15–49.

estimated adult HIV prevalence. Adults are estimated to account for over half of all deaths in Botswana, Namibia, and South Africa and over 40 percent in Kenya, Mozambique, and Zambia. In countries such as Côte d'Ivoire, Ethiopia, Nigeria, Rwanda, Tanzania, Uganda, Haiti, and Guyana, with moderate or low HIV prevalence, the estimated adult percentage of deaths is still increased from one-fifth or one-fourth to a third of all deaths.

In 2005, in the 15 selected countries, AIDS is estimated to have increased deaths among adults by 1.5 million. Even countries with low estimated prevalence, where mortality due to other causes may be lower, are estimated to experience increases in deaths among the adult population. A dramatic rise will be seen among those countries with estimated adult HIV prevalence rates over 30 percent, such as Botswana, where AIDS is estimated to increase crude death rates among adults by over 30 per 1,000 (Figure 1.8).

Countries reporting stabilizations or declines in HIV seroprevalence are still likely to experience amplified adult crude death rates due to infections from 10 years previous. Zambia has an estimated adult crude death rate of 19 deaths per 1,000 adults in 2005, a tripling due to AIDS

Figure 1.8. Adult Crude Death Rates With and Without AIDS in Selected Countries, 2005
(Deaths per 1,000 adults)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

mortality. Rwanda and Kenya have estimated crude death rates of 10.5 and 10 per 1,000 adults, an increase of 6 per 1,000. Even with the decline in prevalence levels in Uganda, death rates there are still inflated by 4 per 1,000 adults as a result of AIDS, to a rate of 9 deaths per 1,000 adults.

In Haiti, with an estimated adult HIV prevalence of 6 percent, the highest in Latin America and the Caribbean, the adult crude death rate is estimated at 9 per 1,000 adults, compared with 4 deaths per 1,000 without AIDS mortality. In Guyana, with an estimated adult HIV prevalence around 3 percent, estimated adult crude death rates are slightly higher with AIDS mortality. With an estimated HIV prevalence below 1 percent, the adult crude death rate for Vietnam is estimated to be only slightly increased because of AIDS. If Vietnam is able to keep its epidemic under control, rates will remain stable for the next decade.

In the absence of AIDS, by 2015 the percentage of all deaths projected to occur in adults would likely remain stable; however, with AIDS mortality an increase in the adult percentage of deaths is projected for many of the countries selected. In Côte d'Ivoire, Mozambique, South Africa, Tanzania, Zambia, and Haiti, 40 to 50 percent of all deaths are projected to occur in

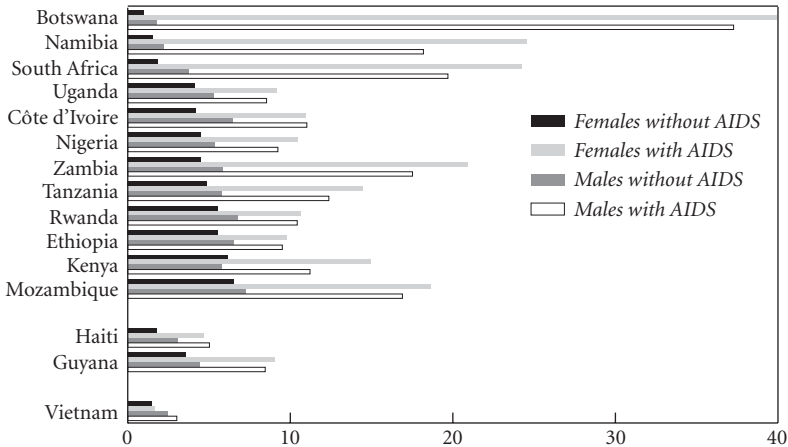
the adult population. In Botswana and Namibia, over 60 percent of all deaths are likely to occur among adults.

Given an assumed peak in estimated HIV prevalence by 2010, death rates are likely to remain stable or decrease by 2015, depending on the nature of the epidemic in each country. Estimated adult crude death rates will be inflated by 14 to 36 deaths per 1,000 adults in Botswana, Mozambique, Namibia, South Africa, and Zambia. Adult crude death rates are projected to remain lower for Uganda and Kenya as HIV prevalence continues to decline, at 6 and 9 deaths per 1,000 adults, respectively; these represent only slight increases over the without-AIDS scenario.

AIDS mortality patterns are driven by HIV prevalence patterns. Mortality rates among 15- to 49-year-old women are increasing dramatically as more women become infected through heterosexual transmission. As stated previously, in sub-Saharan Africa women make up more than half of all infections and are becoming infected at younger ages and in greater numbers than men. As a consequence, the impact of AIDS on mortality for women is also more pronounced: following the age pattern of HIV prevalence, mortality for women is estimated to peak among 30- to 34-year-olds, whereas the peak for men is later in life, among 35- to 44-year-olds (see Figure 1.6 for South Africa). In the absence of AIDS, deaths tend to be higher among 15- to 49-year-old men than among women of the same age, but this ratio is reversed in many countries affected by HIV/AIDS. For example, in Botswana and South Africa, countries with HIV prevalence rates over 20 percent, women accounted for over 50 percent of all deaths in the population aged 15–49 in 2005, compared with 35 percent and 33 percent, respectively, in the absence of AIDS (Appendix Table 1.A2).

Figure 1.9 further illustrates that, in the absence of AIDS, male adult crude death rates would be expected to be higher than female rates for most of the countries selected. With the addition of AIDS mortality, estimated female adult crude death rates not only jump significantly, but also are noticeably higher than those of their male counterparts in many African countries. The estimated female adult crude death rate for Botswana increases dramatically, from 1 death per 1,000 adults in the without-AIDS scenario to 40 deaths per 1,000 in the with-AIDS scenario. The latter is higher than the estimated male adult crude death rate of 37 deaths per 1,000 adults, thus decreasing the ratio of male to female adult deaths from 1.8 to 0.9 for 2005. The estimated female adult crude death rate increases by 12 deaths, to 23 deaths per 1,000 adults, for Mozambique, Namibia, Zambia, and South Africa with the addition of AIDS mortality, compared with an increase of 9 deaths, to 16 deaths per 1,000 adults, for males in the same countries.

Figure 1.9. Adult Crude Death Rates by Sex, With and Without AIDS in Selected Countries, 2005¹
(Deaths per 1,000 adults)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

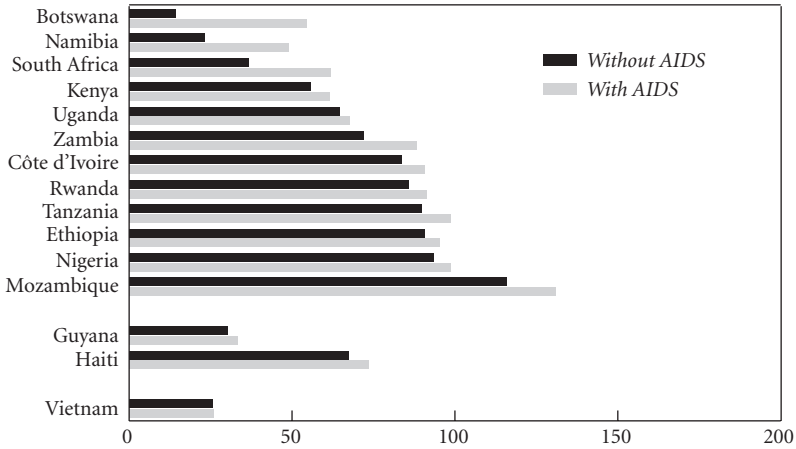
¹Adults are defined as persons aged 15–49.

Infant and Child Mortality

The fact that women are getting infected, falling ill, and dying in the midst of their reproductive years means an increase in the number of babies born HIV-positive. The relative impact of AIDS on infant mortality—the estimated number of infants per 1,000 live births who will die before their first birthday—will depend on the prevalence of HIV in the population, in addition to infant mortality from other causes. Unfortunately, because of the AIDS pandemic, much of the decrease in infant mortality seen during the 1980s and 1990s has disappeared. In sub-Saharan Africa over 30 percent of all children born to HIV-infected mothers become HIV-positive through the birth process or by breastfeeding.

It is estimated that in 2005 more infants are likely to die from AIDS than from any other cause in Botswana and Namibia (Figure 1.10). With an HIV prevalence of nearly 40 percent, Botswana has an estimated infant mortality rate of 55 infant deaths per 1,000 live births in 2005; it would be 14 per 1,000 live births in the absence of AIDS. Namibia's estimated infant mortality rate is 49 infant deaths per 1,000 live births, an increase of 26 infant

Figure 1.10. Infant Mortality With and Without AIDS in Selected Countries, 2005¹
(Infant deaths per 1,000 live births)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

¹Deaths before the age of 1 year.

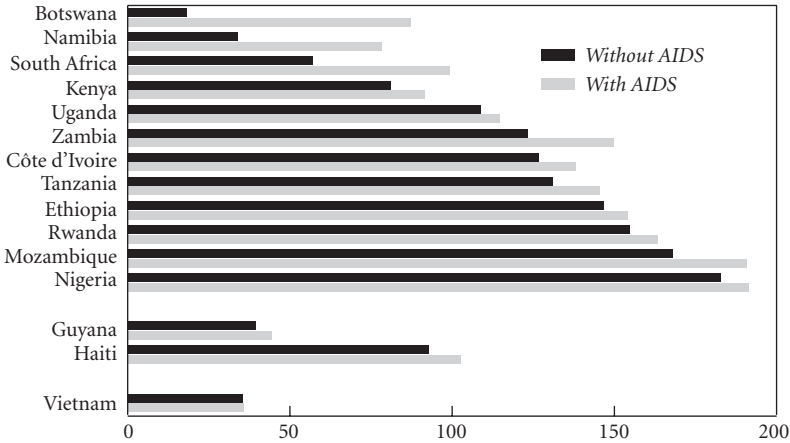
deaths per 1,000 due to AIDS. Estimated infant mortality in South Africa is increased by 40 percent as a result of AIDS. Because of more moderate HIV prevalence levels in Ethiopia, Nigeria, and Rwanda, estimated infant mortality in those countries is increased by a smaller 4 to 6 deaths per 1,000 live births.

Both Kenya and Uganda are experiencing only slightly increased estimated infant mortality rates as well, and, because of their efforts against the HIV/AIDS epidemic, infant mortality by 2015 is projected to decrease by 17 and 16 births, respectively, with increases of 1 death and 2 deaths per 1,000 live births due to AIDS. In the next decade, although infant mortality is expected to decrease, it will not decrease as dramatically as it would have in the absence of AIDS. For example, estimated infant mortality will still be inflated by 3 deaths and 6 deaths per 1,000 live births as a result of AIDS in Guyana and Haiti, respectively.

Many HIV-infected children survive past their first birthday only to die before the age of 5. AIDS deaths among children under 5 are resulting in higher mortality rates in that age group. Under-5 mortality is estimated to have more than doubled because of AIDS in Namibia; in Botswana 80 per-

Figure 1.11. Child Mortality With and Without AIDS in Selected Countries, 2005

(Deaths per 1,000 children under 5 years)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

cent of deaths among children under 5 are due to AIDS; and 40 percent of under-5 mortality in South Africa is due to AIDS. AIDS will also aggravate under-5 mortality rates in countries such as Côte d'Ivoire, Ethiopia, Mozambique, Nigeria, Rwanda, Tanzania, Uganda, Zambia, and Haiti, which already have high under-5 mortality rates due to other causes (Figure 1.11).

Without the prevention of mother-to-child transmission, under-5 mortality rates in 2005 are significantly higher with AIDS than without it. Even in countries with lower HIV prevalence, AIDS mortality is increasing under-5 mortality rates. By 2015 AIDS mortality is estimated to make up nearly 90 percent of deaths in this age group in Botswana, two-thirds of deaths in Namibia, and half of deaths in South Africa.

Life Expectancy

One of the most shocking markers of the demographic effect of AIDS mortality is life expectancy at birth—the estimated average number of years a person could expect to live if age-specific death rates prevail throughout his or her life. In developing countries life expectancy was

chronically low mainly because of high infant mortality. Once measures were taken to alleviate the common causes of infant mortality, life expectancies began to climb. However, life expectancies in many sub-Saharan African countries are now estimated to be cut in half because of AIDS mortality among adults.

More generally, life expectancy is an important component of key indicators of welfare such as the Human Development Index (HDI) of the United Nations Development Programme, which also includes measures of educational attainment and GDP per capita. In sub-Saharan Africa most of the attainment in human development, as measured by the HDI, over the last 50 years was based on increased life expectancy; this attainment is now rapidly being eroded by the HIV epidemic. Similarly, using a method based on individual valuations of mortality risk, Crafts and Haacker (Chapter 6, this volume) estimate that the welfare impact of reduced life expectancy due to HIV/AIDS dwarfs all estimates of the impact of HIV/AIDS on GDP per capita.

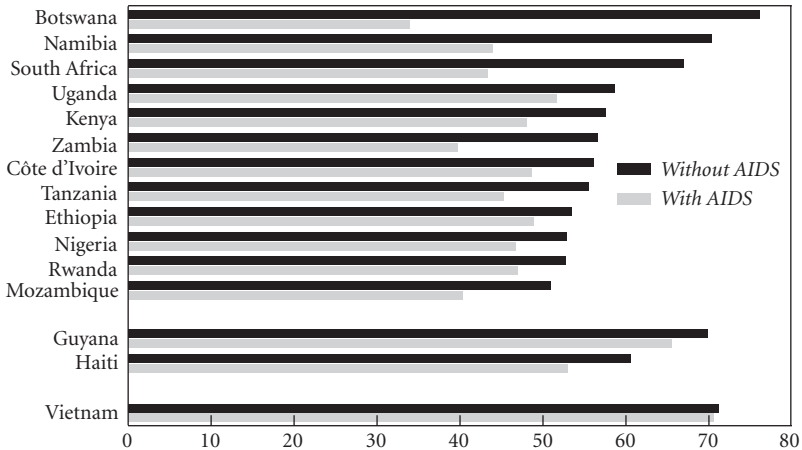
Estimated average life expectancy at birth for the selected countries in Africa is 45 years in 2005—an average of 14 years of life less than it would have been without AIDS mortality. The countries with estimated adult HIV prevalence over 20 percent (Botswana, Namibia, and South Africa) are estimated to have lost 24 to 42 years of life expectancy at birth as a result of AIDS mortality (Figure 1.12). All of the selected countries in Africa would have estimated life expectancies of 50 years or more without AIDS.

Estimated crude death rates are lower in countries outside of Africa with lower HIV prevalence, but life expectancy is still affected, although to a lesser extent than in sub-Saharan Africa. With the addition of AIDS mortality, life expectancy in Haiti is 53 years instead of 61 years; in Guyana life expectancy is 65.5 years instead of 70 years.

Within less than 10 years, some countries in sub-Saharan Africa are projected to see life expectancies at birth fall to around 30 years—levels not seen since the beginning of the twentieth century. Among those selected countries that would have approached or exceeded life expectancies of 70 years by 2015 (Botswana, Namibia, and South Africa) in the absence of AIDS, life expectancy is instead projected to be 35 years in Botswana, 38.5 years in Namibia, and 44.5 years in South Africa; these figures represent losses of 45 years, 28.5 years, and 25.5 years of life, respectively.

AIDS mortality is expected to continue to result in lower life expectancies in Latin America, the Caribbean, and Asia. Life expectancies in 2015 are projected to be 5 and 8 years lower in Guyana and Haiti, respectively, than they would be without AIDS. And although estimated HIV prevalence

Figure 1.12. Life Expectancy at Birth With and Without AIDS in Selected Countries, 2005
(Years)



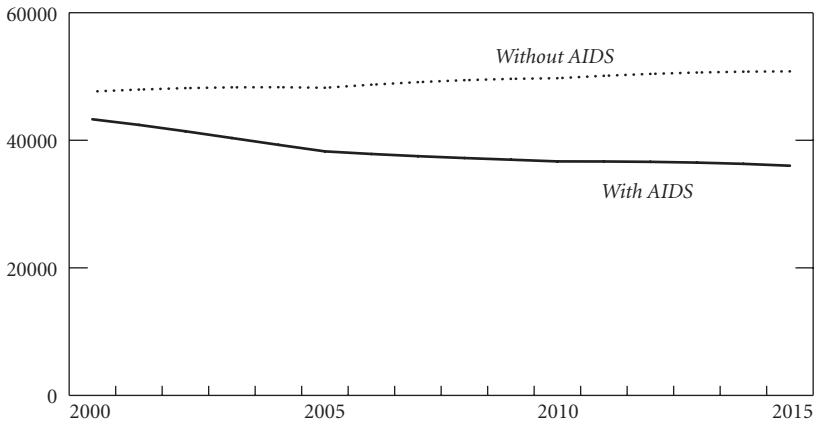
Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

is very low in Vietnam, projecting the current epidemic results in a loss of 1 year of life by 2015.

Fertility and Population Growth

Even as mortality rates are rising, fertility rates are expected to decline by 2015. HIV/AIDS affects fertility rates, as fertility tends to be lower for HIV-infected women than for uninfected women. In addition, approximately one-third of children born to HIV-positive mothers are infected and unlikely to reach childbearing age themselves. HIV/AIDS may also reduce birthrates indirectly, through its impact on sexual behavior, as women may reduce risky sexual practices by increasing abstinence and condom use and reducing the number of sexual partners they have over time. Finally, in many countries affected by the pandemic, AIDS mortality may affect population growth as the increase in deaths among reproductive-age women leads to fewer births. As Figure 1.13 illustrates, Botswana, which has a high crude death rate among adult women, is expected to experience a decline in births throughout this decade.

Figure 1.13. Births With and Without AIDS in Botswana
(Thousands)



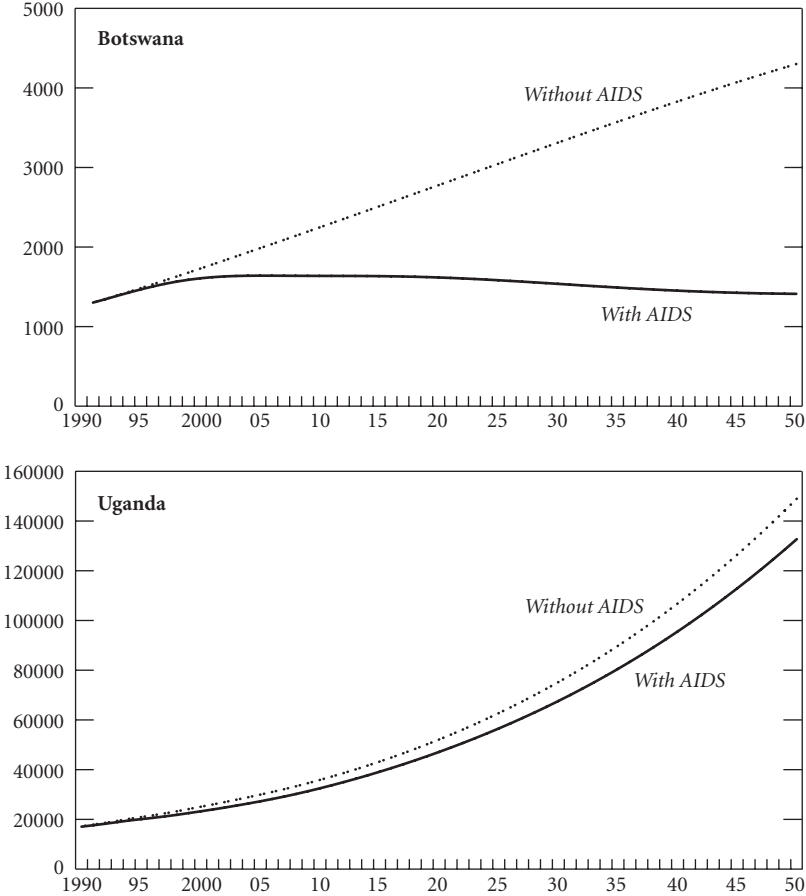
Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

Population will continue to grow in most of the selected countries, even though estimated crude death rates are high, because of high fertility and large numbers of young people. However, populations in severely affected countries are projected to decline over time, as is evident in Botswana, where the estimated 2005 growth rate is negative. In addition, population growth rates in Namibia and Zambia for 2005 are estimated to be half or less of what they would have been without AIDS.

By 2015, in addition to Botswana and South Africa, Guyana and Namibia are projected to experience negative or zero population growth rates because of AIDS mortality compounded by lower fertility and international migration. Although Uganda and Kenya are only slightly affected by AIDS mortality in 2005, estimated growth rates for these two countries will no longer be slowed by AIDS by 2015.

As a direct consequence of lower population growth rates, populations will be much smaller in the future than they would have been in the absence of HIV/AIDS in many of the affected countries. Figure 1.14 shows population projections for Botswana, where the population is projected to decline in absolute terms by 12 percent between 2000 and 2050, and where the projected 2050 population is 67 percent lower than in a scenario with no AIDS; and Uganda, where the population in 2050 is projected to be 11 percent lower than in a scenario without AIDS.

Figure 1.14. Change in Population With and Without AIDS in Botswana and Uganda
(Thousands)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

Socioeconomic Aspects of Changes in the Population Structure

In countries with projected negative population growth, AIDS mortality is likely to produce population pyramids of a pattern never seen before. As mortality increases among 15- to 49-year-olds, the population structures of countries with high HIV prevalence are likely to change from the typical

pyramid shape of a young and growing population to one more in the shape of a chimney. For example, in Botswana (Figure 1.15), men below the age of 20 and between the ages of 25 and 55 are likely to outnumber women in each of the 5-year age cohorts by 2025.

The socioeconomic implications of such a population chimney are not yet clear, but such a dramatic rise in adult mortality is sure to have profound and far-reaching effects. Most notable are the resulting increase in orphans and other vulnerable children, subsequent changes in household composition, a decrease in the labor force, and an increase in demand for and costs of social services.

Dependency Ratios

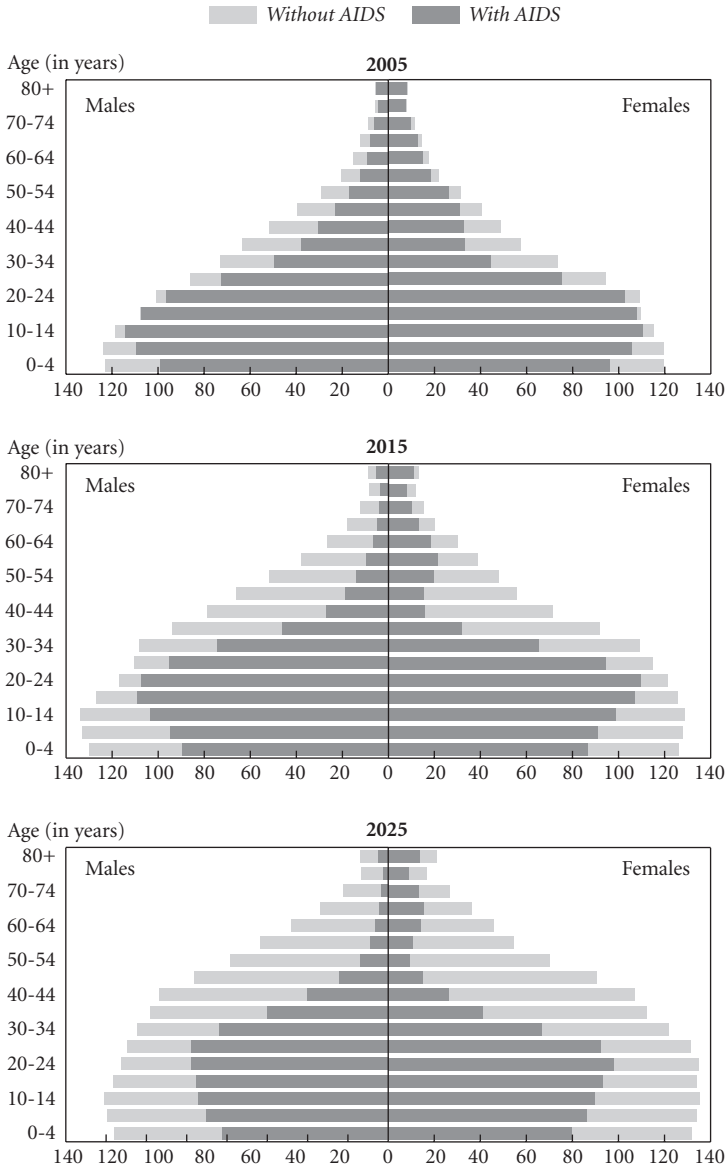
The estimated increase in mortality among adults may bring about a corresponding increase in the total dependency ratio, or the number of children and people of retirement age divided by the adult population available to support them. However, with infant and child mortality also increasing because of transmission from mother to child, a lower fertility rate for HIV-infected women, and a decline in the number of people reaching retirement age, this increase may not be as dramatic as one might expect.⁸ Table 1.2 shows the change in the dependency ratio among the 15 countries selected for analysis. There is a small increase in the dependency ratio in the projections incorporating estimated AIDS mortality; however, there is also a decline in these ratios from 2005 to 2015.

The loss of support from an economically active adult can impose a great financial burden on the remaining members of the household, in addition to putting a strain on already weak health and social services systems. Studies conducted throughout the 1990s indicate that the death of an HIV-positive adult member of a household imposed more of a financial burden on the household than if the adult had died from another cause, that the household's consumption of basic necessities fell following the death of a member from AIDS, and that the death of an adult female had a stronger negative impact on household consumption than that of an adult male (Ainsworth, Fransen, and Over, 1998).

Parents of adults who are HIV-positive may have an unexpected financial burden to bear in addition to the physical and emotional trauma of

⁸Haacker (Chapter 2, this volume) attributes observed increases in dependency ratios to an increase in the ratio of the young population (ages 0–14) to the working-age population (ages 15–49) while the relative size of the old population declines, mitigating the increase in total dependency.

Figure 1.15. Population With and Without AIDS by Age and Sex in Botswana
(Thousands)



Source: U.S. Census Bureau, International Programs Center, HIV/AIDS Surveillance Data Base (2004) and unpublished tables.

Table 1.2. Projected Total Dependency Ratios for Selected Countries
(*Dependent persons per 100 persons of working age*)

Country	2005		Projected 2010	
	With AIDS	Without AIDS	With AIDS	Without AIDS
Botswana	74.0	66.7	62.0	54.6
Côte d'Ivoire	77.6	76.7	73.2	71.8
Ethiopia	87.4	86.9	77.2	76.4
Kenya	81.2	79.8	78.5	77.2
Mozambique	84.7	83.0	72.8	69.9
Namibia	73.3	70.6	56.7	54.6
Nigeria	83.1	82.4	82.1	81.1
Rwanda	80.2	79.6	80.5	78.9
South Africa	55.0	52.7	47.2	44.9
Tanzania	87.3	85.8	77.8	76.0
Uganda	109.7	107.8	104.2	101.2
Zambia	95.8	92.7	87.7	83.1
Guyana	46.1	45.7	45.7	44.9
Haiti	85.4	84.7	78.9	77.2
Vietnam	50.7	50.6	40.1	40.0

Sources: U.S. Census Bureau, International Programs Center, International Data Base (2004), and unpublished tables.

having to care for their ill children. They may have to assume the cost of providing material support during their offspring's illness, of paying for funerals, and of fostering grandchildren—all at an age when they would otherwise be expecting their adult children to take care of them.

Orphans and Vulnerable Children

What the dependency ratios mask is the impact of increasing numbers of children affected by AIDS. UNAIDS, the United Nations Children's Fund (UNICEF), and the U.S. Agency for International Development (USAID) estimate that, in 2003, 143 million children under the age of 18 in Africa, Asia, Latin America, and the Caribbean (8.4 percent of all children in those regions) were orphans, and that HIV/AIDS had created 15 million orphans (UNAIDS, UNICEF, and USAID, 2004).⁹

As Table 1.3 shows, these aggregates mask very substantial differences across regions and countries. Sub-Saharan Africa, the region worst affected by HIV/AIDS, has the largest share of orphans: its 43.4 million orphans in 2003 made up 12.3 percent of all children in the region; 12.3 million (28.3

⁹The recent estimates on orphans and vulnerable children affected by AIDS define an orphan as a child under the age of 18 who has lost at least one parent as a result of AIDS (UNAIDS, UNICEF, and USAID, 2004).

Table 1.3. Estimated Number of Orphans by Developing Region and in Selected Countries

Region/Country	2003				Orphans, Projected 2010	
	Orphans		AIDS orphans		Thousands	Percent of all children
	Thousands	Percent of all children	Thousands	Percent of all children		
Sub-Saharan Africa	43,400	12.3	12,300	28.3	50,000 ¹	12
Botswana	160	20.0	120	75.0	190	24
Côte d'Ivoire	940	13.4	310	33.0	1,000	13
Ethiopia	3,900	11.1	720	18.5	4,700	11
Kenya	1,700	11.3	650	38.2	1,900	11
Malawi	1,000	14.3	500	50.0	1,300	15
Mozambique	1,500	15.0	470	31.3	1,900	17
Namibia	120	12.0	57	47.5	180	18
Nigeria	7,000	10.1	1,800	25.7	8,200	10
Rwanda	810	16.2	160	19.8	800	14
South Africa	2,200	12.9	1,100	50.0	3,100	19
Tanzania	2,500	17.9	980	39.2	2,900	15
Uganda	2,000	11.1	940	47.0	1,900	11
Zambia	1,100	18.3	630	57.3	1,200	19
Zimbabwe	1,300	18.6	980	75.4	1,400	21
Asia ²	87,600	7.3	...	...	80,100	7
Cambodia	670	9.6	...	...	690	9
Thailand	1,400	7.0	...	...	1,400	7
Vietnam	2,100	7.0	...	...	1,800	6
Latin America and Caribbean	12,400	6.2	...	...	12,000	6
Brazil	4,300	7.4	...	...	4,000	7
Haiti	610	15.3	...	...	560	13

Source: UNAIDS, UNICEF, and USAID (2004).

¹Of which 36.8 percent are projected to be orphaned as a result of HIV/AIDS.

²Excluding the former Soviet Union.

percent) of these orphans were AIDS orphans. By 2010 the total number of orphans is projected to increase to 50 million (12.5 percent of all children), of whom 18.4 million (36.8 percent) will be AIDS orphans. In 7 of the 14 African countries in Table 1.3, half or more of all orphans are AIDS orphans. In countries with high HIV prevalence such as Botswana and Zimbabwe, three-quarters of all orphans are AIDS orphans. But a lower estimated adult HIV prevalence does not necessarily translate into less of an impact on children. Ethiopia, Kenya, Rwanda, and Uganda all have estimated adult HIV prevalence between 4 percent and 7 percent. Nearly half of all Uganda's orphans, and over a third of Kenya's orphans, are AIDS orphans, compared with one-fifth in Rwanda and Ethiopia.

Table 1.3 also reports estimates and projections of the numbers of orphans in Asia and Latin America. Countries in Asia have much lower esti-

mated adult HIV prevalence, yet because of its large population this region has the largest number of orphans. As of 2003, although only 7.3 percent of all children in Asia were orphans, their number amounted to 87.6 million. This region also has younger epidemics, which have the potential to expand rapidly throughout the population. For example, Vietnam has an epidemic concentrated mainly among injecting drug users and sex workers; estimated adult HIV prevalence was below 1 percent in 2003 (UNAIDS, 2004a). With orphans already estimated to number over 2 million, a modest increase in HIV prevalence could increase this number dramatically.

AIDS has such a great impact on the number of orphans and vulnerable children because it so often creates double orphans—if one parent succumbs to AIDS, it is very likely that the other parent will as well. Frequently, orphans are taken care of by extended family; yet AIDS is not just killing parents, but aunts and uncles also. Often grandparents are raising their grandchildren, or orphaned children are themselves assuming the role of head of household. According to recent DHS data on household composition, one-fifth to one-quarter of households in Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe are fostering children. And, in Tanzania and Zimbabwe, the percentage of children under 18 who have lost one or both parents is projected to increase over the next 10 years (UNAIDS, UNICEF, and USAID, 2004). Orphans tend to live in households with lower income per capita and may have impaired access to education: UNICEF (2003) estimates that, in sub-Saharan Africa, median dependency ratios are 20 percent higher in orphan households than in nonorphan households, and that school enrollment rates for orphans are 13 percent lower than for nonorphans.

Children under 5 who are orphaned by AIDS are at risk of dying from AIDS themselves—as noted above, without intervention approximately a third of children born to HIV-positive mothers will be infected either at birth or through breastfeeding. But many more children are vulnerable to the effects of the large number of adults dying from AIDS around them. These children will be living with and caring for one or both sick and dying parents, or living in a household that has taken in one or more orphans. Girls especially may have to cut short their education in order to support the rest of the family. Providing enough food will become an increasing problem for rural households, if there is no longer anyone to cultivate the family crops.

Labor Force

As Figure 1.3 showed, the bulk of HIV infections are occurring among young adults, those just entering the workforce. Unless they receive treat-

Table 1.4. Life Expectancy at Age 15 by Sex, With and Without AIDS, in Selected Countries
(Years)

Country	2005				Projected 2015			
	Male		Female		Male		Female	
	Without AIDS	With AIDS	Without AIDS	With AIDS	Without AIDS	With AIDS	Without AIDS	With AIDS
Botswana	60.6	23.5	64.9	23.2	63.4	24.7	67.6	24.1
Côte d'Ivoire	47.6	41.5	53.1	43.9	49.3	42.0	55.4	44.4
Ethiopia	47.5	43.3	50.5	44.9	49.1	43.8	52.7	45.3
Kenya	48.6	40.4	49.4	38.6	50.8	48.7	52.2	49.3
Mozambique	46.4	36.1	48.9	36.5	48.1	33.6	51.1	31.5
Namibia	56.3	34.8	60.0	32.4	58.0	36.2	62.2	32.6
Nigeria	49.6	44.0	52.4	44.4	50.7	45.2	54.0	46.3
Rwanda	48.1	42.8	51.0	44.1	49.6	44.5	53.0	46.1
South Africa	53.1	34.5	60.0	33.6	54.9	36.3	61.5	33.6
Tanzania	48.4	39.3	51.6	39.5	50.1	41.3	53.9	42.0
Uganda	50.9	44.7	54.0	45.7	52.5	49.4	56.1	52.1
Zambia	49.6	34.0	53.1	33.4	51.2	35.8	55.2	34.6
Guyana	54.9	51.7	61.3	56.5	56.8	53.6	63.4	58.0
Haiti	50.9	44.1	54.4	46.1	52.7	46.1	56.8	48.0
Vietnam	56.8	55.9	62.3	61.9	58.6	57.7	64.1	63.4

Source: U.S. Census Bureau, International Programs Center, International Data Base (2004) and unpublished tables.

ment, those who become infected today are expected to become ill and die within 10 years. At current estimates, life expectancy for those just reaching maturity is expected to decrease significantly in many countries struggling with an overwhelming HIV/AIDS epidemic. For several high-prevalence countries in Africa, as Table 1.4 details, in 2005 those aged 15 years are only expected to live another 25 to 35 years.

The rise in mortality among adults in their prime productive and reproductive years has implications for the labor force, and not just as a reduction in numbers, but also in terms of the structure of the working-age population. As detailed in Figure 1.15, the age pyramid will narrow as mortality, especially for the working-age population, increases and, as a consequence, fewer people live to an advanced age. This means that the pool of more experienced individuals, those who would qualify for leading positions in society and the economy, shrinks. Higher mortality causes increased attrition rates, disrupting economic processes and imposing additional costs on producers, through higher medical and death-related benefits and higher training costs associated with the replacement of staff. Long before an HIV-positive individual enters the last stage of the illness and finally dies, his or her well-being and health

become impaired, and the infected person increasingly requires medical attention and home care. This rise in morbidity results in an increase in sick leave and absenteeism, as well as declining productivity on the job. At the household level, the sickness of a breadwinner reduces income and wealth, and other household members have to divert time from productive activities or education to provide care. As the expected remaining working time of the average worker declines, the expected returns on investments in training decline, with possible implications for the accumulation of human capital.

Conclusions

Twenty years ago, few would have predicted the current state of the HIV/AIDS pandemic. As the world enters a third decade with high HIV prevalence rates in many countries and the likelihood of an effective vaccine, or even widespread availability of therapeutic medication, still low, many millions more are likely to die from AIDS than have died already over the past two decades. This fact, together with increasing stress on health infrastructures and lack of institutional supports for social services, means that poor countries are likely to be under enormous strain as they attempt to cope with the consequences of AIDS morbidity and mortality—not to mention the burden future generations will likely have to bear in dealing with the pandemic.

In addition to the psychological and social strain, the increase in HIV infections and AIDS deaths among adults in their prime has implications for the public financing of services for the older population, from health care to pensions to welfare. Instead of contributing to these measures, the increase in the number of adults affected by HIV/AIDS will reduce the resources available and increase competition for these services.

Some countries in southern Africa are just beginning to experience the effects of high AIDS mortality. In many other countries the epidemic is poised to explode. Although Senegal, Thailand, and Uganda are notable success stories, that success is due to concerted efforts at all levels of society. And although HIV/AIDS prevalence in Asia has not approached that seen in some countries in Africa, the large populations of some of these countries suggest that the sheer numbers of HIV infections and of AIDS deaths could become overwhelming. Hence the current burden of disease, death, and orphanhood is likely to be a problem in many countries around the world for the foreseeable future.

Appendix: Impact of HIV/AIDS on Demographic and Mortality Indicators

Table 1.A1. Impact of HIV/AIDS on Demographic Characteristics of Selected Countries, 2005 and Projected 2015

Country and Year	Population Growth Rate (percent a year)		Crude Death Rate (deaths per 1,000 persons)		Life Expectancy at Birth (years)		Infant Mortality Rate (deaths per 1,000 live births)		Under-5 Mortality Rate (deaths per 1,000 persons)		Total Fertility Rate ¹
	With AIDS	Without AIDS	With AIDS	Without AIDS	With AIDS	Without AIDS	With AIDS	Without AIDS	With AIDS	Without AIDS	
2005											
Botswana	—	2.6	29.4	3.5	33.9	76.1	54.6	14.4	87.2	18.1	2.8
Côte d'Ivoire	2.1	2.5	14.9	11.0	48.6	56.1	90.8	83.8	138.2	126.8	4.6
Ethiopia	2.4	2.6	15.1	12.7	48.8	53.5	95.3	90.6	154.1	146.6	5.3
Kenya	2.6	3.1	14.7	9.8	48.0	57.5	61.5	55.9	91.6	81.0	5.0
Mozambique	1.5	2.2	21.0	13.9	40.3	50.9	130.8	116.0	190.9	168.1	4.7
Namibia	0.7	2.2	18.4	4.9	43.9	70.3	49.0	23.2	78.3	34.0	3.2
Nigeria	2.4	2.7	17.2	13.9	46.7	52.9	98.8	93.4	191.5	182.9	5.5
Rwanda	2.4	2.7	16.3	13.3	47.0	52.7	91.2	85.8	163.5	154.7	5.5
South Africa	-0.3	1.2	21.3	7.2	43.3	67.0	61.8	36.7	99.4	56.9	2.2
Tanzania	1.8	2.4	16.7	11.3	45.2	55.5	98.5	89.9	145.5	131.1	5.1
Uganda	3.3	3.5	12.8	10.0	51.6	58.7	67.8	64.6	114.7	108.8	6.7
Zambia	2.1	3.0	20.2	10.9	39.7	56.6	88.3	72.0	149.9	123.3	5.5
Guyana	0.3	0.5	8.3	6.4	65.5	69.9	33.3	30.3	44.5	39.4	2.1
Haiti	2.3	2.6	12.3	9.1	52.9	60.6	73.5	67.5	102.6	92.7	5.0
Vietnam	1.0	1.1	6.2	6.0	70.6	71.2	26.0	25.6	35.8	35.3	1.9
Projected 2015											
Botswana	-0.1	2.1	29.0	3.0	34.7	79.6	52.0	8.1	84.2	9.7	2.3
Côte d'Ivoire	1.7	2.1	13.9	9.2	50.7	60.1	74.0	66.2	110.1	97.1	3.8
Ethiopia	1.9	2.2	13.2	10.2	51.2	57.5	78.4	73.0	122.9	113.9	4.2
Kenya	1.8	1.8	8.5	7.5	58.8	61.4	44.6	43.6	63.2	61.3	3.3
Mozambique	0.9	2.0	22.4	11.6	38.5	54.9	111.6	94.3	162.6	134.0	3.9
Namibia	—	1.4	19.0	4.6	44.6	73.1	43.5	16.9	68.7	23.3	2.2
Nigeria	2.4	2.7	14.7	11.5	50.3	56.7	83.2	77.8	153.9	145.1	5.1
Rwanda	2.2	2.5	13.7	10.8	50.8	56.7	75.6	70.7	130.3	122.0	4.9
South Africa	-0.5	1.0	22.1	7.2	44.5	70.1	50.9	26.0	80.0	37.6	1.9
Tanzania	1.9	2.4	14.3	9.1	48.9	59.5	79.8	70.8	115.5	100.5	4.2
Uganda	3.7	3.7	9.1	8.0	58.9	62.5	53.3	51.2	85.6	82.0	6.4
Zambia	1.9	2.7	17.9	8.7	42.5	60.6	74.4	57.7	122.0	94.3	4.7
Guyana	-0.1	0.2	8.5	6.6	68.0	72.7	25.1	21.8	33.2	27.5	2.0
Haiti	2.3	2.6	10.6	7.3	56.3	64.4	56.9	50.9	78.3	68.1	4.2
Vietnam	0.9	1.0	6.2	5.8	73.2	74.0	19.0	18.5	25.2	24.5	1.8

Source: U.S. Census Bureau, International Programs Center, International Data Base (2004) and unpublished tables.

¹The number of children a woman would have in her lifetime if she were to live to the end of her child-bearing years and bore children in accordance with current age-specific fertility rates.

Table 1.A2. Impact of HIV/AIDS on Adult Mortality Indicators in Selected Countries, 2005 and Projected 2015¹

Country and Year	Adult Deaths (percent of all deaths)		Adult Crude Death Rate (deaths per 1,000 adults)						Ratio of Male to Female Adult Deaths	
	With AIDS	Without AIDS	All adults		Males		Females		With AIDS	Without AIDS
			With AIDS	Without AIDS	With AIDS	Without AIDS	With AIDS	Without AIDS		
2005										
Botswana	68	21	38.6	1.4	37.3	1.8	39.9	1.0	0.9	1.8
Côte d'Ivoire	36	24	11.0	5.3	11.0	6.4	11.0	4.2	1.0	1.5
Ethiopia	30	22	9.6	6.0	9.5	6.5	9.8	5.6	1.0	1.2
Kenya	44	30	13.1	6.0	11.2	5.8	14.9	6.2	0.8	0.9
Mozambique	40	23	17.8	6.9	16.9	7.3	18.7	6.5	0.9	1.1
Namibia	58	20	21.3	1.9	18.2	2.2	24.6	1.5	0.8	1.5
Nigeria	27	17	9.8	4.9	9.2	5.4	10.5	4.5	0.9	1.2
Rwanda	32	23	10.5	6.2	10.4	6.8	10.6	5.5	1.0	1.2
South Africa	56	21	22.0	2.8	19.7	3.7	24.2	1.8	0.8	2.0
Tanzania	38	22	13.4	5.3	12.4	5.8	14.4	4.9	0.9	1.2
Uganda	30	20	8.8	4.7	8.5	5.3	9.1	4.1	1.0	1.3
Zambia	44	22	19.2	5.2	17.5	5.8	20.9	4.5	0.9	1.3
Guyana	34	21	8.8	4.0	8.5	4.5	9.1	3.6	0.9	1.2
Haiti	22	19	2.3	2.0	3.0	2.5	1.7	1.5	1.8	1.7
Vietnam	34	22	4.9	2.4	5.0	3.1	4.7	1.8	1.1	1.8
Projected 2015										
Botswana	71	18	36.8	1.0	34.9	1.3	38.8	0.7	1.0	2.0
Côte d'Ivoire	42	25	11.4	4.6	11.3	5.8	11.5	3.4	1.0	1.6
Ethiopia	36	25	9.6	5.1	9.3	5.6	9.8	4.5	1.0	1.2
Kenya	37	32	6.3	4.9	6.0	4.9	6.7	4.9	0.9	1.0
Mozambique	48	25	21.1	5.8	18.6	6.3	23.6	5.3	0.8	1.2
Namibia	60	19	20.5	1.6	16.9	1.9	24.4	1.2	0.8	1.6
Nigeria	29	18	9.0	4.3	8.6	4.9	9.4	3.8	1.0	1.3
Rwanda	34	24	9.7	5.3	9.6	6.0	9.9	4.6	1.0	1.3
South Africa	54	19	21.3	2.4	17.9	3.2	24.9	1.6	0.8	2.0
Tanzania	43	25	12.1	4.5	11.3	5.1	13.0	3.9	0.9	1.3
Uganda	28	21	5.8	3.8	6.0	4.5	5.5	3.2	1.1	1.4
Zambia	50	24	18.4	4.4	16.6	5.1	20.4	3.6	0.9	1.4
Guyana	39	23	8.3	3.3	8.0	3.9	8.7	2.8	0.9	1.4
Haiti	31	18	4.8	2.2	4.8	2.8	4.8	1.5	1.1	1.9
Vietnam	20	17	2.1	1.7	2.7	2.1	1.6	1.2	1.8	1.9

Source: U.S. Census Bureau, International Programs Center, International Data Base (2004) and unpublished tables.

¹Adults are defined as persons aged 15–49.

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